The first lines of the theory and practice of surgery: including the principal operations (Volume 2).

Contributors

Cooper, Samuel, 1780-1848.
Parker, Willard, 1800-1884.
Harvard Medical School
National Library of Medicine (U.S.)

Publication/Creation

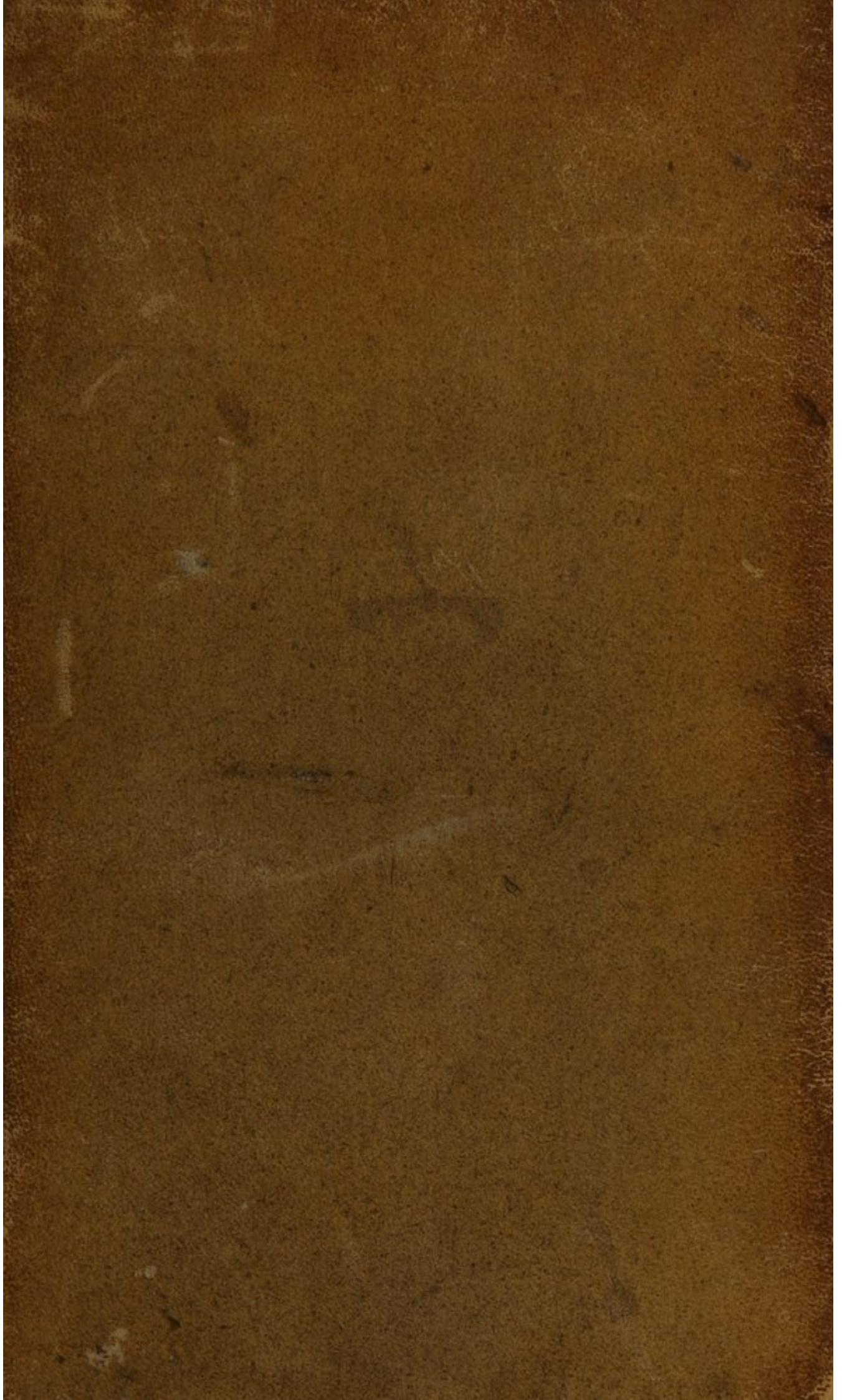New York : Samuel S. and William Wood, 1844.

Persistent URL

https://wellcomecollection.org/works/tbptwngw

License and attribution

Cooper on Spermatic Cord, Rowland on Neuralgia, Osborne on Dropsy, Syme on Rectum, and Clendenning on the Heart,—all in one vol.
Cooper on Dislocations.
———— on Hernia.
Cooper and Travers' Surgical Essays.
Cooper's Surgical Dictionary.
———— Lectures on Surgery.
Copland's Dictionary of Medicine.
Coster's Physiological Practice.
———— Manual of Surgical Operations.
Coulson on Bladder and Prostate Gland.
Cox on Bones, Ligaments, &c.
——— on Insanity.
Coxe's Dispensatory.
Craigie's Anatomy.
Cultivator, 7 vols.
Curling on Tetanus.
Cutler on Bandages.
Cyclopedia of Practical Medicine, 4 vols.
Dana's Mineralogy.
———— Muck Manual.
Darwin's Zoonomia, 2 vols.
Davidson and Hudson on Fever.
Davis on Hydrocephalus.
Davy's Physiological Researches.
Dendy on Dreams.
———— on Skin in Infancy.
Desault's Surgery, 2 vols.
Deslandes' Manhood.
Detmold on Club Foot.
Dewees' Midwifery.
———— Practice of Physics.
———— on Females.
———— on Children.
Dick on Digestion.
Doane's Surgery Illustrated.
Dorsey's Surgery, 2 vols.
———— Cooper, 2 vols.
Downing's Landscape Gardening.
———— Cottage Residences.
Druitt's Modern Surgery.
Dublin Dissector.
Dublin Practice of Midwifery.
Ducamp on Retention of Urine.
Duffin on Deformity of the Spine.
Dunglison's Physiology, 2 vols.
———— New Remedies.
———— Practice, 2 vols.
———— Therapeutics, 2 vols.
———— Medical Dictionary.
———— Hygiene.
———— Medical Student.
Dunsford's Advantages of Homœopathy.
Duparcque on Uterus.
Dupuytren's Lectures on Surgery.
Eaton's Manual of Botany.
Eberle on Children.
Eberle's Practice of Medicine, 2 vols.
———— Therapeutics.
———— Notes.
Edward's Surgical Anatomy.
———— Anatomy and Physiology.
Edwards and Vavasseur's Materia Medica.
Edwards on Life.
Ellis' Medical Formulary.

Encyclopedia Americana, 13 vols.
Evanson and Maunsell on Children
Ewell's Medical Companion.
Faithorn on Liver.
Faraday's Chemical Manipulations.
Farrar's Optics.
———— Astronomy.
Ferguson on Puerperal Fever.
Ferguson's Practical Surgery.
Fessenden's American Gardener.
———— Complete Farmer.
Fisher on the Vine.
——— on Small Pox.
Fitch on Consumption.
Fitch's Dental Surgery.
Flourens sur la Generation, l'Ovologia, et l'Embryologie.
Fordyce on Fever.
Forry on Climate of the United States.
Francis' Denman's Midwifery.
Freckleton's Pathology.
Gall's Manual of Phrenology.
Gallup's Institutes of Medicine, 2 vols.
Gerhard on the Chest.
Gibson's Surgery, 2 vols.
Goddard's Plates of Arteries.
———— do Nerves.
Godman's American Natural History, 2 vols.
———— Discourses.
———— Anatomical Investigations.
Goldsmith's Animated Nature, 4 vols.
Gooch on Diseases of Females.
Gooch's Midwifery.
Goods' Book of Nature.
———— Study of Medicine, 2 vols.
Graham's Chemistry.
Graves' Clinical Lectures.
Granville on Counter Irritation, and Morgan's Surgery.
Gray's Operative Chemist.
———— Elements of Chemistry.
———— Pharmacy.
———— Botanical Text Book.
Green on Diseases of the Skin.
Gregory's Practice of Physic, 2 vols.
Gross' Pathological Anatomy, 2 vols.
———— Anatomy, &c. of Bones, and Joints.
Guthrie on Fractures, Christison on the Kidneys, and Evers' Comparative Anatomy.
Hahnemann's Homœopathic Medicine.
Hale's Flora's Interpreter.
Halford's (Sir Henry) Essays.
Hall on the Blood.
——— on Nervous System.
——— on Diagnosis.
——— on Diseases of Females.
Hall's Practice of Medicine.
Halsted on Dyspepsia.
Hamilton on Purgatives.
———— on Mercury.
Hare's Chemistry.
Harris' Dental Surgery.
Harris on Maxillary Sinus.
Hatin's Obstetrics.
Heberden's Commentaries.
Hecker's Epidemics of Middle Ages
Hennen's Military Surgery.

FIRST LINES

OF THE

THEORY AND PRACTICE

OF

SURGERY.

THE

FIRST LINES

OF THE

THEORY AND PRACTICE

OF

SURGERY;

INCLUDING

THE PRINCIPAL OPERATIONS.

BY SAMUEL COOPER,

SENIOR SURGEON TO UNIVERSITY COLLEGE HOSPITAL, AND PROFESSOR OF
SURGERY IN THE SAME COLLEGE, ETC.

WITH NOTES AND ADDITIONS,

BY WILLARD PARKER, M. D.,

PROFESSOR OF SURGERY IN THE COLLEGE OF PHYSICIANS AND SURGEONS
IN THE UNIVERSITY OF THE STATE OF NEW YORK, ETC., ETC.

IN TWO VOLUMES.

VOL. II.

Fourth American, from the Seventh London Edition.

NEW YORK:
SAMUEL S. AND WILLIAM WOOD,
261 Pearl Street.

1844.

CONTENTS.

SECTION III.

OPERATIONS

ERRATA.

Page 284, *line* 42, } Port au caustigue, *read*, Porte au caustique.
" 285, " 5, 9, }

" 352, " 2, *bottom*, long union, *read*, bony union.

" 373, " 31, *top*, brachiau, *read*, brachium.

" 529, *last line*, Paucoast, *read*, Pancoast.

" " " Port, *read*, Post.

THE

FIRST LINES

OF THE

PRACTICE OF SURGERY.

SECTION II.

INJURIES AND DISEASES OF PARTICULAR ORGANS AND REGIONS.

INJURIES OF THE HEAD AND THEIR CONSEQUENCES.

THIS important subject will here be considered, as it relates,
1st, *To superficial injuries; i. e. wounds and contusions of the scalp,*
2dly, *To fractures of the skull;*
3dly, *To wounds of the brain;*
4thly, *To compression of this organ;*
5thly, *To concussion of it;*
6thly. *And to inflammation of the brain and its membranes from external violence.*

SUPERFICIAL INJURIES.

In consequence of the free intercourse, subsisting between the vessels of the pericranium and those of the dura mater, through the medium of the diploe of the skull, inflammation on the outside of the cranium is apt to be propagated to the dura mater. This is one reason why injuries of the scalp, especially contusions and contused or lacerated wounds of it, are generally more serious than similar injuries merely affecting the common integuments of other parts of the body. Indeed, it is a maxim in surgery, that no wound of the head is so trivial as not to require the strictest attention.

The scalp is often the seat of erysipelas, which, in certain constitutions, will be brought on by a very slight cut or contusion; the in-

flammation spreading rapidly, and soon involving not only the scalp, but the forehead, eyelids, and greater part of the face. Too often also, notwithstanding the most judicious treatment, delirium, or coma, comes on, and the case has a fatal termination. I know of several instances, in which the removal of very small encysted tumors from the head led to the production of phlegmonous erysipelas, in so violent a form that the loss of life was the result.

Contusions of the head frequently give rise to an effusion of blood under the aponeurosis of the occipito-frontalis. The swelling is generally soft in the centre, and hard at its circumference; hence the feel of it may lead an inexperienced surgeon to suspect, that the accident is a fracture of the skull, with depression of the bone. In other instances, the extravasated blood may lie immediately under the scalp, and cover all the upper part of the head, raising up the soft parts in a manner that creates an alarming degree of disfigurement. In general, however, these accumulations of blood under the scalp, from blows on the head, subside very favorably under the use of a few brisk purgatives, and the application of lotions, containing a proportion of the muriate of ammonia, diluted acetic acid, and camphorated spirit. If, however, inflammation and abscess were not to admit of being prevented, fomentations, poultices, free openings, and washing out all the matter and putrid blood with a syringe and tepid water, would be the proper treatment.

When the scalp is wounded, or severely contused, the hair should always be cut off immediately; and, in many cases, it is a matter of prudence to shave the whole scalp, not merely that the wound may be rightly and conveniently dressed, but that every part of the outside of the head may be seen and duly examined, and every mark of external violence detected. Hæmorrhage is, of course, to be stopped, and the wound freed from extraneous substances, and clots of blood; rules applicable to wounds in general.

Frequently the *scalp* is not merely *wounded*, but *lacerated, bruised,* and *more or less extensively separated from the subjacent parts.* In many instances, not only is the scalp thus torn and detached, but a portion of the skull completely denuded, the aponeurosis of the occipito-frontalis muscle and the pericranium being torn up together with the scalp. Here the raised portion, or flap, of the scalp, however torn and irregular it may be, should never be cut away, but be immediately replaced, and laid down upon the exposed portion of the cranium. The scalp is exceedingly vascular, and nature is more successful in repairing its injuries, than circumstances would sometimes lead us to anticipate. At all events, the chance of its preservation and reunion should be taken; for, if we succeed, we materially lessen the risk of necrosis of one or both tables of the skull. We thus expedite the patient's cure, and obviate the deformity which would ensue, either from cutting the flap away, or leaving it more or less displaced from the parts with which it was naturally

connected. If slips of adhesive plaster and a bandage be not suffi-
cient to maintain such flap in the proper position, we ought to avail
ourselves of the assistance of the interrupted suture, making as few
stitches as possible, because they are a source of irritation, and, in
this situation, likely to promote the occurrence of erysipelas. For
the same reason, when they have been employed, they should be
cut and withdrawn at an early period, that is to say, on the removal
of the first dressings.

When *erysipelas* follows wounds of the head, it is to be treated
according to the rules delivered in the first section of this book.
Cold washes ought to be applied to the head, copious venesection
practised, the free use of leeches not omitted, and the exhibition of
calomel, James's powder, and saline aperient medicines, actively
followed up in the early stages of the case. When abscesses seem
likely to form under the tendon of the occipito-frontalis muscle, and
to bring on sloughing of that aponeurosis, a free incision down to
the bone should be made without delay. It is an observation made
by Dupuytren, that, in phlegmonous erysipelas of the head, the in-
teguments hardly ever mortify, like the skin of the leg from the
same disorder; and the reason which he ascribes for the difference
is an anatomical fact; namely, that in the leg the integuments re-
ceive blood only by ramifications from the tibial and fibular arteries,
which lie very deep, while the skin of the head has the occipital,
temporal, and frontal arteries directly under it; consequently, it is
not so easily destroyed by the mischief produced under the apon-
eurosis of the occipito-frontalis muscle, as the skin of the leg is by
similar mischief between it and the fascia.

In the *treatment of suppurating wounds of the scalp*, one object
constantly requires our vigilance; namely, that of preventing the
matter from spreading widely in the cellular tissue under the scalp,
or in that under the tendon of the occipito-frontalis muscle. We
must, therefore, be careful to make with promptitude the free open-
ings, which may be required for this purpose, and to apply pres-
sure, with the view of preventing fresh accumulations.

Frequently, when a portion of the scalp has been separated from
the subjacent parts, and replaced, it will unite at every point; but
in other instances, the union may not be general, and collections of
matter may form in certain places. Here one principal indication
is, to procure a ready outlet for the matter; for if we neglect to do
so, it will not only destroy whatever union may have taken place,
but diffuse itself to a great extent, and lead to a vast increase of mis-
chief and danger. The loose cellular tissue, connecting the tendon
of the occipito-frontalis to the pericranium, may also be the seat of
extensive abscess, and that aponeurosis itself mortify; though the
scalp itself will not generally slough, for reasons already stated.

FRACTURES OF THE SKULL.

When the solution of continuity is very fine, it is termed a *capillary fissure;* when more open, a *fracture.* The broken portion of bone may either continue on a level with the rest of the cranium, or be beaten in, or, as we say in the language of surgery, depressed. The inner table, being more brittle than the outer one, is usually more extensively broken than the latter; and occasionally, violence, applied to the head, will fracture the inner table, and actually cause a depression of it, though the outer table may not be at all broken.

The most important distinctions are those of *depressed* and *undepressed fractures, comminuted fractures,* and *fractures of the inner table alone.*

In young subjects, *depressions of the skull without fracture* sometimes happen; a circumstance owing to the softness and elasticity of the bones of the cranium in the early periods of life; and now and then cases present themselves, in which the bones of the cranium are separated from one another at the sutures.

When violence is applied to the skull, the fracture may not happen to the part which is *immediately* struck, but in some other situation more or less remote from it: this kind of accident is termed a *counter fracture,* or, more commonly, a *counter fissure.* Fractures of the base of the skull are sometimes produced in this way, but not always; for a blow on the occiput or temporal bone may cause a fracture extending from the part actually struck to the base of the cranium.

It was formerly the custom to inquire of candidates for a surgical diploma the symptoms of a fracture of the skull; and I have no doubt that, in the times to which allusion is now made, certain replies of the most erroneous kind were expected and given; for vertigo, paralysis, stupor, loss of sense—circumstances specified by writers and lecturers, about thirty years ago, as symptoms of fractured skull—really denote injury of the brain, or disturbance of its functions, and not a fracture of the skull. The simple solution of continuity in the bone, were it not accompanied by other mischief, would not be attended with any particular circumstances denoting its existence; and, in fact, every experienced surgeon knows, that many fractures of the skull are, on this account, completely overlooked—never discovered; and the patients get well without a single bad symptom. A mere crack in one of the bones of the cranium, *abstractly considered,* is not more likely to produce any serious complaints, than a simple fissure in any other bone; and if symptoms of consequence do frequently attend the accident, they proceed either from the bone being beaten inwards, so as to press upon the brain, or from the mischief done to the parts within the skull by the same force that broke the bone itself. The same violence which breaks

the cranium, may occasion a concussion of the brain, an extravasation of the blood in or upon it, or subsequent inflammation of that organ and its usual consequences.

In Klein's *Chirurgische Bemerkungen* (p. 161.), we find a remarkable proof of the truth of these observations. A man's skull was so badly broken, that, after death, the left half of it could with very little trouble have been separated from the right; yet, after the patient had recovered from the first stunning, which lasted an hour, he remained twenty-four hours without a single bad symptom.

A fracture *without depression*, then, is not, in itself, productive of any dangerous effects, or of any symptoms peculiar to it, or by which its existence may be known. Hence, if the scalp be free from wound, the accident is not likely to be detected at all; but the want of precise information on this matter, I should say, ought to be of no importance in practice, because the treatment should be regulated by other considerations. Thus, if the symptoms indicate concussion or compression of the brain, or a tendency to inflammation of this organ, we are to act accordingly, whether the bone be broken or not. We are led to adopt rigorous antiphlogistic treatment, or to examine the bone, with the view of making a perforation of it, by entirely different reasons than the existence of a *simple undepressed fissure* or *fracture*. However, when the symptoms indicate pressure on the brain, and the part struck is denoted by a wound, or ecchymosis of the scalp, we are then called upon to make an incision, for the purpose of ascertaining *whether any fracture with depression exists*; and, if this should not be the case, such incision may still be useful, because, if the symptoms call for the trephine, the part that has been struck is generally the proper one for its application, as being the most likely situation for any effusion of blood, and for any splintering or depression of the inner table. However, when we trephine under these circumstances, in the expectation of finding blood extravasated under the part to which the violence has been directly applied, we sometimes learn that this is not the case, and that the pressure is neither produced by an effusion of blood on the dura mater in this situation, nor by any fracture and depression of the internal table. Experience proves, that blood is frequently effused in or upon the brain, in situations more or less remote from the part of the head which received the blow.

We are not to suppose, then, that fractures *without depression* are not often accompanied by bad symptoms, but only that the mere injury of the bone itself is not the cause of them. The same violence which breaks the bone may cause a concussion of the brain, an extravasation of blood in or upon it, or a subsequent inflammation of it or its membranes. But fractures *with depression* are a very frequent cause indeed of dangerous symptoms, because neces-

2*

sarily attended with compression of the brain. Yet, it is a curious fact, that the symptoms do not appear to be constantly in a ratio to the degree and extent of the depression of the bone. Sometimes fractures with a manifest and visible depression of the skull are not accompanied with any bad symptoms, or any of those effects known usually to arise from pressure on the brain. I was once called to a hackney coachman, a patient under the care of Mr. Hooper, of the London Road, in one of whose parietal bones a depression as large as a crown-piece had been occasioned; yet he had no urgent symptoms of pressure on the brain, and ultimately got well without an operation. We are not, therefore, to employ the trephine in every example of fracture with depression, but only in those cases which are made urgently dangerous by the existence of such pressure on the brain as this organ cannot quietly endure. I believe it to be an excellent general rule in surgery, *never to trephine a patient for a fracture of the skull, unless he be actually laboring under coma, paralysis, and other symptoms of compression in an urgent and dangerous degree*, excited either directly by the pressure of the bone itself, or by blood effused under it, or by suppuration under it, the consequence of a subsequent inflammation of the dura mater. One exception to the foregoing rule, sometimes specified, is a depressed fracture, occasioned by a pointed weapon, or a punctured fracture, as the injury is often termed; and the reasons assigned for such practice are, first, that this kind of injury of the bone is always attended with a splintered state of the inner table; and, secondly, that the patient will have the best chance of recovery, if the bone be removed before inflammation and suppuration of the dura mater have had time to take place.

Fractures of the base of the skull are cases of so perilous a nature, that they are generally regarded as inevitably fatal. Whether the opinion be true to this extent, is not an easy point to determine, because we never know positively, while the patient lives, whether the fracture has been of this kind or not; and if he recover, we have no opportunity of ascertaining the point by examination. Fractures of the base of the skull are mostly produced by the application of great violence to the lateral parts of the head, or to the vertex and base through the spinal column. If a person fall from a great height, and the top of the head come to the ground, the skull is operated upon by two forces—the resistance of the ground, and the pressure of the body upon the base of the cranium: the bones are seldom displaced to any extent; the dura mater is generally lacerated; the substance of the lower surface of the brain itself wounded; and blood, consequently, effused at the base of the brain. Indeed, such has been the degree of violence, that we generally find blood effused, not merely in this situation, but in others. I have opened many persons who died with fractures of the base of the skull, and the mischief noticed within their heads corresponded in every respect to what has now been described.

Bleeding from the nose, mouth, or ears, when attended with other circumstances, evincing the receipt of a violent injury of the head, and much consequent disturbance of the functions of the brain, has been frequently insisted upon as denoting a fracture of the base of the skull. Sir Benjamin Brodie relates one example of such a fracture, which was attended with hæmorrhage from the ear, and where the source of the blood was found, after death, to be the lacerated carvernous sinus. Perhaps, however, no great degree of importance can generally be attached to this symptom; for such bleeding sometimes comes on from slight injuries, not at all affecting the cranium or its contents; while other cases are met with, where, on dissection, extensive fractures are found of the petrous portion of the temporal bone, and of the sphenoid and ethmoid bones, though no bleeding at all had occurred from the ears, nose, or mouth.

Treatment of Fractures of the Skull.—If the fracture be unattended with depression, or with symptoms of a dangerous degree of pressure, either from this cause, or from extravasation of blood, we must direct our views to the prevention of another source of peril, namely, inflammation of the brain, which may, perhaps, sometimes, be caused by the mechanical irritation of the inequalities of the fracture, but generally by the same violence which broke the bone itself. When the broken bone is not depressed, we can scarcely venture to trephine on the supposition that the inflammation of the dura mater and brain, which often follows such an injury, is owing to the mechanical irritation of the irregularities of the fracture; and, if this should not be the cause of the inflammation, as I believe it seldom is, then the infliction of additional mechanical injury by the operation would be the least rational and advisable measure that could possibly be adopted. Here, it appears to me far more prudent to be content with antiphlogistic treatment, such as cold washes to the head, venesection, arteriotomy, leeches, the free exhibition of calomel, with tartarised antimony, saline purgative medicine, and barley water or tea for sustenance. Nor should the antiphlogistic regimen be altogether discontinued till three or four weeks have elapsed; for the records of surgery prove, that a disposition to inflammation of the brain and its membranes lasts a considerable time after the application of external violence to the head; and such disorder has attacked and proved fatal to many who, supposing all risk over, have returned, prematurely, to their usual mode of living.

Some very interesting cases, illustrating this fact, are contained in Pott's works, and Klein's *Chirurgische Bemerkungen* (12mo, Stutgard, 1801, p. 113., &c.) In some of these examples, the patients remained well and sensible more than a month after the receipt of a blow on the head, and were then seized with fever, shivering, convulsions, paralysis, &c., which soon destroyed them. What is particularly worthy of notice is, that, in some of the cases,

though the symptoms began thus late, and perhaps proved fatal in two or three days, a large portion of the brain and its membranes were inundated with matter; parts of it destroyed; its membranes considerably thickened, and even broken. We must here suppose, either that such disease was going on for a time, without producing any particular bad symptoms, or that its progress was most rapid after it had once begun.

[Many practising surgeons have had the opportunity of seeing cases of concussion terminate fatally, some weeks after the accident, when the patients have supposed themselves well, and have returned to their occupations. A susceptibility to inflammation of the brain and its membranes, continues for a long time, from one to six months. The following case illustrates what I mean. W. B., farmer, aged 24, of good constitution and habits, while engaged in stoning a well, was struck upon the back part of the head, by a stone weighing five or six pounds. He was knocked down, and all the usual symptoms of concussion supervened. Under the ordinary antiphlogistic treatment, he recovered in two weeks. He seemed entirely well when we discharged him, and all the functions were acting in harmony. He was apprised of the danger to which he would expose himself, if he should return to his ordinary out door labors.

He *felt* well, and hence concluded the cautions of the surgeon a matter of supererogation. It was December,—there had been a fall of snow, and his sheep were still out. He therefore, regardless of all advice to the contrary, went out in pursuit of his flock. The night following, he was attacked with a chill, inflammation of the brain ensued, and in ten days from the time, he died, despite all the aid that could be afforded. This patient would certainly have recovered if he had followed the cautious course which had been laid down for him.—Ed.]

A doctrine has arisen, that fractures of the cranium, attended with a wound of the scalp directly over the injury of the bone, are accompanied by much greate danger than other fractures of the skull, uncombined with such a wound. In short, it is alleged, that there is the same difference in this respect as prevails between simple and compound fractures of the bones of the extremities. This is the belief entertained by that highly respected surgeon Sir Astley Cooper, whose views of every part of surgery have great experience for their foundation. The point is important, because the doctrine might deter us from examining the state of the skull by an incision, and applying the trephine, when the patient's safety, perhaps, depended very essentially upon such measures not being postponed. Surgeons, who subscribe to this view of the subject, will naturally be as much afraid of cutting down to a fracture of the cranium when there is no wound, as of cutting into a simple fracture of the leg, and making it compound. They will be inclined to avoid this proceeding, and, of course, to refrain from trephining, whenever the fracture is not accompanied by a wound; while, if the fracture happen to be already exposed by the accident, they would probably apply the trephine for precisely the same symptoms

as they conceive would not justify it when no wound of the scalp exists. If I feel certain of any thing in surgery, it is that *the decision for the operation of trephining should depend upon the symptoms of pressure on the brain being urgent, dangerous, and unequivocally manifested*; and, I believe, whether there be a wound of the scalp or not conjoined with a fracture of the skull, it is our duty, under those circumstances, always to examine the state of the bone, and not to let our conduct be at all influenced by any analogy, whether true or not, between these cases and simple and compound fractures of the limbs. If the doctrine be true, however, which I am by no means prepared to deny, it should certainly teach us not to use the knife without any real occasion for an inspection of the bone.

In the time of the French Academy of Surgery, it was customary to employ the trephine, or rather the trepan, in almost all cases of fractured skull, not merely for the removal of any urgent symptoms present, but with the view of *preventing their occurrence at all*. The absurdity of the latter doctrine received a complete exposure from the facts and observations published by the late Mr. Abernethy, whose investigations into this difficult part of surgery contributed very essentially, as I think, to its improvement, more especially by showing in what cases the application of the trephine might do good, and in what instances the operation should not be undertaken. Even at the present day, his advice is sometimes neglected; for I am continually hearing of persons being trephined under circumstances in which, according to the principles established by his researches, they cannot possibly be benefited by the removal of any part of the cranium. Here, so far as I can judge, the nature of the symptoms actually existing should be the guide; and, instead of admitting the wisdom of the old rule of trephining, in anticipation of bad symptoms which are only apprehended, but may never occur, I should say that the plan is altogether contrary to the dictates of reason and experience. As Mr. Abernethy observed, if the brain will, in the first instance, bear a certain degree of pressure without ill consequences, whether from fracture or effusion,—if it will, at first, bear it without production of urgent symptoms, or irritation of the dura mater by the inequality of a fracture,—why should it not continue to do so subsequently? Dupuytren records the case of a banker at Paris, who was lately living in perfect health with a considerable depression of the cranium, though the accident took place many years ago. Yet Velpeau's observation on this and other similar facts is, that, for one patient who gets well under such treatment, ten would die. It is also not to be denied that, in some instances, the leaving of the bone depressed has been followed, at a subsequent period of life, by severe, and even fatal, affections of the brain and nervous system. It may be asked, then, why do I not approve of trephining every fracture with depression, whether at-

tended at first with urgent symptoms or not? My answer is, that I cannot recommend this plan, partly for the reasons stated by Abernethy, and partly because I doubt whether the cases of subsequent inconveniences, or dangers, from the continuance of the bone below its proper level, when the depression caused no bad symptoms at first, are numerous and common enough to be a foundation for what ought to be the general plan. Supposing the scalp were wounded, the fracture of the skull comminuted, we ought to extract all the loose fragments; for they are already detached, and might cause irritation of the dura mater. This practice would be conformable to the general rules relative to the treatment of all wounds, wherever situated. But, if the pieces of bone were not completely detached, so that they could not be removed without an operation, and no bad symptoms existed, I should be inclined to join those surgeons, who do not recommend an operation under these circumstances.

One consideration which influences me in defending the principle, that the trephine should not be used in injuries of the head, unless bad symptoms actually exist, and are of that description which may be relieved by this measure, is, that the operation itself, viz., the removal of a portion of the skull, and the exposure of the dura mater, are proceedings attended with some considerable risk of bringing on bad, and even fatal, consequences. The late Mr. Ramsden was rather fond of operating; and I remember very well two cases, in which he tried what the trephine would do for the relief of a long-continued fixed pain at one part of the head. A piece of bone was sawn out in each case; inflammation of the dura mater ensued; and, in two or three days, each patient fell a victim to the experiment. The removal of a portion of the cranium is also followed, in a certain number of examples, by a gradual protrusion of the brain through the aperture—a *hernia cerebri*, which generally has a fatal termination.

WOUNDS OF THE BRAIN.

Many fractures with depression produce a laceration of the membranes, and even of the substance, of the brain. This organ, important as are its functions, is frequently wounded without the event being immediately productive of those perilous symptoms which might be expected, but there is a difference in this respect, the reason of which is not at present satisfactorily understood: in some cases, a comparatively slight wound of the brain gives rise to severe and rapidly fatal consequences; while, in others, the same degree of injury, so far as it can be ascertained, occasions no serious symptoms. In the Memoirs of the French Academy of Surgery are detailed various recoveries from most serious injuries of the

brain; such cases as would *a priori* have been regarded as completely hopeless. If we look over the annals of surgery, we find numerous cases in which the patients were cured, notwithstanding the brain had not merely been wounded, but portions of it torn away, or separated. In one of the volumes of the Medical and Chirurgical Transactions of London are the particulars of a boy, through whose frontal bone the linch-pin of a gun was driven with such violence that it lodged in the anterior lobe of the brain. Directly after the injury, he walked several hundred yards, and then fell down, and was seized with convulsions. No suspicion was at first entertained of the passage of a foreign body into the brain. Venesection and other antiphlogistic measures were put in practice; and, on the following day, the urgent symptoms had abated. The boy was treated on this system until the 27th day, when a piece of iron was noticed at the bottom of the wound, and extracted. It proved to be the linch-pin of a fowling-piece, a substance of considerable size and weight. A cure ensued, with the exception of an amaurosis of one eye. A French soldier was wounded at the battle of Waterloo: a musket-ball entered at the anterior portion of the squamous suture, lodged in the substance of the brain; and on the fifth day, after an enlargement of the wound, and the removal of several fragments of bone, it was extracted from the posterior lobe of the right hemisphere of the brain, where it had rested upon the tentorium. Headache and partial deafness of the right ear were the only bad symptoms. A recovery took place. However, I believe the history of this part of surgery will warrant me in representing wounds of the brain as generally attended with vast danger; and that, even if no bad symptoms occur directly after the accident, they mostly come on and prove fatal afterwards. Paroisse gives an account of twenty-two French soldiers, from whose skulls portions of bone, with the scalp and slices of the upper part of the brain, had been separated by sabre wounds. All these men ultimately died; but at first they had no bad symptoms, and actually performed a journey of ninety miles after the receipt of their wounds, one half of which distance they travelled on foot.

Surgeons may be called upon to perforate the cranium for the removal of balls lodged within its cavity. Larrey relates some extraordinary examples of this practice; and it was he who first suggested the necessity of sometimes making a counter-opening in the bone for the accomplishment of this purpose, when the ball had passed to some point of the surface of the brain remote from the opening by which it had entered. He introduces an elastic gum catheter along the track of the ball, and makes a perforation with a trephine over the part where he feels that it is lodged. Now, one of these histories is very curious; for, after having removed a portion of the skull with the trepan, he took out an iron ball, that weighed seven French ounces, which was lodged upon the anterior

lobe of the right hemisphere and against the orbitar process and spine of the os frontis. The patient suffered a painful sense of weight in his head; and whenever he inclined it backward he was seized with syncope. Here, also, the case ended in the recovery of the patient.

In *the treatment of injuries of the head*, attended with a *wound of the dura mater* or *substance of the brain itself*, if no particular symptoms or circumstances immediately demand the trephine, our chief reliance should be upon rigorous antiphlogistic treatment; the same plan as already advised for fractures unattended with urgent symptoms of compression. The external wound itself is to be treated on common principles; it is to be made clean; foreign bodies, or fragments of bone, are to be taken out, and its sides brought together. Such cases commonly end fatally; but we must not absolutely despair of them, for the injury, and even a considerable loss of substance in the upper part of the himispheres, may occur, as we find in the cases which I have quoted, without being necessarily fatal, or even productive of very alarming symptoms.

Wounds of the dura mater and brain are sometimes followed by hernia cerebri, which then often appears to have a considerable share in occasioning the patient's death.

[We are to bear in mind, that when the brain is injured, the danger is always in proportion to the concussion, and not to the amount of laceration.

In several cases, we have *removed* portions of brain, and the patients have recovered without any untoward symptoms. Such cases are produced, when the violence applied strikes obliquely, and as it were brushes the head, instead of coming upon it perpendicularly.—ED.]

COMPRESSION OF THE BRAIN

May arise from fracture with depression, from an extravasation of blood within the cranium, or from a collection of matter in the substance of the brain, or between the inner table and the dura mater, in consequence of previous inflammation, the symptoms of which must than precede those which usnally accompany the injurious effect on the brain. Compression of the brain may also be produced by the lodgment of balls within the cranium, or by the formation and growth of tumors. When such pressure exists, it cannot be expected that the symptoms will be alike in all cases, because the pressure not only differs in respect to its cause, its degree, and its situation, but it differs also in another important point of view, namely, that relating to the kind and quantity of other injury, or mischief, with which such pressure may be conjoined. For we find in practice, that every case of pressure, following external

violence, is not so clear as many writers would lead us to suppose; and that we do not always have mere pressure to deal with, but often pressure combined with iconcussion, with inflammation, or with a wound or laceration of the membranes or substance of the brain. In short, we frequently have to exercise our judgment on what may be called *mixed*, or *complicated*, cases, in which the symptoms do not correspond altogether to those either of compression, concussion, or inflammation singly. Yet, if we understand the general character of the symptoms resulting from each of these states, we shall be in a great measure qualified to judge of the effects likely to be the result of their happening to be coexistent.

It may be thought that apoplexy will give us the best illustration of the symptoms of simple compression of the brain; yet this is perhaps not precisely the case, because apoplexy is often preceded by disease of the brain; and, at all events, as good an illustration of them is afforded by certain cases, in which, after the receipt of a blow on the head, the patients recover from their stunned state, immediately following the blow, and shortly afterwards begin to labor under the effects of an effusion of blood, gradually going on within the head.

The *symptoms of compression of the brain* are headache, stupor, and drowsiness; and, while the quantity of effused blood is small, they may be the chief symptoms. Afterwards, when it increases, and the pressure on the brain is greater, there will be a *loss of all sensibility*, and of *all power over the voluntary muscles*. The eyes will remain half open, the retina will be perfectly insensible, the pupils will generally be dilated, and the iris quite motionless, even when a candle is brought close to the eye. The patient may be pinched or pricked, but he is perfectly unconscious of it: the bladder, being paralytic, cannot empty itself; or its sphincter and that of the anus being in this state, the urine and fæces come away involuntarily. The pulse is slow, and respiration carried on with difficulty and a stertorous noise.

The observations, already delivered respecting mixed or complicated cases, enable us at once to perceive that, even when compression of the brain exists, and this in an unequivocal manner, the symptoms may be modified by the particular complications attending it. Thus, frequently, one pupil may be contracted, and the other be dilated; or the patient may be paralytic on one side, and convulsed on the other. My experience teaches me, that convulsive twitches of the muscles are rather a symptom of laceration of the brain, than of simple compression. They often attend fractures with depression.

In compression, there is usually no sickness and no vomiting. This fact is well exemplified by cases, in which the patient is free from these symptoms until he has been trephined, and then the removal of the pressure is sometimes immediately followed by the rejection of the contents of the stomach.

Another fact which deserves notice is, that, when pressure exists only on one side of the head, the paralysis generally manifests itself in parts on the opposite side of the body. Complete hemiplegia, however, is much more rarely the consequence of accidental injuries of the head, than of apoplexy; a difference, perhaps, referable in these cases to the difference in the situation of the effused blood.

With respect to paralysis, though it is a common symptom of pressure, various facts prove, that it may also arise from concussion.

Too much attention cannot be paid to one circumstance, frequently throwing considerable light on these cases. I allude to the patient sometimes *recovering his senses, after having been stunned by the blow, and then relapsing into a drowsy condition, which is soon followed by all those symptoms already specified as denoting compression of the brain.* That these symptoms cannot depend upon concussion is manifest; for then *the patient would not have regained his senses for a time,* a fact proving that the stunned condition of the patient, or the immediate effect of the concussion, had subsided. That the symptoms cannot depend upon a depressed fracture is equally manifest, because the *patient would have been senseless from the first, and have continued so without remission.* That the same symptoms cannot depend upon the lodgment of matter beneath the skull is certain, *because there has not been time enough for inflammation and suppuration* to occur. The real cause of the return of the loss of sense, then, under these circumstances, becomes tolerably evident, and is accounted for by the extravasation continuing slowly to increase, and to produce more and more pressure, and its usual consequences, notwithstanding it had not advanced sufficiently at first to prevent the return of the mental faculties, on the subsidence of the immediate effects of the concussion which the brain had sustained.

When no interval of sense takes place, but the patient lies insensible and motionless from the first, then we can only form a judgment of the cause of this state of the system by the consideration of other symptoms. Frequently cases of this kind are particularly unfavorable, as being complicated ones, combining concussion and compression together; and not only these evils, but a wound or laceration of the brain, and even a fracture at the base of the skull or elsewhere.

Extravasations of blood between the dura mater and the base of the cranium are mostly fatal. When the blood lies between the dura mater and the tunica arachnoides, it is often widely diffused, so as not to admit of being effectually discharged. When situated on one of the hemispheres, between the cranium and the dura mater, however, it is often circumscribed, and may be discharged by a perforation of the bone.

There is frequently extreme difficulty in forming an opinion about

the precise situation of extravasated blood, even when symptoms indicate such extravasation. Generally we know not whether the blood lies on the dura mater or in a deeper situation, or under what part of the cranium. Now, if the symptoms be urgent, the rule is, that *we are to be guided in the choice of a place for the application of the trephine by any mark of violence on the scalp, or any wound or fracture showing the part on which the violence has acted;* for it is directly under it that the extravasation is frequently, though not constantly, situated. We should also consider on which side of the body the paralytic effects show themselves, as the probability is, that the pressure is on the hemisphere of the brain of the opposite side. But, supposing there were twitches, or spasmodic action, of the muscles of the arm or leg of the opposite side, with paralysis of the limbs on the same side, as the mark of violence, the surgeon should not trephine in the expectation of the blood being effused under that part of the skull which received the blow. In University College Hospital, I have had several cases, confirming the correctness of this advice.

Sometimes there is no mark of external violence on the head, no wound to guide us, no restriction of paralysis to one side of the body, no interval of sense. Here circumstances are desperate, and we have no choice, but either that of trusting to means calculated to stop the further effusion of blood in the head, viz., cold washes and venesection, or that of perforating the cranium without any kind of clue to the situation of the effused blood.

Under these circumstances, the generality of practitioners would be content with bleeding and antiphlogistic treatment; while others, knowing that when a considerable quantity of blood is effused on the surface of the dura mater, it is generally poured out from the middle meningeal artery, might feel disposed to trephine in the track of that vessel. Were there any guide to the side of the head on which the extravasation lay, this bold measure might be warranted; but many surgeons would rather confide in antiphlogistic treatment, and it is not for me to pronounce such decision erroneous. Often the blood is on both sides, or at the base of the skull likewise; and sometimes not only so, but not under the part struck.

When dangerous compression of the brain arises from a fracture with depression, the indication is to elevate or remove the portion of bone forced below the level of the rest of the cranium. For this purpose, we are to adopt certain modes of proceeding, which will be explained when I describe the operation of trephining.

Also *when suppuration occurs on the surface of the dura mater, and produces urgent symptoms of pressure,* the same operation is indispensable ; but this case is generally not one of simple compression,—it has been preceded, and is usually still accompanied, by inflammation under the cranium, affecting not merely the dura mater, perhaps, but the brain itself. In the museum of University College

is a cranium in which a small exfoliation has commenced, in consequence of suppuration on the dura mater. It is one of Pott's cases, as they are called, in consequence of his having particularly described them. In this instance, the trephine was applied, and the dura mater found red and spongy. But the case was not one of simple pressure; for besides the disease of the dura mater, another preparation, taken from the same patient, exhibits a deeply-seated abscess in the brain, about an inch below that part of the skull which is undergoing exfoliation.

The patient, before exhibiting the symptoms of pressure, must have had those of meningeal inflammation,—he must have had severe pains in the head, shiverings, an accelerated pulse, and disturbance of the intellects, followed by coma, and loss of sense, and generally a puffy circumscribed tumor of the scalp, and detachment of the pericranium, corresponding to the extent of the abscess between the inner table and the dura mater. Or, if there were an external wound, its lips would have lost their vermillion color, become pale, flabby, and swollen, and the discharge changed to a scanty fœtid ichor.

Such a case calls for the immediate perforation of the bone, and rigorous antiphlogistic treatment, copious bleedings, leeches, the repeated exhibition of calomel and James's powder, and saline purgatives, with abstinence and quietude.

CONCUSSION OF THE BRAIN

Has many degrees, as may readily be conceived, when the great difference which exists between its two extremes is recollected,— the slight transient stunned condition of the patient, the sudden effect of a moderate blow on the head, and that complete disorganisation which, at the moment of the injury, permanently annihilates all the powers of life.

When the concussion is slight, the patient may be stunned only for a few seconds, or minutes, and a degree of headache, followed by acceleration of the pulse, vertigo, and sickness, may take place; but, in general, none of these effects continue long if depletion be employed. However, in some examples, a very slight blow on the head will bring on inflammation of the dura mater, and this sometimes long after the accident, when all apprehension of danger has ceased.

When the violence applied to the head is greater, the patient is immediately stunned : his extremities become cold ; his pulse is feeble, slow, and intermitting; his respiration difficult, but generally without stertor; and his sensibility and power of motion are entirely abolished.

This is the *first stage of concussion*, or the first effects produced

by severe degrees of it. Such a state cannot last long, for the patient either dies in a very short time, or the effects which I have been describing gradually subside, and are succeeded by others, which may be said to constitute the *second stage of concussion.*

In this the pulse and respiration improve, and, though not regularly performed, are sufficient to maintain life, and to diffuse warmth over the extreme parts of the body. The nervous influence is also now so far revived, that if the skin be pinched the patient is conscious of the injury; and in many cases the contents of his stomach are thrown up; but he lies in a dull stupid state, quite inattentive to slight external impressions. In proportion as the first effects of the concussion subside a little more, he becomes capable of replying to questions put to him in a loud tone of voice. So long, however, as the stupor remains, the inflammation of the brain is moderate; but as the former abates, the latter seldom fails to increase, so as to bring on the *third* or *inflammatory stage of concussion.*

In this *third stage,* if the eyelids be opened, the patient will shut them again in a peevish manner; the pupils are contracted, and a strong light is very offensive. The patient is sleepless; talks much and incoherently; and, if not restrained, will get out of bed, and act with frantic absurdity. As the delirium increases the pulse becomes small, very quick, and even rapid; and, if the inflammation of the brain be not checked, suppuration, or effusion, will occur within the head, preceded by rigors, and the foregoing symptoms change into others, arising from the pressure of the fluid on the brain.

The dangers, then, of concussion depend upon its original violence, which may be such as to kill the patient at once, or upon the inflammation of the brain and its consequences often following the injury.

With respect to the sickness and vomiting, they are generally early symptoms, and seldom continue after the patient has recovered from the first shock of the accident.

Concussion and compression, we know, are often combined; and this fact will explain why the symptoms frequently have not the simplicity we might expect from some descriptions given of them.

Patients, who recover from severe degrees of concussion, sometimes remain variously and curiously affected by the the accident during the remainder of their lives. Imbecility, loss of memory, and a marked change in the character are sometimes the permanent consequences. The patient may have loss of hearing, or partial paralysis. In consequence of an accidental concussion of the brain, a patient, previously a lunatic, has been known to recover his reason. In other instances, the patient, at first, can only remember circumstances with which the mind had been lately impressed, but afterwards recollects nothing but what happened in his chidhood. Sometimes one effect is the total forgetfulness of a language, with which

3*

the patient was previously familiar.   Mr. Liston attended a woman, who recovered her hearing entirely from the accidental effects of a concussion of the brain.   I lately attended a lady in the Regent's Park, who met with a concussion of the brain from her horses taking fright and galloping away with the carriage till it came in contact with some iron railings: in this example, the patient has not the slightest recollection of having met with any accident in the Park; nor does she remember the circumstance of the horses galloping away with her, or the fall of her coachman from the box.   During my attendance on her, with the late Dr. Pinckard, she never adverted to the injury of her head, but repeatedly to a slight burn of her neck, which she had met with two or three days before the other more serious injury.

I believe there is great practical utility in dividing *concussion of the brain* into the three stages which I have described, because the treatment should be regulated accordingly.   In the *first stage*, the taking away of blood must be improper and dangerous, the powers of life being already reduced to the lowest ebb; and, consequently, an attempt to reduce them further would be contrary to the dictates both of reason and experience.   The patient, in fact, is already in danger of dying, without any reaction taking place in the system, and nothing would be more likely than bleeding to render the risk of this termination still greater.   On the contrary, the indication is to endeavor to rally the depressed state of the system, for which purpose warmth should be applied to the surface of the body, and especially to the epigastrium and extremities, and stimulants to the nostrils.   These I consider safer means than the internal administration of cordials and spirituous medicines, which, after the revival of the patient, always begin to have the most pernicious effects.   However, some practitioners venture to give ammonia or ardent spirits by the mouth, or even to throw up turpentine clysters.   From these plans I should always abstain myself, and be content with external stimulants, which can be discontinued directly if they are no longer needed, without any hurtful prolongation of their action.

In the *second stage*, in which the freedom of the circulation has been restored, and a disposition to inflammation of the brain commences, all sources of excitement should be removed.   The patient should be kept perfectly quiet in a darkish room, the head should be shaved and covered with cold applications, blood be taken away, the bowels freely opened with calomel and antimonial p wder, and the functions of the bowels and skin promoted with saline aperient draughts.   When the circulation rises a little more, the pulse quickens, and the fever and cerebral excitement have taken place, the lancet, assisted with leeches, small repeated doses of tartarised antimony, and cold washes to the head, may be said to be the sheet-anchor.   At this period, we should bleed fearlessly,

as often as the pulse rises above a certain point; for if we do not check the disturbance of the circulation, the inflammation in the head will certainly increase, and the patient die. It is in cases of this description that arteriotomy is frequently practised.

The *third stage* is that of complete phrenitis, requiring quietude, bleeding, purgatives, calomel, tartarised antimony, and cold evaporating lotions on the head, and, after a time, blisters on the scalp, or the application of the antimonial ointment to it. When bleeding can no longer be continued, and there is risk of effusion upon the brain, we should give calomel freely, or employ mercurial frictions, so as to excite a salivation.

When all risk of arterial excitement is over, and certain imperfections and infirmities of the intellectual and muscular systems remain, seemingly as consequences of effusion, or some other permanent changes in the brain, the patient should be put under the influence of mercury, and the scalp blistered, or rubbed with the ointment of the iodide of potassium.

HERNIA CEREBRI, OR ENCEPHALOCELE.

As a subject intimately connected with the consideration of injuries of the skull, I will now make a few observations on *hernia cerebri*, or *encephalocele*, as it is sometimes called, which signifies a gradual protrusion of a portion of the brain through a preternatural opening formed in the skull, either by the trephine, or by the exfoliation of a portion of bone in the state of necrosis. In children, indeed, the protrusion has been known to happen through an opening in the skull, left by its incomplete ossification. When hernia cerebri follows the application of the trephine, or the loss or removal of bone from other causes, some days generally elapse before the brain begins to protrude through the aperture; and this occurrence is preceded by ulceration, or sloughing, of the dura mater, without which circumstance probably there would be no protrusion at all in ordinary cases; I mean such as follows the removal of bone by the trephine. The tumor soon attains the size of a pigeon's egg, and its circumference is pressed upon by the edges of the opening. There is great tendency to hæmorrhage from the surface of the protruded mass, and consequently the tumor is usually covered with layers of coagulated blood. In some few cases, the patients do not lose their senses; though in by far the greater number of examples they lie in a comatose state; and if coma does not exhibit itself at first, it always comes on in the advanced stage of the disease. The immediate cause of hernia cerebri is obscure and unsettled, no completely satisfactory explanation of it having yet been given by any pathologist. It is said to arise in consequence of the removal of bone; but this is not the only cause, for if it were so, the pro-

trusion would always follow such loss of bone, which is contradicted by experience. The ulceration of the dura mater, and other changes, appear to be concerned. The cortical and medullary portions are often distinctly visible in the protruded mass, and the pia mater is seen dipping down into the sulci, and enveloping the convolutions. Occasionally the tumor ceases to enlarge, acquires a brownish color, pours out a fœtid matter, and breaks into several pieces, which afterwards separate, and are thrown off; and then granulations will sometimes arise, and the patient recover. This favorable termination, however, is rare; and I have seen so few patients get well who had hernia cerebri, that the prognosis seems to me very unfavorable, more especially when our ignorance of its proximate cause is taken into the account. In France it used to be the practice to dress the swelling with a pledget dipped in wine. Such an application, one would suppose, could not promise to be very serviceable; yet Larrey and others prefer it. In this country. pressure in moderation has sometimes been tried, and even the bolder method of slicing off the protruded part of the cerebral mass. As a linen compress cannot be so exactly applied as a plate of metal, I should conceive that when the surgeon means to resist the return of the protrusion, the latter should be preferred. In removing a hernia cerebri with the knife, there is frequently profuse hæmorrhage; but though copious at first, certain cases on record prove, that it stops after a short time, and is not itself productive of danger. The liberties taken with the protruded portion of brain, without any apparent ill consequences, are truly surprising: the facts demonstrate, at all events, that the superficial parts of the hemispheres will bear a great deal of injury and mutilation, without life being destroyed or recovery prevented. We cannot wonder that this disease should be so often fatal, when we remember, that, in most cases, it is complicated with extensive and deep-seated injury of the brain. Dissection shows, that there is generally blackness and sloughing of the dura mater for some extent around the tumor; and that, in many cases, the substance of the brain has a softened and broken-down appearance. A fœtid dark colored fluid is also found between the dura mater and arachnoid membrane, which latter part is often thickened and opaque.

[In the N. Y. Journal of Med. and Surgery, No. 4, 1840, there is a valuable paper upon hernia cerebri by Dr. Buck one of the Surgeons of the N. Y. Hospital. He analysed thirty-three cases, and the result tends to confirm us in opinions somewhat at variance with those expressed by Mr. Cooper

Thirty-one of the thirty-three cases were males. The reason for this is, that males are more exposed to injuries of the head than females, and not that there is any difference in the organization of the brain. The youngest subject was two and a half years old, the oldest forty. Seventeen of the number were twelve and under, and nine were from thirteen to twenty, making twenty-six, out of the thirty-three cases,

under twenty-one years of age. This shows, that we have a greater tendency to fungus cerebri in young subjects. In twenty-one of the cases, the dura mater was lacerated, in ten there was no solution of its continuity. In fourteen, the brain was wounded, and portions torn away, in five, it was wounded, but none torn away, and in ten, it was not seen, as the dura mater was whole.

The time when the fungus commenced varied. In six cases, it occurred before the sixth day; in fifteen, between the seventh and twelfth; and in five, between the twelfth and twenty-fifth days, and in one instance, after eight weeks. The earliest appearance of the disease was on the third day, and more than three-fourths of the hernia, occurred before the twelfth day. Seventeen recovered, and sixteen died. Twelve of those who recovered were twelve years old and under, and only five of those who died were less than twelve. The size of the tumor varied, from one inch and a half in diameter, to a mass measuring six inches by three and a half on the surface, and two and a half in thickness. The tumors, in eleven of the sixteen fatal cases were examined; nine of them, were composed of the medullary and cortical substance of the brain and two of those reported by Mr. Abernethy, consisted of a coagulum of blood.

From this analysis of Dr. Buck we learn, that young subjects are more exposed to fungus cerebri than old, probably because there is always a stronger tendency to inflammation of the brain in children. We learn also that there is more danger of hernia, when the dura mater is lacerated, and the brain wounded. We discover too, that the tumor shews itself, generally, by the twelfth day, after the injury; that when the disease does occur, there is an even chance that the patient will recover; and that the younger the subject, the better the prognosis.

We learn, moreover, that the structure of the tumor is cerebral in most instances, and that there is no one course of local treatment, which can be relied upon in all cases.

We entertain the opinion, that the liability to the occurrence of hernia, is always proportionate to the amount of general injury of the brain. We have never yet seen a case of fungus cerebri, however extensively the dura mater and brain were lacerated, except when there had been decided concussion.—ED.]

FUNGOUS TUMORS OF THE DURA MATER.

Fungous tumors sometimes grow from the external surface of the dura mater, and, after destroying the superincumbent portion of the cranium, make their appearance in the form of an external swelling under the scalp. They are generally preceded by a blow, or fall on the head, and occur at the part to which the violence was applied. As the fungus grows larger, its pressure against the skull, and particularly its pulsatory motion derived from that of the brain, occasion a slow and gradual absorption of the bone, just in the same

way as an aneurismal tumor destroys any part of a bone against which it happens to press. The portion of the cranium immediately over the swelling being absorbed, the fungous excrescence meets with less resistance; it quickly protrudes through the opening in the skull; forms a prominent tumor under the scalp; and enlarges with increased rapidity. The severe pains in the head, which precede the external appearance of the disease, become still more violent as soon as the fungus protrudes through the opening in the bone, and is irritated by the sharp inequalities of its edge. The swelling has a manifest pulsation, corresponding to that of the arteries; and when compressed, it either returns entirely within the cranium, or is considerably lessened. The pain then subsides, the tumor being no longer irritated by the irregular circumference of the opening in the skull. If the size of the fungus be large, no relief can be thus obtained; for, when an endeavor is made to reduce the tumor, all the alarming symptoms of pressure on the brain are immediately excited.

Fungous tumors of the dura mater constitute a very dangerous form of disease, and mostly prove fatal.

Before a fungus of this description has made its way through the cranium, and projected under the scalp, so that its nature and existence can be ascertained, the practitioner has no opportunity of attacking the disease with any effectual means. The ordinary treatment of the severe pain occurring in certain parts of the head, after blows or falls on the cranium, and before the fungus protrudes, has consisted of bleeding and evacuations. But when the disease has manifested itself in the form of an outward swelling, the nature of which is recognised from previous circumstances, as well as from the pain which attends it, and subsides on its reduction, and its pulsatory motion, the head should be shaved, a crucial incision made in the scalp covering the fungus, the angles dissected up, and the whole of the tumor and the margin of the opening through which it protrudes fairly exposed. But, as it is impossible to get at the entire root of the fungus, while it is closely embraced by the cranium, it becomes necessary to saw away the surrounding bone. This object can be best accomplished with one of Hey's saws. The root of the fungus being thus exposed, the next business is to cut it away from the dura mater. Fungous tumors of the dura mater have occasionally been extirpated with a ligature. The first operation which I ever saw in St. Bartholomew's Hospital, was the excision of two or three of such tumors, which was performed by the late Mr. Ramsden. The patient did not recover.

DISEASES OF THE EYE AND ITS APPENDAGES.

This part of surgery being now cultivated with minute care, no

surgeon, who values his own reputation, will neglect the study of it. Were it not a subject disfigured by too many harsh and barbarous terms, I should say, that it is one of the most inviting departments of surgical pathology and practice—one, in which we may often actually see the changes of disease exactly as they occur, and estimate their nature and character with wonderful precision.

For the sake of method, I will divide it into three parts; the first comprising *diseases of the lachrmyal organs*, the second *those of the eyelids*, and the third *the diseases of the eye itself.*

DISEASES OF THE LACHRYMAL ORGANS.

The lachrymal gland is not itself very liable to disease. In scrofulous children, it is occasionally the seat of inflammation and suppuration; but such a case is uncommon. The proper treatment would be leeches, purgative medicines, a cold evaporating lotion, and other antiphlogistic remedies. If suppuration could not be prevented, the cold lotion should be exchanged for poultices and fomentations; and, as soon as matter had formed, a puncture ought to be made, if possible, through the conjunctiva, under the outer portion of the upper eyelid; or, if this were impracticable, through the skin.

Another disease is an *indolent scrofulous enlargement of the lachrymal gland*. When I speak of any disease of the lachrymal gland, the case, whatever it may be, must be an uncommon one; and this we shall be convinced of when we hear, that the Reports of the London Opthalmic Infirmary, for twelve successive years, contain no example of any disease of the lachrymal gland. If we were to meet with an indolent enlargement of it, we ought to treat it with the general remedies recommended for other scrofulous diseases, especially the repeated use of leeches, the compound calomel pill at night, and aperient medicine in the morning; or, what might be still more advisable, we should have recourse to friction with iodine ointment, prepared according to Lugol's formula, the patient taking at the same time the iodine solution, made according to his directions.

Scirrhus of the lachrymal gland is mentioned by most surgical writers; but doubts are sometimes entertained, whether a certain chronic induration of the lachrymal gland, generally described as scirrhous be truly of this nature; for the disease is remarked not to affect the lymphatic system; never to undergo malignant or cancerous ulceration, independently of that of the eyelids or conjunctiva; not to be followed by relapse after extirpation; and that the lachrynal gland is not very prone to assume any malignant change, may be inferred from the fact, that when the globe of the eye and the other contents of the orbit are extensively diseased, the lachry-

mal gland usually remains unaffected. The same fact is common-
ly noticed in cases of medullary disease of the retina, even when it
has advanced to that degree which makes the removal of the eye
necessary. The gland may be rendered as large as, or even lar-
ger than, a walnut; but when removed, its texture, though harden-
ed, does not always exhibit the peculiarities of the schirrhous struc-
ture. However, the best authorities differ on this subject; for
some of them contend, that the lachrymal gland, conjunctiva, and
eyelids are the parts about the eye peculiarly liable to cancer; and
there is no doubt, that the lachrymal gland is sometimes involved
when these other parts are attacked. A truly scirrhous affection
of the lachrymal gland alone is undoubtedly a rare disease. In the
examples, recorded by Mr. Todd and Dr. O'Beirne, the struc-
ture of the diseased gland seems to have corresponded to that or-
dinarily described as characteristic of scirrhus.

What is reputed to be *scirrhus* of the lachrymal gland, is not at-
tended with that preternatural dryness of the eye which has fre-
quently been supposed to be an unavoidable consequence of such a
disease; for in the cases of it, recorded by Mr. Todd and Dr.
O'Beirne, in the 3d vol. of the Dublin Hospital Reports, there was
actually an increased secretion of tears; an *epiphora*, as it is tech-
nically called. The symptoms characterising it are, lancinating
pain in the external and upper part of the orbit; enlargement of the
gland, till it forms a prominent, hard, lobulated, tumor, quite per-
ceptible under the tense skin of the upper eyelid, and displacing
the eye-ball in a greater or less degree, downwards, inwards, and
forwards; dulness of the cornea; dimness of sight; double vision;
dilatation of pupil; and at length complete blindness. In the worst
stages, the temporal side of the orbit is dilated, or the eye so press-
ed upon as to be destroyed by ulceration and the evacuation of its
humors.

As for the treatment, with the view of reducing and dispersing
what is termed scirrhus of the lachrymal gland, the means proposed
are leeches, followed by a succession of blisters, alternately to the
neighboring part of the forehead and temple; or friction with
Lugol's iodine ointment, assisted by the internal exhibition of the
iodine solution.

Were these plans to prove ineffectual, and the tumor to become
a source of considerable annoyance to the patient, or of mischief
to the eye, it would be necessary to remove the diseased gland.
The operation cannot be easily done from beneath the upper eye-
lid, as it is sometimes recommended, unless an incision be made
through the outer commissure, so as to let that eyelid be turned
completely up, and the conjunctiva be sufficiently exposed. Hence
surgeons, who have occasion to remove the lachrymal gland, have
generally preferred cutting directly down to the tumor, making a
crucial incision over it, raising the angles of the wound, and then
taking hold of it with a tenaculum, and dissecting it out.

The return of vision, and of the eye into its place again, does not always take place immediately; and the sight may, indeed, never be recovered. In one case, reported by Dr. O'Beirne, the eye resumed its proper position, and vision was restored. In another instance, the particulars of which are given by Mr. Todd, though the protrusion of the eye was gradually rectified after the operation, the blindness continued. In one or two examples, which were under Mr. Lawrence, the operation was followed by a considerable improvement of the sight.

Diseases of the Caruncula Lachrymalis.—The caruncula lachrymalis and semilunar fold of the conjunctiva are liable to inflammation, and sometimes matter collects in the substance of the former. The treatment consists in the removal of the cause, which may be the pressure and irritation of the eyelashes, or the presence of some extraneous substance; but the most common cause is exposure to cold. The caruncula is to be frequently bathed with tepid water, and opening medicines administered. In the early stage of a severe case, a leech might be put on the caruncula; and, in the event of suppuration, a bread and water poultice, included in a little muslin bag. The abscess should be opened early; and if fungous granulations arise, they are to be repressed with the nitrate of silver.

Encanthis signifies a chronic enlargement of the caruncula lachrymalis. Two forms of it are usually described; one, a *simple* indolent swelling of the part; the other, a *scirrhous* affection of it, disposed to degenerate into cancerous ulceration, but, fortunately, so rare that some surgeons, who have had the greatest opportunities of seeing this department of surgery, have not met with a single example of it. The inconveniences necessarily resulting from an encanthis, are considerable, as chronic ophthalmy, an impediment to the complete closure of the eye, and an interruption of the passage of the tears into the nose by the compression and displacement of the puncta lachrymalia. Hence the tears are continually dropping over the cheek, so as to produce the complaint technically named *stillicidium lachrymarum*, which is not to be confounded with *epiphora*; for while this last consists in so profuse a secretion from the lachrymal gland that the tears cannot wholly pass down into the nose, the *stillicidium* is a dropping of the tears over the cheek, in consequence of an impediment to their passage from the eye into the lachrymal sac. From the various causes, which I have explained as accompanying encanthis, the eyesight itself must be considerably weakened and disturbed.

When an encanthis cannot be reduced by applying to it the vinous tincture of opium, or a solution of the nitrate of silver, and especially when, from its great pain and disposition to bleed, it evinces a cancerous tendency, or, at all events, a propensity to become a very painful and troublesome disease, it should be removed without further delay. Some operators pass a ligature through it,

by means of which they draw it out, while they perform the requisite incisions with a small scalpel; but taking hold of it with a tenaculum will enable us to cut it away with facility.

In the encanthis of the large inveterate kind, an elongation of it upon the inside of each eyelid may be seen, requiring to be separated with the knife in the commencement of the operation, before the main part of the tumor is separated. The surgeon should be careful not to encroach upon the conjunctiva, and, if possible he should save a small portion of the caruncula, sufficient to prevent a perpetual dribbling of the tears over the cheek, after the cure of the disease. The eye is to be bathed with tepid water, and afterwards mild ointments, and astringent collyria, &c., are to be employed. If the granulations rise too much, the nitrate of silver is to be applied.

Of various Diseases of the Lachrymal Organs, formerly confounded together under the Name of Fistula Lachrymalis.—It is only within a few years, that any discrimination has been introduced into the views taken by surgeons of the diseases of the lachrymal organs. Nearly all these complaints were supposed to be essentially connected with obstruction of the nasal duct; and hence its removal was generally the principal thing contemplated in the treatment. It was too much looked upon as a cause, and not as an accidental accompaniment or consequence, of certain affections of the lachrymal parts of the eye. The truth is, obstruction of the nasal duct is sometimes merely the temporary effect of inflammation; and, I might say, that in the greater number of diseases affecting these parts, such obstruction either does not really exist, or, at all events, has no share in the original production of the inconveniences which the patient is experiencing. Thus, if the disease be simply a morbid change in the secretion of the mucous lining of the lachrymal sac, the *blennorrhœa sacculi lachrymalis*, as it is termed,—or if the case be merely an extreme relaxation of the part, the *hernia*, of it, as it is sometimes called, the absurdity of opening the sac with a knife, and thrusting a probe, bougie, or style down into the nose, must be obvious.

Inflammation of the lachrymal sac may extend, more or less, down it into the nasal duct. The affection may be *acute* or *chronic*; the latter being more common than the former. In the acute, a swelling, shaped like a horse-bean, and attended with a degree of redness, presents itself just below the tendon of the orbicularis palpebrarum muscle. The swelling of the skin is at first confined to the part over the lachrymal sac, but afterwards spreads to the eyelids, which present an œdematous appearance. Now, in consequence of the lining of the sac and nasal duct becoming thickened, the passage for the tears into the nose is obstructed; so that, partly from this cause, and partly from the shrunk contracted state of the puncta lachrymalia, usually noticed at the same time, the tears do not descend into the nose, but fall over the cheek; consequently

there exists what is termed a *stillicidium lachrymarum*. However inflamed the skin may be, we may always distinctly feel the swelling of the lachrymal sac beneath it. In healthy individuals, this kind of inflammation of the lachrymal sac rarely leads to the permanent obliteration of the nasal duct by the effusion of fibrine, though in scrofulous subjects such a result is possible.

The pain attending acute inflammation of the lachrymal sac and lining of the nasal duct, is more severe than might be expected from the small extent of the part affected. The headache is excruciating, and the fever considerable. Frequently the case advances to suppuration. The sac, and the parts by which it is covered, being incapable of any further distention, sometimes slough; but, more commonly, in the middle of the swelling a yellowish soft point is observed, which soon gives way. Then, the collection of pus and mucus within the sac makes its way through the orbicularis palpebrarum and the integuments; but, by this opening, merely the thinner parts of the matter are discharged, and the tumor is for a time somewhat lessened. Soon afterwards, when pressure is made upon the superior part of the sac, not only pus and mucus are discharged from the opening, but occasionally a quantity of pure tears; a proof, at all events, that the conveyance of the tears into the sac is now re-established. In other words, the action of the lachrymal puncta and canals has again commenced. This is always a favorable circumstance, as it denotes that now the only question relates to the state of the nasal duct. For some time after the discontinuance of suppuration, a morbid secretion, somewhat like pus, is kept up from the mucous membrane of the sac; but this also ceases in its turn, and healthy mucus is again formed in the natural quantity. Sometimes the opening in the sac now heals up either spontaneously or by the aid of common surgical treatment. Most frequently it contracts at first to a very minute size, through which, if the nasal duct should not have become duly pervious again, the tears and mucus will occasionally be discharged. Should this minute opening close, and the nasal duct still remain impervious, the patient is obliged several times in the day to press upon the sac, in order that the mucus and tears collected in it may be discharged through the lachrymal puncta and canals. In other instances, the swelling of the lining of the sac and duct lessens with the inflammation; the passage for the tears is restored; and a complete cure is the result.

From what has been stated, it is manifest, that it is not every inflammation of the lachrymal sac that terminates in the production of an external opening indisposed to heal, or a *fistula lachrymalis*, as it is termed. Whether such an opening form or not, and whether, when formed, it will become fistulous or not, will materially depend upon the treatment.

If, when the lachrymal sac is violently inflamed, the case be neglected or wrongly managed, a complete or partial closure of the

nasal duct by the adhesive inflammation is likely to be the conse-
quence. There may also be produced an obliteration of the lach-
rymal canals, in which event, the absorption of the tears, and their
conveyance from the eye into the sac, may be for ever impeded,
and the patient remain during the rest of his life afflicted with a *stil-
licidium lachrymarum.*

In the *first stage*, the plain indication is to endeavor to subdue the
inflammation; and it is by combating this affection, and not by at-
tacking one, or even several of the symptoms, or effects, that we
shall have the greatest success in curing the patient. For instance,
what would here be more absurd than the scheme of dilatation, by
the introduction of probes through the lachrymal canals into the sac,
or even through the nasal duct into the nose? This would only be
subjecting the inflamed parts to a new cause of irritation, and in-
creasing the risk of greater mischief than is actually impending.
Hence, instead of trying to insinuate instruments from one of the
puncta lachrymalia down into the nasal duct,—a method, as I think,
never advisable as a common practice, on account of its injurious
effect upon the delicate organization of the lachrymal puncta and
canals; and, as Dr. Mackenzie attests, rarely successful in any
cases; we should have immediate recourse to antiphlogistic treat-
ment; applying leeches freely and repeatedly to the inflamed part
and its vicinity, covering it either with a cold evaporating lotion, or
applying poultices and fomentations, and prescribing saline aperient
medicines, followed by the exhibition of calomel, and antimonial
powder. A very low diet will always be requisite; and, when the
pain is severe, venesection.

Two principles I wish particularly to inculcate: 1st, that it is not
every inflammation and temporary obstruction of the lachrymal sac
and duct, which require the introduction of instruments down the
duct into the nose: 2d, that when the obstruction is permanent, we
should puncture the sac, and attack the obstruction in this manner.
This is much better than throwing lotions into the sac through the
lachrymal puncta and canals, whereby we should be more likely to
destroy the right action of these delicate organs, than remove the
stoppage of the flow of the contents of the sac into the nose.

In the *second stage*, when resolution is no longer practicable, the
cold lotion may be laid aside for emollient applications; and when
the sac is so distended with mucus and pus that the centre of the
swelling begins to soften, and a fluctuation to be perceptible, a
puncture should be made large enough for the ready discharge of
the contents of the sac. Having made an opening, I would merely
inject tepid water with Anel's syringe down the nasal duct; a plan,
which may be repeated every day, if the fluid can be made to pass
into the nose. If it cannot, the obstruction should be removed with
a probe.

When, by means of antiphlogistic treatment, the inflammation of

the membrane of the sac has subsided, and by this and other measures the mucous secretion from it has been brought into a healthy state, and all the induration has disappeared, we may then think of adopting some plan for the re-establishment of the passage through the nasal duct, if it should not have already become free again under the treatment here recommended.

What I have now said principally relates to acute inflammation of the lachrymal sac; but this part is still more liable to *chronic inflammation.* Sometimes, and especially in scrofulous subjects, the lachrymal sac becomes distended with mucus, without any previous active inflammation in it. This is the stage which Dupuytren calls the *lachrymal tumor,* and which begins almost imperceptibly, the swelling being at first scarcely distinguishable, and situated under the inner canthus, and below the tendon of the orbicular muscle. It is circumscribed, and at first unattended with pain, or any change of color in the skin. The inconvenience, first noticed, is a weakness of the eye, from the tears collecting at the internal canthus. Whenever the patient looks at minute objects, he finds a tear ready to drop over the cheek; and, to relieve himself from this annoyance, he is obliged to press upon the sac, so as to expel its contents, which either regurgitate through the puncta, or, what is less common, pass down into the nose. In this case, the nostril is generally drier than in the natural or healthy state of the lachrymal organs. Things go on in this way a considerable time, until at length the tears cannot any longer be made to descend by pressing upon the tumor in the corner of the eye; but, instead of doing so, they regurgitate entirely by the puncta lachrymalia, mixed with pus and mucus, and the whole of the lachrymal secretion falls over the cheek. The mucous membrane of the sac is the chief seat of this chronic inflammation. Sometimes the lachrymal canals, the sac, and the nasal duct are all affected together; and occasionally the lachrymal canals alone. After a certain period, the effects of the inflammation generally extend, more or less, to the mucous membrane of the eyelids, and even to the eye itself. The edges of the former are swollen, and adhere together in the morning; and the vessels of the conjunctiva are always more injected with blood than in the healthy state of the eye. In many individuals, the complaint disappears during summer, but returns at the commencement of cold or wet weather.

The complaint may continue in the above state for a long time; but, at last, a period arrives, when the parietes of the tumor become very thin, when the swelling can no longer be emptied by pressure, and the skin over the sore is red, hot, and painful. Frequently the inflammation extends to the eyelids, cheek, nose, and forehead. A fluctuation is now felt in the tumor, which points and bursts; and the opening, if neglected, is converted into a true *fistula lachrymalis.* In most patients, the stillicidium lachrymarum is

4*

now materially lessened, in consequence of the tears finding an out-
let through the new opening, which the nasal duct did not previous-
ly afford them.   The discharge from the sac is a mixture of tears,
mucus, and pus.

The *treatment of chronic inflammation of the lachrymal sac* con-
sists in endeavoring to remove the inflammation; and, if we suc-
ceed in this purpose early enough, we prevent suppuration and ul-
ceration of the sac, the formation of a *fistula lachrymalis*, as it is
called; the nasal duct will not be permanently obstructed; and the
tears and mucus will gradually resume their proper course into the
nostril.

If, after the cure of the inflammation, the passage should not be
free, and the sac remain distended, we may endeavor to press the
fluid, with which it is filled, down into the nostril, placing the fin-
ger for this purpose between the puncta and the sac, and pressing
from the puncta towards the nose.   We may also instil into the
corner of the eye, every day or every second day, a few drops of
a lotion containing 2 grs. of the nitrate of silver, or from 2 to 4
grs. of the sulphate of zinc, to an ounce of distilled water; and in
order that such fluid may be absorbed by the lachrymal puncta, the
patient should lie upon his back, and continue quietly in this position
during, and for a short time after, the operation.

When the conjunctiva of the eyelids and the Meibomian glands
are affected, we may employ salves, the best of which are the
ointment of the nitrate of quicksilver, in the proportion of one
third of it to two thirds of spermaceti ointment; the red or white
precipitate of mercury ointment in the proportion of one scruple of
the powder to an ounce of lard; or the nitrate of silver ointment,
from five to ten grains to an ounce.   Undoubtedly, when suppura-
tion cannot be prevented, emollient poultices and fomentations are
advisable; and, as soon as the abscess is distinctly formed, a punc-
ture should be made in it.

On examining the nasal duct, we now generally find it contract-
ed at one or several points; and, for the removal of the obstruction,
we are next to introduce a probe, and then employ a *nail-headed
style*, in order to remove the disposition of the passage to close
again.   This instrument may be worn for an unlimited time without
any material annoyance.   The eyelids being drawn outwards, so as
to put the orbicularis palpebrarum on the stretch, we are to make
a puncture in the sac with a lancet, or a narrow sharp-pointed bis-
toury, along the surface of whose blade the style will pass into the
sac, as on a director; a convenient method, which, I observe, was
practiced by Dupuytren, with his cannula, and which I have seen
Mr. Liston adopt, in University College Hospital, with great skill,
as soon as the puncture had been made.   It is the method to which
I usually give the preference.   Before making the puncture, we
ascertain the precise situation of the nasal edge of the orbit, and of

the tendon of the orbicular muscle: for it is between these points that the knife should be introduced, carefully avoiding to go below the margin of the orbit, where the sac will not be found: a large quantity of mucus and puriform matter will be immediately discharged. A common silver probe is then to be passed into the sac, and thence down the nasal duct into the nostril, so as to clear away the obstruction. It should be introduced horizontally, till it touches the nasal side of the sac; it should then be raised into a vertical position, and its point directed downwards and a little backwards. If it meet with an obstruction, we must not immediately conclude, that there is an obliteration of the duct; but should press the probe down a little more strongly, turning it round between the fingers, and giving it different directions. In this way, the obstacle may frequently be overcome, and the probe will suddenly descend. The probe is then to be withdrawn, and a little tepid water injected; after which the style is to be introduced sufficiently far to bring its head in contact with the skin. I see no utility in making a formal extensive incision: all that is required is a puncture to let out the matter, and to allow the style to be introduced, which is to be withdrawn, once or twice a week, and tepid water, or some slightly astringent lotion, injected through the nasal duct.

After the style has been worn a little time the *blennorrhœa of the sac*, as it is termed, disappears almost entirely. The tears and mucus, absorbed by the lachrymal canals, would seem to be conveyed along its surface through the nasal duct; and thus the functions of the parts being restored, the inflammation and discharge quickly subside. The curious fact of the fluid taking its natural course, when a solid style is thus kept in the nasal duct, seems to Mr. Lawrence to be explained by what happens in the urethra; namely, by the enlargement of that canal round a catheter, which is left in it.

Sometimes, after the style has been worn one, two, or three months, it is discontinued, and the opening heals up; but a relapse takes place, and it is necessary to introduce the style again, and to continue it for some weeks longer. What proves how little inconvenience is commonly felt from its presence is, that the patient will often express a preference to wearing it a very long time, rather than subject himself to the slightest chance of a return of the disorder.

When the head of the style is covered with black sealing wax it causes little or no disfigurement. The instrument must occasionally be taken out and cleaned. After the parts have become habituated to it, I find that taking it out once a-week is quite sufficient. If left in too long, without being cleaned, it would be corroded, and likely to break in the part.

When the style, on being first used, creates much irritation, it is better to withdraw it, and after clearing away all obstruction in the

nasal duct once more with a probe, we are to be content with injecting tepid water through the nasal duct by means of Anel's syringe, using at the same time leeches, emollient applications, and aperient medicines. Instead of a style, a tube made of gold, or silver, is employed by some practitioners. Baron Dupuytren prefers a tube of this kind, which is introduced into the nasal duct by means of a steel stilet, bent at a right angle at the portion beyond the bend corresponding to the cavity of the tube. The latter must be fairly lodged in the duct, with its upper or expanded portion occupying the lower part of the sac. The puncture soon heals, and the tube serves as an artificial channel for the tears. It is calculated, that Dupuytren treated 3000 cases in this way, and that, in nine out of every ten, the cure was accomplished, without any inconvenience from the continuance of the tube in the duct. In some instances, however, it became displaced, rising too high, or sinking into the nostril, through the lower opening of the duct. The first occurrence brings on inflammation, ulceration, and abscess, which render the extraction of the tube necessary. The second inflames and irritates the mucous membrane of the nostrils, and sometimes excites ulceration and sloughing of it, and the end of the tube may even perforate the roof of the mouth. Dupuytren has suggested very good plans for extracting the tube in each of these events; but as the style, preferred in this country, is not liable to the inconvenient consequences here specified, I need not enter into any further details.

When a probe cannot be got through the obstruction in the nasal duct at the first trial, a piece of catgut, ar bougie, may be left in the passage, and the attempt to overcome the stoppage daily repeated. If the obliterated portion of the nasal duct should still prevent success, perhaps the right practice would be that of rendering the nasal duct pervious again, by means of a small triangular perforator. This, I think, would be better than drilling a hole in the os unguis, and removing any portion of this bone with forceps, or destroying it with the cautery. If the perforated part of the duct should not admit of being kept open after the style has been worn a long time, the patient must continue to wear either it or a silver or gold tube. Caries of the os unguis, so frequent formerly, is now rarely met with, a proof that it was generally occasioned by wrong treatment. In the Leçons Orales of Baron Dupuytren is an instance, however, where such caries took place, even before the lachrymal tumor had burst, or any fistula had been formed.

With respect to *general treatment.*—In scrofulous cases, chronic inflammation of the lining of the sac and nasal duct will sometimes not yield, unless an attempt be made to improve the state of the constitution, by alteratives, tonics, especially the sulphate of quinine, and iodine medicines. We may also usefully combine with such treatment blisters behind the ears, or a seton in the nape of the

neck, and iodine lotions, according to the formulæ given by Dr. Lugol.

Obstruction of the Puncta Lachrymalia and Lachrymal Canals.— The puncta lachrymalia are sometimes congenitally deficient; such a case is hopeless. Sometimes the puncta and canals are constricted, but pervious; and occasionally they become blocked up with calcareous matter deposited from the tears. The most frequent cause of their obstruction is a thickening of the membrane lining them, a consequence of previous inflammation.

When calcareous matter is present, it must be removed, as soon as its presence has been detected, by means of Anel's probes, made expressly for the purpose of examining the lachrymal puncta and ducts, and for removing any slight obstruction in them. When they are stopped up with mucus, they may, with these instruments, easily be made pervious again. In examining the superior punctum and lachrymal duct, we are to introduce the point of the probe first from below upwards, till it reaches the angle of the canal. It is then to be directed circularly downwards and inwards. In examining the inferior duct, we are to direct the point of the probe first from above downwards, and then horizontally towards the sac.

When, with these instruments, we cannot decidedly make out whether there is an obstruction in the puncta or not, we may put into the lacus lachrymarum a drop of an aqueous solution of saffron, while the patient lies upon his back. If the canals execute their office, this colored fluid will disappear, without falling over the cheek.

When the puncta and canals are completely obliterated, the case is irremediable; for, were we to think of forming new puncta and ducts we could not give them the organisation essential to make them of any use.

Sometimes cases present themselves, in which a *stillicidium lachrymarum* arises from atony and relaxation of the lachrymal puncta and canals, in consequence of previous inflammations, or the too frequent irritation of them with probes and syringes. The puncta are seen to be widely open, and incapable of contraction.

For the cure of this form of disease, an astringent collyrium, made of distilled water and a small proportion of the sulphate of iron, and camphorated spirit, or the tinct. opii, is to be dropped out of a pen, or director, into the inner angle, frequently in the course of the day; the patient being kept for some time on his back after each application.

In old persons, this kind of stillicidium is attended with more or less separation of the lower eyelid from the eye. It may be somewhat relieved by astringent collyria: but never admits of a perfect cure.

DISEASES OF THE EYELIDS.

Inflammation of the eyelids is not so disposed to involve the eyeball, as external inflammation of the latter is to extend itself to the former. However, if the inflammation of the eye be restricted to its internal textures, then the eyelids are not affected. When abscesses form in the cellular tissue of the eyelids, an early opening should be made in them, as the most likely means of preventing the extension of the disease, and subsequent eversion of the part. Passing over wounds, phlegmonous and erysipelatous inflammation of the eyelids, the treatment of which is regulated by general principles, I shall first consider—

CATARRHAL INFLAMMATION OF THE EYELIDS,

Which affects their mucous membrane and the glands of Meibomius, and begins near the margins of the eyelids, which becomes sore, and are affected with heat and dryness. Their lining assumes a red, thickened, and villous appearance, and, if everted, looks like a piece of scarlet velvet. When the eyelids are moved, the pain is severe, because then the inflamed surface rubs against the globe of the eye; and hence, in every severe case, the patient keeps the eye more or less shut, and the eyelids motionless. In the beginning of the attack, the natural mucous secretion is suppressed, and a sensation of dryness and stiffness is experienced; but, after a little while, this feeling subsides, because now the secretion of mucus recommences, and is even more abundant than natural, though altered in quality, and somewhat like pus. The secretion from the Meibomian glands is also changed, so that it has a share in making the eyelids stick together in the night, and in the morning the patient cannot open his eye.

Catarrhal inflammation of the eyelids is mostly produced by atmospheric causes, and such as usually bring on inflammation of other mucous membranes. But inflammation of the lining of these parts is sometimes owing to its being habitually exposed to the irritation of smoke, or of an atmosphere impregnated with gas or vapor of a stimulating kind, minute particles of lime, &c. The influence of any of these causes will be rendered more powerful, if the patient be uncleanly or intemperate.

In the early stage, during which the inflammation is always more or less acute, antiphlogistic remedies are proper, as leeches, tepid lotions, and the unguentum cetacei, to the edges of the eyelids, in order to keep them from becoming adherent in the night time. The bowels are to be kept well open; and, at first, some brisk purgative medicine should be given. These means, if the case be one of

sufficient severity, are to be followed up by a blister on the nape of the neck. When the acute form of the complaint has been subdued, we are to employ astringent lotions, and stimulating applications, especially the vinum opii, and the ung. hydrarg. nitratis, which latter is to be melted, and put on the edges of the eyelids with a camel-hair pencil. At first, it ought to be weakened with an equal quantity of the ung. cetacei.

OPTHALMIA TARSI, OR PSOROPHTHALMIA,

Is merely a chronic inflammation of the lining of the eyelids, or rather of their margins, occasioning their adhesion together in the night, a degree of soreness and itching in the parts, and a falling off of the eyelashes. The Meibomian glands are considerably implicated. When the lining of the eyelids has been frequently in the state of chronic inflammation, especially in old subjects, not only are the eyelashes lost, but the edges of the lids, instead of being angular, become rounded, and present an habitually raw and red appearance, which is technically named *lippitudo* or *blearedness*.

When ophthalmia tarsi has continued for a long while, or been neglected, the orifices of the ducts of the Meibomian glands, placed along the inner margin of one or both eyelids, may be partially or totally obliterated; and it is chiefly in such examples that the eyelashes are lost, and the edges of the lids are rounded off. Sometimes an eversion of the lower eyelid takes place, from a contraction of the frequently excoriated parts of the adjoining skin of the cheek, or an inversion of the part, from the effect of previous ulcerations on the inside of it.

When a person is troubled with ophthalmia tarsi, or psorophthalmy, he should never attempt to open his eyes in the morning till the glutinous matter, which makes the eyelids and eyelashes adhere together, has been properly softened and dissolved, so that it may be done without pain. For this purpose, the margins of the eyelids and the eyelashes should be anointed with a small quantity of spermaceti cerate. Then a piece of soft sponge, wrung out of hot water, is to be held over the eyelids for a few minutes, after which the eye may be opened without pain. All the gummy matter should be tenderly removed, because, so long as it remains, no eyewater nor salve can be brought in contact with the principal seats of the complaint.

The first indication, or that of diminishing inflammation, may be further promoted by fomenting the eyelids with a decoction of camomile flowers, applying leeches to the eyelids, and giving aperient medicines.

In bad cases, the eyelids may be covered at night with a bread

and water poultice, included in a bag of fine muslin, the margins of the eyelids being first smeared with a little spermaceti ointment.

The second indication, or that of healing the ulcerated or excoriated parts of the lid, is fulfilled by applying to them the unguentum hydrargyri nitratis, more or less weakened at first with a proportion of lard; or salves containing the red or white precipitate of mercury, in the proportion of 10 or 12 grains of the former, or 30 grains of the latter, to an ounce of lard.

When small ulcerations are noticed along the margins of the eyelids, they are to be touched with the nitrate of silver, or a strong solution of it; and, in bad cases, it is best before using the caustic, to extract the eyelashes, for if their bulbs are suffered to be destroyed by the ulceration, they will not be reproduced.

The *third indication*, or that of improving the general health, requires employment of tonic and alterative medicines, sea bathing, pure air, and regular exercise.

THE HORDEOLUM, OR STYE,

Is generally compared to a little boil, of about the size of a barleycorn, projecting from the eyelid. It is of a deep red color, attended at first with itching, and afterwards with a considerable tenderness, and even more pain than might be expected from so trivial a swelling. Sometimes the irritation is such that the conjunctiva is partially inflamed, and the motion of the eyelid productive of great annoyance. It is the nature of a sty to suppurate very slowly; but at length it does suppurate, points, and bursts; and after discharging a minute quantity of curdy matter and disorganised cellular membrane, it usually subsides and disappears. But if any of the sloughy matter remain within it, the disease is apt to return, or to degenerate into a hard, white, chronic tumor, that is very slow in undergoing any change, and is technically named *grando*, from having been compared to a hailstone. Young persons are often annoyed for several weeks by a succession of styes, one forming as soon as another is cured.

In the beginning, cold applications, as the lotio plumbi acetatis, or a cold bread poultice, made with the same, or iced water may be tried, though we rarely succeed in dispersing the swelling altogether in this way. However, we may first try what cold applications and aperient medicines will do; and when suppuration is obviously taking place, exchange them for warm poultices and fomentations. As soon as we see a white speck on the apex of the little tumor, provided the tumor is slow in bursting of itself, we may make a small puncture in it; but this should not be done unnecessarily, or prematurely, as it would only increase the inflammation, without obtaining any discharge of the contents of the sty. The pus and

sloughy cellular substance are then to be pressed out, and a poultice applied again.   When the sloughy cellular membrane is very slow in coming out, the cavity may be touched with lunar caustic, or with the end of a probe dipped in sulphuric acid.

The best way of treating the tumor, termed *grando* or *chalazion*, is to open it, press out its contents, and touch the interior of the cyst with lunar caustic, scraped to a point.

ENCYSTED TUMORS OF THE EYELIDS

Are not unfrequent, their seat being generally in the cellular tissue, connecting the integuments of the lid with the orbicular muscle ; but they may be more deeply placed, so as to be covered not only by the orbicularis, but by the levator muscle.   The more fluid kinds sometimes grow to the size of a pigeon's egg; but the steatomatous ones rarely become larger than a filbert.   They often contain, besides the ordinary matter of encysted swellings, small short hairs, entirely destitute of bulbs and tubes.

The encysted swellings, not closely connected with the tarsal cartilage, are to be treated precisely on the same principles which apply to ordinary swellings of a similar character in other situations; but if they should be intimately connected with the cartilage, a formal dissection of them out would be difficult without cutting a portion of the cartilage away.   Such operation may be rendered unnecessary, by everting the eyelid, and making at the point where it appears to be thin and most closely connected with the base of the swelling a free puncture through the cartilage, by which the contents of the swelling, if fluid, will be discharged, but if found not to be fluid, a second cut may be made across the first and the four angular flaps snipped off with scissors.

ECTROPIUM, OR EVERSION OF THE EYELIDS,

Is a case productive of vast annoyance and considerable disfigurement.   The lower eyelid is most frequently affected, its edge falling downwards and forwards away from the eyeball, which is no longer duly covered and protected.   This exposure of the lower portion of the eye, and of the conjunctiva of the eyelid, produces in these parts a degree of inflammation, attended with constant pain and redness, and thickening of the membrane, which is at length converted into a hard callous substance, lying just under the eyeball.   As the flow of tears, towards the inner angle, and through the puncta lachrymalia, is also obstructed, they fall over the cheek, which is apt to become excoriated.

Ectropium may arise from various causes, which considerably influence the treatment; for it may be either a permanent or only a temporary deformity, which will subside of itself on the abatement

of the inflammation that has given rise to it. Thus we meet with *ectropium from acute inflammation of the conjunctiva.* When it affects the upper lid, it is in some degree accidental. A child, for example, is laboring under acute purulent ophthalmy, and the surgeon, in order to examine the eye, or remove the copious discharge, everts the upper eyelid; the child begins to cry violently, and all attempts to reduce the lid to its natural position are found to be ineffectual. It soon becomes greatly distended with blood; and even if it admit of being replaced, it is generally everted again as soon as the child begins to cry. When this variety of ectropium affects the lower eyelid, it is not produced in this accidental way, but by the swelling and protrusion of the inflamed conjunctiva.

The *treatment of ectropium from acute inflammation of the conjunctiva* requires, 1st, scarification of the everted conjunctiva; 2d, after the swelling of the eyelids has been lessened by the discharge of blood, the part may generally be reduced; 3d, if the inflammation be not very acute, the lid is to be kept from quitting its natural position by means of a compress and roller. In the contrary case, every thing must be avoided likely to make the child cry; and the attendants are to be instructed how to replace the eyelid, if it should happen to become everted again. A collyrium containing alum, the nitrate of silver, or sulphate of copper, must be applied frequently, for the purpose of checking the purulent discharge.

When scarifications fail to remove or prevent the eversion, we may cut away a portion of the swollen conjunctiva. The bleeding which follows will prove of great service. Afterwards strips of plaster passed from the upper to the lower lid, and a compress and bandage, will prevent the return of the displacement.

Ectropium of the lower eyelid from relaxation is most frequent in elderly persons, as a consequence of *chronic inflammation of the conjunctiva* and Meibomian glands. From constant exposure, the inside of the everted lid becomes red, firm, and almost insensible, and the lower punctum lachrymale displaced forwards. These various circumstances are necessarily productive of a weeping of the eye, a *stillicidium lachrymarum,* and of various degrees of inflammation of the eyeball itself.

The *treatment of ectropium of the lower eyelid from relaxation,* consists, first, in removing the inflamed state of the eyelids and conjunctiva, and then in applying escharotics to the exposed conjunctiva, for the purpose of obviating the tendency to a return of the displacement. After having scarified the inflamed conjunctiva, we may apply the sulphate of copper, or nitrate of silver, and a compress and roller. In inveterate cases, a portion of the thickened and relaxed conjunctiva is to be removed.

Ectropium of the lower eyelid, consequent to excoriation of it and the cheek, resulting from long-continued ophthalmia tarsi or lippitudo, is one of the most common forms of the disease. The pal-

pebral conjunctiva becomes thickened by long-continued and re-
peated inflammation; while the skin excoriated, or even ulcerated,
shrinks, becomes shortened, and thus draws the edge of the lid out-
wards.   In this case, the edges of the lid are rounded off, the ori-
fices of the Meibomian glands partially or completely obliterated,
the eyelashes destroyed, and a considerable portion of inflamed con-
junctiva exposed to view.   The ophthalmia tarsi is to be removed
by the means already explained.   For the removal of the chronic
lippitudo, Mr. Lawrence finds that no application answers better
than the red precipitate ointment, which may be freely applied to
the thickened and everted surface, as well as to the ciliary margin
of the lid.   It reduces the swelling of the conjunctiva, and rectifies
the secretion of the tarsal glands.   Ectropium, even when accom-
panied with much thickening of the conjunctiva, may be remedied
in this manner.   In more obstinate cases, the skin of the everted
lid is to be smeared with zinc ointment, and the exposed conjunc-
tiva scarified and touched with nitrate of silver.   Should these
means not prove effectual, a portion of the conjunctiva must be re-
moved.   In bad cases, resisting this treatment, the practice of cut-
ting out a portion of the cartilage of the shape of the letter V is
sometimes adopted.

*Ectropium of the lower eyelid from disunion of it from the up-
per one at the temporal angle* is seldom seen, except in old persons
who have been long afflicted with inflammation of the margins of
the eyelids, and have had a succession of ulcers near the outer com-
missure.   The treatment requires an operation similar in principle
to that performed for the cure of harelip, namely,—the edges of the
disunited commissure are to be cut off, and the parts then brought
together by means of a suture.   The diseased state of the eyelids,
however, should be first previously removed.

Ectropium from the contraction of a cicatrix.—The deformity is
not an unfrequent consequence of a wound, an abscess, an ulcer,
or a burn.   In slight cases, the simple operation of removing a fold
of the conjunctiva may be sufficient; but some examples are met
with, in which the degree of eversion is very great, the length of
the eyelid in the transverse direction much increased, and its outer
surface fixed by adhesions.   Here the cicatrix must first be divided,
in order to loosen the lid from its unnatural position, and then a por-
tion of the conjunctiva is to be removed; but, for the purpose of
counteracting the morbid elongation of the lid from one canthus to
the other, it is sometimes necessary to remove a portion of the
whole thickness of the tarsal cartilage, shaped like the letter V, and
then to bring the edges of the wound together with a suture.   Or,
in some examples, we might imitate Jaeger in completely detaching
the everted eyelid from the cheek, or superciliary ridge, leaving it
connected at the angles only.   The details of this operation may be
found in Mr. Lawrence's " Treatise on Diseases of the Eye."
p. 350.

ENTROPIUM.

Amongst the numerous diseases of the eyelids, I have next to explain one which is exactly the reverse of the preceding; namely, *entropium*, or *enversion* of the eyelids, which is mostly seen in old subjects, in whom the skin of these parts is loose and redundant, destitute of a proper degree of elasticity, and thrown into folds. When the upper eyelid is inverted in the slightest degree, a considerable irritation of the eye is produced; but when a large portion of it is so displaced, the case becomes truly afflicting. The friction of the eyelashes against the eye is incessant, attended with immense suffering; the eye itself inflames, the cornea ulcerates, or becomes opaque, and the eyesight is ultimately destroyed.

The inversion may be either temporary or permanent, the former chiefly affecting the lower lid, and occurring in chronic external ophthalmia, or sometimes even more acute cases. The ciliary margin becomes contracted from repeated inflammation; a spasmodic action of the orbicular muscle is produced, and the eyelid being thus forced inwards, retains its unnatural position. The temporary inversion may be generally remedied by putting a small compress against the lower portion of the eyelid, and fixing it there with adhesive plaster, placed transversely over it. If this plan be continued for twelve or twenty-four hours, the inversion will not return.

Permanent entropium may be mostly cured by cutting away a fold of the integuments near the edge of the tarsus. We first take up a portion of them with the entropium forceps, and observe whether what we hold is sufficient to bring the eyelid into its right position; if so, we cut it off with a small pair of curved scissors, and unite the edges of the wound with one or two sutures, which may be withdrawn the next day, as the wound will then have united.

Another mode of cure is that of producing a contraction of the skin of the eyelid, by cautiously applying across its central part a little sulphuric acid, by means of a thin bit of wood dipped in it, and rubbed upon an oval space a little longer than the extent of the inversion, and from three to six lines in breadth. Three or four applications will generally suffice.

But more difficult cases sometimes arise from an alteration in the shape of the cartilage of the eyelid. For these, the common plans will not answer, and we must try others. One consists in making two perpendicular incisions in the broad margin of the tarsus, at the sides of the inverted part, and then making a transverse cut through the lining of the eyelid, from the extremity of one of the first wounds to that of the other. The inverted portion of cartilage, thus comprised within the incisions, is then to be put into its right position, and retained in it with sticking plaster.

When the vicious shape of the tarsal cartilage makes the adaptation of it to the eye impracticable, its total excision has been occasionally performed.

Sometimes it seems as if entropium depended upon the cartilage being too short; for if a cut be made through the outer commissure, the eyelid no longer presses against the eye. Another operation, adopted by Jaeger, of Vienna, consists in paring away the edge of the inverted tarsus.

TRICHIASIS

Signifies the growth of the eyelashes in such a direction, that they rub against and irritate the eyeball.

We seldom find all the eyelashes turned towards the eyeball, except when trichiasis is really accompanied by an inversion of the eyelid itself. The inconveniences of the complaint are severe; for the friction of the eyelashes against the eye brings on inflammation of that organ, and, in time, and under neglect, opacity of the cornea and blindness. The wrong direction of one or more of the eyelashes is often overlooked, and the effect, the inflammation, only attended to: but here, as in every other part of surgery, we should search for the cause of the disease, and not disregard it in the treatment; for its removal will alone frequently suffice to bring about a cure.

One plan of treatment consists in removing, one after the other, all the inverted cilia by means of forceps. Each eyelash is to be laid hold of as close as possible to the skin, and pulled out quickly in a straight direction; but, in general, the result is only a temporary relief, as the hairs grow again. Hence, I believe, the best way is to pare off as much of the ciliary margin of the eyelid as will include the bulbs of the inverted eyelashes.

When trichiasis is merely an effect of entropium, the eyelashes need not be extracted, as the cure is brought about by the measures applicable to the entropium.

Distichiasis means a double row of eyelashes; but, in fact, the supernumerary cilia are never arranged in this regular order; nor do they usually extend the whole length of the eyelid, but are scattered at different points, between the natural place of the eyelashes and the orifices of the Meibomian glands. Cases also sometimes present themselves, in which strong hairs grow from the inner concave surface of the eyelids.

The only effectual mode of treatment is to extract the hairs and their bulbs.

PTOSIS.

An inability to raise the upper eyelid, which hangs loose and

5*

pendulous over the globe of the eye. In some examples, this depends upon excessive distension and inflammation; but what is more commonly understood by ptosis is that form of it, which is accompanied by paralysis of the levator palpebræ superioris. If the eyelid be lifted from the eye, it gradually sinks down again by its own gravity, being often slightly œdematous, the eye looking dull, the iris being less irritable than natural, the pupil dilated, and the eye frequently amaurotic.

Ptosis is generally symptomatic of disease of the brain, and the treatment must be regulated accordingly. With due attention to the cause, however, there is no objection to rubbing the eyelid with camphorated mercurial ointment, or with liniments containing ammonia or camphor, or to blistering the neighboring part of the forehead.

PARALYSIS OF THE ORBICULAR MUSCLE

Sometimes follows operations performed near the lower extremity of the parotid gland, and producing injury of the branches of the portio dura of the seventh pair of nerves. So far as the eye is concerned, the consequences are not usually serious, and the inconvenience is that of not being able completely to shut the eye; a state, to which the term *lagophthalmos* is applied, whether arising from palsy of the orbicular muscle, or a shortening or retraction of the upper eyelid itself. However, lagophthalmos, when it exists in a considerable degree, may bring on inflammation of the conjunctiva, opacity of the cornea, and even staphyloma.

GRANULAR CONJUNCTIVA

Is mostly an effect of severe purulent ophthalmy, and consists of a rough, hard, granulated state of the lining of the eyelid, attended with a thin or puriform discharge, a varicose affection of the vessels of the sclerotic conjunctiva an increased vascularity and opaque appearance of the cornea, great tenderness of the eye, and an incessant epiphora, or copious effusion of tears. The mechanical friction of the granulations against the cornea, has the effect of changing the texture of the delicate layer of the conjunctiva extended over it. In recent cases, leeches may be applied near the eye, and other means adopted to lessen inflammation of the organ. Then the granular surface of the eyelid is to be smeared with the melted ung. hydr. nitratis, or a strong solution of the nitrate of silver, twenty or thirty grains to one ounce of water, by means of a camel-hair pencil, or rubbed with the sulphate of copper, or nitrate of silver. For this purpose, the eyelid should always be completely everted, as there is sometimes a semilunar fringed excrescence at the angle

where the conjunctiva passes from the globe to the eyelid, which might otherwise escape attention. After caustic has been used, the eyelid must be bathed with tepid water before it is returned into its natural position again.

Sometimes, when the granular productions are remarkably hard, callous, and pendulous, excision is preferred.

CONCRETION OF THE EYELIDS.

Two varieties are met with: in one, the inside of one or both eyelids is adherent to the eyeball (symblepharon); in the other, the edges of the two eyelids are connected together (anchyloblepharon). This last case is sometimes, though rarely, a congenital malformation; and, when it occurs, it is mostly as the result of violent inflammation or burns. The treatment consists in dividing the adhesions with a knife, guided along a director, so as not to injure the eye itself, and keeping the edges of the wound asunder. If the cornea be known to be opaque, such an operation is useless.

As for adhesions of the eyelids to the eyeball, it is only when they are loose and of limited extent, and not situated over the cornea, that the division of them can be of any service.

DISEASES OF THE EYE.

I now proceed to consider *diseases of the eye itself;* and first, *inflammation of it,* termed *ophthalmia,* the most frequent of all its disorders, and that, indeed, which may likewise be connected with any other complaint of the eye, either as a cause or an effect. It is only of late years that the various inflammatory affections of the eye have been well discriminated; for ophthalmia used to be a term applied to every inflammation of the eye, or parts appertaining to it, whether the eyelids, the conjunctiva, the sclerotica, the iris, or the retina, were the structure chiefly concerned; and although the epithets *mild* and *severe, dry* and *humid, external* and *internal,* were in common use, the more valuable distinctions, deducible from the structure principally affected in different examples, the characteristic symptoms of each variety, and its most appropriate treatment, were altogether overlooked. In whatever parts inflammation occurs, we know, that its effects are always modified by the structure affected. Now the eye, small as it is, contains a great variety of textures, each possessing both physical and vital properties peculiar to itself, and consequent-

ly exhibiting, under the process of inflammation, phenomena which are peculiar to it. The modifications of inflammation, arising from differences of texture, are often beautifully displayed in the eye; and this in so distinct a manner, that its appearances and changes under inflammation are commonly cited by the pathologists of every school, as presenting, perhaps, the very best illustration that can be found of several most important points, relative to the nature of this interesting process.

One thing, which I conceive it is very useful to understand, is, that inflammation of the eye generally commences in one structure, to which it is at first restricted, and beyond which, if it be rightly treated, it may not materially extend. But if it be neglected, or wrongly treated, it soon exceeds its original limits, and perhaps ultimately invades every part of the organ. The conjunctiva, the sclerotica, the cornea, the iris, the crystalline capsule, and the retina, all severally exhibit a series of the modifications of inflammation, dependent upon peculiarity of texture. The *mucous tissue* of the conjunctiva secreting a profuse quantity of purulent matter, as in the ophthalmia of new-born infants; the *fibrous sclerotica*, affected for months with rheumatic inflammation; the *transparent fibro-cartilaginous cornea* becoming opaque, or being destroyed, layer after layer, by ulceration; the *erectile iris* losing all power of executing its motions of expansion and contraction; the *crystalline capsule* pouring out coagulable lymph from its serous surface, and this lymph forming the medium of morbid adhesions; the *nervous retina*, too deeply seated to be immediately observed, but, in a few hours, losing its inconceivably delicate and specific sensibility, are all so many circumstances illustrating the modifications of inflammatory action, and the various consequences of it in different textures of the eye.

Inflammations of the eye, besides being modified by differences of texture, are also much influenced by peculiarities of constitution, constitutional diseases, and certain artificial states of the constitution; and they are subject to innumerable variations, from the influence of those inscrutable connections called sympathies. Scrofula, syphilis, gout, disorder of the digestive organs, and that deranged state of the system which is sometimes termed *mercurialism*, are each of them either capable of exciting inflammation in different parts of the eye, or, at least, of communicating to an inflammation, excited by other causes, such differences in character as shall often render the recognition of the disease difficult, though we may be perfectly familiar with it in its more simple form.

With respect to the treatment of inflammation of the eye in general, I may observe that, if the disorder be not speedily checked by efficient and active means, it will soon extend from the texture originally attacked to others, and that its continuance beyond a certain period will permanently impair the delicate structures of the

organ, or even cause a total annihilation of its functions.   Hence the necessity of adopting very active treatment; and this, not on account of any danger to life, or any extraordinary suffering, great as this may be, but to prevent those changes of structure which would weaken or destroy the eyesight.   Hence we are frequently called upon to take away asmuch blood from the system for an inflammatioin of the eye, as for an tnflammation of the pleura or lungs, stomach, or brain, or any other most important internal organ.   If prompt and vigorous treatment be not adopted in the early stage of inflammatory affections of the eye, we frequently find lymph effused, or opaque matter deposited in the transparent parts of the eye; or the retina more or less impaired in texture and sensibility; the pupil rendered irregular, the motions of the iris prevented by adhesions; or the complaint degenerated into a chronic form, sometimes difficult of cure, and always lessening the chance of such a recovery as leaves behind it no defect or weakness of the eye, either with reference to its moveable, its transparent, or its nervous textures.

External inflammation of the eye may be seated in the conjunctiva only or in the sclerotica and cornea.   Simple inflammation of the conjunctiva is a much less serious complaint than that of the sclerotica.   Yet, specific inflammations of the conjunctiva are exceedingly urgent cases, as, for instance, violent purulent and gonorrhœal ophthalmies, which, if unsuccessfully treated, soon involve the organ in incurable mischief.   In sclerotic inflammation, the implication of the cornea, and the ready transition of the inflammation to the iris, always expose the organ to considerable danger.

From these preliminary romarks, I proceed to the consideration of the chief varieties of ophthalmy, beginning with—

INFLAMMATION OF THE CONJUNCTIVA,

Divided into the following kinds:—
1. Simple or catarrhal.
2. Purulent, or Egyptian.
3. Leucorrhœal, or the ophthalmy of new-born infants.
4. Gonorrhœal.
5. Scrofulous.

1. *Simple inflammation of the conjunctiva.*—*Catarrhal ophthalmy,* as it is often called, generally commences with stiffness and smarting of the eyelids, or a sensation as if sand had got under them, an increased secretion from the lachrymal gland, giving a watery appearance to the eye, with some degree of redness and uneasiness upon exposure of the organ to the light.   When fully developed, the disease is characterised by considerable redness, and the increased lachrymal discharge is exchanged for one of a thin whit-

ish mucus; but the pain is generally slight, and now there is no in-tolerance of light. The redness is superficial, and the tint a bright scarlet, forming a striking contrast to the rose or pink color which be-longs to inflammation seated in the sclerotica. The distended vessels form a network, and the redness is in patches; though, in the fullest development of the affection, the whole surface of the conjunctiva becomes of a bright red, the redness first showing itself at the cir-cumference of the eyeball, and gradually advancing towards the cornea. In severe cases, small ecchymoses, or effusions of blood, may be noticed in the conjunctiva; and sometimes little vesicles, filled with a serous fluid, arise upon it, near the margin of the cornea.

The conjunctiva is seldom considerably swollen, and never in the degree exemplified in what is termed *chemosis*, or that remarkable elevation of the conjunctiva, which is sometimes caused in other ophthalmies by effusion of lymph under it. There is, however, a certain quantity of serum poured out under it, whereby it is some-what raised up from the sclerotica.

As soon as the lachrymal discharge, observed in the very com-mencement, stops, its place is supplied by an increased secretion of mucus, which is at first thin, but becomes thicker, as the inflamed conjunctiva goes through certain stages, assuming a whitish or yel-lowish appearance, and even that of pus. It is this altered secre-tion which, drying on the eye-lashes in the night-time, makes the eyelids adhere together, so that the patient has a difficulty in open-ing them in the morning.

In every well-marked case of catarrhal ophthalmy, the eyelids participate in the affection; and whenever the attack is severe, other mucous membranes suffer. Hence pain and sense of weight about the frontal sinuses and antrum, disordered stomach, foul tongue, chills, succeeded by heat, and other febrile complaints.

Simple inflammation of the conjunctiva is distinguished from com-mon inflammation of the external tunics by its catarrhal origin; the diurnal remission and nocturnal exacerbation of the symptoms; the absence of pain and of intolerance of light, even when there is great general redness; the bright scarlet color of the membrane; the distended state, and areolar arrangement of its vessels; and the altered mucous secretion from the lining of the eyelids. From pu-rulent ophthalmy it is distinguished by its milder nature; its indispo-sition to do mischief to the cornea, or the deeper textures of the eye; its not being infectious or contagious; its having no tendency to cause chemosis; and its freedom from all the severe sufferings which attend bad forms of purulent ophthalmia.

The origin of this complaint is generally ascribed to atmospheric causes—exposure to draughts of air or cold winds—sudden changes from heat to cold. Frequently it prevails as an epidemic in cer-tain towns and districts, owing to particular states of the air, not

precisely ascertained; or shows itself extensively in schools. For its relief, mild antiphlogistic treatment will generally suffice; and it is not necessary to reduce the patient so much as in some other inflammatory affections of the eye; unless the patient be of a full habit, or both eyes be severely attacked. We need not therefore always have recourse to venesection. In ordinary cases, cupping and leeches will answer the purpose. The bowels, however, should be freely opened; and if the tongue be foul, an emetic ought to follow the loss of blood. Saline and sudorific medicines, as a solution of the sulphate of magnesia, with a proportion of tartarised antimony in it, may then be given repeatedly, and the feet put into warm water at night. In a case of severity, we might, after depletion, put the patent, in the evening, into a warm bath, and, directly he is taken out of it, give him a full dose of the pulv. ipecac. comp.

As local applications, we may foment the eye with a decoction of poppy-heads; but afterwards, when the inflammation is on the wane, astringent lotions, containing three or four grains of the nitrate of silver or sulphate of copper, in ℥iv. of distilled water, will be beneficial. These, with blisters on the nape of the neck, or behind the ear, will generally soon complete the cure: if not, the remains of the disorder may be got rid of by introducing into the eye, once a day, a drop of the vinum opii, or of the liq. plumbi acetatis. To prevent the agglutination of the eyelids in the night, their edges may be smeared at bedtime with spermaceti ointment.

2. *Purulent* or *Egyptian ophthalmy*, reputed to be *contagious*, is one of the most violent forms of ophthalmia. The first stage, that in which no pus is secreted, never surpasses thirty-six hours, and is often of shorter duration. At the end of this time, purulent matter is always found on some portion of the conjunctiva. Frequently the patient makes no complaint, till he finds that his eyelids adhere together in the morning, or till the sensation of some extraneous substance in the eye becomes distressing. In some cases, a sudden attack of darting pain in the eyeball or forehead is the first thing experienced; while, on other occasions, the increased vascularity of the conjunctiva first excites notice. The right eye is more frequently attacked than the left. It is also in general more severely affected, and the sight of it oftener lost. In some instances, only one eye suffers, but more commonly both; although there is often an interval of several days before the second becomes inflamed. A considerable itching is first felt in the evening, or a sensation as if there were dust in the eye, which becomes watery. This is succeeded by a sticking together and stiffness of the eyelids in the morning, which parts appear more swelled than natural. Their internal surface is inflamed, tumid, and highly vascular; and the caruncula lychrymalis enlarged and reddened. Generally, in about twenty-four or thirty-six hours, the discharge from each eyelid is al-

ready considerable. It is at first thin, but soon becomes viscid and opaque, and lodges particularly about the internal angle. There is also a frequent gush of tears, an *epiphora*, especially when the eye is exposed to a current of air. The patient always complains of a sensation as if the eye were full of sand, but seems to experience, comparatively speaking, little uneasiness from the light.

In the second stage, the discharge becomes truly purulent, and, in many cases, so abundant, that, on the patient opening his eyes, the matter instantly flows over the cheek, irritating and excoriating it. The quantity of discharge sometimes amounts to several ounces in the day. The whole texture of the conjunctiva may be seen to be swollen and thickened; its vascularity is increased; and its color an intensely bright red. Its mucous surface is rendered villous, pulpy, and granular, like the villous surface of the fœtal stomach, and from the secreting surface, thus produced, the puriform discharge flows. If not checked by effectual treatment, this species of ophthalmy soon attacks the layer of the conjunctiva, extended over the cornea, thickening it, and rendering it more or less opaque. By these changes vision is much diminished, and very frequently the opacity and consequent diminution of vision continue after all the acute symptoms have ceased. But the change in the cornea is not confined to this affection of the delicate layer of the conjunctiva covering its surface; there is often an interstitial deposition between its layers, producing a still worse kind of opacity; and frequently its texture sloughs or ulcerates; the anterior chamber being opened, and a discharge of the humors, and a prolapsus of the iris, being the too frequent consequences. In this manner, both the function and form of the eye may be destroyed.

In some cases, the inflammatory process is still more severe; extending even to the internal textures of the eye, accompanied by a deep throbbing pain in the eye, coming on in paroxysms; but, occasionally, without any remission till the cornea gives way. The duration of the paroxysms of pain, and their recurrence, are irregular. They come on, however, most frequently from ten to twelve at night, with an increased secretion from the lachrymal gland, and a diminution of purulent discharge.

Sometimes the swelling of the conjunctiva is such that the upper eyelid cannot be raised, and projects so enormously that the lower eyelid is entirely concealed by it, attended with a great deal of redness of the integuments, extending even to the cheeks and forehead.

In many instances, the conjunctiva forms a prominent red swelling all round the cornea, so as to give the appearance of a thick ridge of flesh encircling the latter membrane, which seems as if it were sunk in the eye, with only a very small portion of its centre discernible. This state is technically named *chemosis*. If the purulent matter be allowed to lie some time upon the cornea, it may ac-

quire a thick consistence, and so resemble sloughy membrane that an inexperienced surgeon may suppose the cornea has been destroyed.

Whether the infection can be propagated from one person to another, through miasmata in the air, arising from the diseased eye, is a contested point; but that it can be transmitted by direct application of the discharge from a diseased to a sound eye, is tolerably certain. In the Royal Military Asylum, and some other public establishments, the matter of purulent ophthalmia has occasionally been applied inadvertently to the eye of another person, and the disease been excited. Yet it is curious, that the surgeons of the French army in Egypt never suspected its contagious nature. In Egypt, and some other countries, in which it prevails to a great extent, the origin of it is usually ascribed to the combined effect of exposure of the eye to vivid light and heat, reflected in the day-time from a sandy soil, followed by exposure of the organ to the damp, cold, nocturnal air.

The constitutional symptoms are, generally speaking, influenced by the degree of pain and inflammation, and a frequent but soft pulse, not much heat of the skin, the tongue white, not much thirst, the appetite good, the bowels torpid. On the whole, the constitution suffers less than might be expected.

The following are some of the differences of this disease from catarrhal ophthalmia:—1st. The peculiar change of structure in the lining of the eyelids; 2d. The frequently long continuance of the complaint; 3d. The disposition to relapses; 4th. The tendency to chemosis; 5th. The greater swelling of the eyelids; 6th. The great increased vascularity and redness of the conjunctiva; 7th. The copious purulent discharge.

The *treatment* is strictly antiphlogistic—beginning with bleeding, which, in young, strong persons, may be carried at once to the extent of thirty or forty ounces. This is absolutely necessary if *chemosis* already exist; leeches should also be applied about two hours after venesection, which is to be repeated according to circumstances, the renewal of inflammatory action, and the state of the pulse. So long as there is a throbbing pain in the eyeball and orbit, the repetition of bleeding is generally proper. Mr. Tyrrell has published an account of " a successful plan of arresting the destruction of the transparent cornea from acute purulent inflammation."* The cornea appears to him to mortify from the strangulation of its blood-vessels by the chemosis, or the elevation and tension of the conjunctiva, which covers the sclerotica. Hence, he was led to try what benefit might be obtained by some means, which would immediately relieve the tension of the conjunctiva arising from the chemosis. A free division of it, practised *with due regard to the*

---

* F. Tyrrell, in Med. Chir. Tr. vol. xxi. p. 414.

course of its principal vessels, was what seemed to him worthy of trial. The method consists in raising and securing the upper eyelid, and then making free incisions in the sclerotic conjunctiva, and the subjacent loaded cellular tissue, without injury to any other textures of the eye. It is essential, that the incisions extend close to the margin of the cornea, where the tension and pressure are greatest, and that the direction of the wounds correspond to the intervals between the insertions of the recti muscles, so that the principal vessels of the conjunctiva may not be injured. The old plan of scarifying the conjunctiva, which never proved very successful, differed from the latter, inasmuch as the incisions were made circularly, in the direction of the margin of the cornea.

Purgatives are to be given; as a dose of jalap and calomel, followed by a solution of sulphate of magnesia, containing in each dose one fourth of a grain of tartrate of antimony. When severe nocturnal pain is experienced in the orbit, much benefit has resulted from giving every night two grains of calomel and one of opium, until the mouth is sore, but, under other circumstances, the free use of mercury is of no service in purulent ophthalmia. In the chronic stage, when the patient is much debilitated, and the discharge profuse, bark and other tonics are sometimes prescribed. When the cornea is threatened with sloughing, the same medicine is occasionally given.

The local treatment is fully as important as the constitutional. The first thing is completely and frequently, in the course of the twenty-four hours, to clean away the puriform discharge from the eyes. This is to be done partly with a bit of sponge, and partly with a small syringe, and a weak alum lotion ℨ ss. to half a pint, or with a tepid solution of one grain of the bichloride of mercury in eight ounces of distilled water. The best astringent application for checking the secretion is now generally allowed to be a solution of the nitrate of silver—from four or six grains to an ounce of distilled water, and applied once, or at most twice, in the twenty-four hours. Dr. Ridgway even ventured upon twelve grains to an ounce of water, and published a report in favor of this strength; while Mr. Guthrie gives the preference to an ointment containing ten grains of it to ℨ j. of lard. In the early stage, relief will also be derived from anodyne fomentations, the compound powder of ipecacuanha at night, and a mild ointment to prevent adhesion of the eyelids.

3. *Purulent opthalmia of new-born infants* is often believed to arise from the eyes coming in contact with leucorrhœal discharge in the birth. In a great proportion of cases, the mother has vaginal discharge: exceptions are met with, however; and then the influences of draughts of cold air, or of exposure of the young eye to vivid light, usually fall under suspicion. Mr. Hugh Carmichael, who has commented on the little foundation there is for the opinions, prevailing about the causes of the disease, observes that the bowels are always

more or less deranged, and that this may possibly operate as a cause.*

In general, the eyelids are first remarked to be glued together about the third day after birth, but sometimes much later. On opening them a drop of thick white matter is discharged, and their inner surface is found to be swollen and vascular. If the disease be not checked, the swelling of the conjunctiva rapidly increases, and the inflammation extends from the conjunctiva of the eyelids to that of the eyeball. The purulent discharge becomes copious, and the skin of the eyelids assumes a dark red color. Light is now exceedingly painful; the child turns its head from it, and resists every attempt to open the eye. In this state, the eyes may continue about a week, without any affection of their transparent parts, except a slight haziness of the cornea. About the twelfth day, however, suppuration generally takes place between the layers of the cornea, its texture becomes destroyed, it ulcerates, the humors are discharged, and the iris protrudes.

If the disease be seen before the cornea has suffered, the prognosis is favorable. If the cornea has sloughed or ulcerated, the loss of sight is inevitable.

In the third stage, there is a gradual abatement of all the symptoms; the redness, swelling, and discharge are diminished; the light can be endured; and the eye is more easily examined.

Treatment.—One or two leeches may be put on the swollen upper eyelid. The bleeding from the bites will often seriously reduce an infant, and perhaps, in ordinary cases, it is best to be content with a single leech. The discharge is to be washed away with a tepid weak solution of alum, or bichloride of mercury. The lids are to be gently opened, and the discharge removed with a small bit of sponge. The upper lid has a tendency to remain everted, but it may usually be replaced, if the swollen conjunctiva be first pushed back with a probe into its right situation. For checking the discharge, we may use a solution of the sulphate of copper, or nitrate of silver: four grains of the latter, or six grains of the former to an ounce of water, applying it once or twice a day, with a large camel-hair brush, to the whole surface of the inflamed conjunctiva. Mr. Hugh Carmichael prefers, however, weaker collyria, such as one grain of the nitrate of silver, or two or three grains of alum, to the ounce of distilled water. Neither must we forget to apply the ung. cetacei, to keep the eylids from sticking together in the night. If there be a tendency to chemosis, one or two leeches are never to be omitted; the bowels are to be opened with castor oil; and a blister put behind the ear. In tedious cases, I usually give small doses of calomel. The vinum opii is one of the best things for removing the relaxa-

---

* See Dublin Journ of Med. Science, vol. xv. p. 210.

tion of the conjunctiva, left after the cessation of the discharge. Sometimes the disease has been successfully attacked with the nitrate of silver ointment, ten grains to one ounce of lard. The granular state of the conjunctiva generally yields to astringents, or the nitrate of silver, or sulphate of copper.

From the connection existing between this inflammation of the eye and the state of the bowels, Mr. Hugh Carmichael recommends giving the hydrargyrum cum cretâ, in grain or half-grain doses, twice or thrice a day. In obstinate cases, he also advises the nurse to be changed, because her milk may be keeping up the bowel derangement. He objects to pap composed of bread and milk, as likely to become sour. The bread should be of the best quality, and first washed; and the milk be blended with equal, or two parts of water, and sometimes a little calcined magnesia mixed with it. Four grains of calomel and four drops of tinct. opii, divided into four or six papers, one of which is taken every night, he commends, as often the source of much benefit.

Blisters are mostly disapproved of for infants of tender age; but if two or three threads of worsted be greased with the blistering ointment, and placed in close behind the ears, the practice is found by Mr. Hugh Carmichael to be safe, and productive of great benefit. When the cornea suppurates, Mr. H. Carmichael relies on leeches, potassio-tartrate of antimony in doses of one sixth or one eighth of a grain three times a day, the application of blistering ointment in the way described, the alum wash, or alum curd. If the cornea has sloughed, he joins Mr. Saunders in praise of the extract of bark, given to the extent of sixteen or eighteen grains a day, mixed with pap.

4. *Gonorrhœal ophthalmia in its acute forms* is a violent inflammation of the mucous membrane of the eyeball and lids, attended with profuse discharge of matter, closely resembling in all its sensible properties that which issues from the inflamed urethra in clap, and occurring in some kind of connection with the latter complaint.

It is the most severe and rapidly destructive inflammation to which the eye is subject, but fortunately one of the most rare. It is not the consequence of the sudden suppression of gonorrhœa; for, in a great majority of examples, the gonorrhœal discharge is not stopped, though, when the affection of the eye begins, the clap may be on the decline. As gonorrhœa is so common, and this species of ophthalmy so rare, doubts have often been raised about its connection with gonorrhœa at all. Indeed, the mode of infection has not often been unequivocally traced; but that the discharge from the urethra of one individual, applied to the eye of another person, will bring on the disease, seems well proved by facts collected by Mr. Lawrence; and even that the matter of clap, applied to the patient's own eye, will bring on this destructive oph-

thalmia, is exemplified in the consequence of the vulgar custom of attempting to cure sore eyes by washing them with the patient's own urine; for, if he happen to have gonorrhœa on him, the matter is then applied directly to the eye, and a destructive purulent ophthalmia is the result, as related in Mr. Lawrence's work "On the Venereal Diseases of the Eye." The symptoms are those of purulent ophthalmy in the severest form, intense redness, extensive swelling, chemosis, and profuse discharge of thick yellow fluid, quickly followed by ulceration, sloughing, or opacity of cornea.

The *treatment* is not essentially different from that of other severe purulent ophthalmies. The boldest antiphlogistic measures are called for; as copious venesection, cupping on the temples, numerous leeches, &c.; followed by blisters, and warm or cold collyria, according to the patient's feelings. A strong solution of nitrate of silver, ten grains to an ounce, or the strong ointment of the same, has sometimes had the effect of checking the disease.

When the cornea sloughs, and the patient is reduced, we may prescribe bark. In gonorrhœal ophthalmy, the structure of the palpebral conjunctiva is not changed; that is, it does not become granular; one eye is often affected; and the disease may begin on the sclerotic conjunctiva. These characters are all different from such as are usually noticed in ordinary purulent ophthalmy of adults.

SCROFULOUS INFLAMMATION OF THE CONJUNCTIVA.

The symptoms characterising it are slight redness, great intolerance of light, and pimples or small pustules on the conjunctiva. It seldom attacks infants at the breast, but children at some period between weaning and the eighth year. At the commencement of the disease, the redness of the conjunctiva is very slight, and in patches or clusters of vessels; but, afterwards, it increases and becomes more uniform, and the sclerotica appears to participate in the inflammation. At the apex of each of the clusters of blood-vessels, one or more minute pustules arise; sometimes a single elevated point, of an opaque white color, near the centre of the cornea; and sometimes numerous pustules, scattered over different parts of the conjunctiva. In some cases, they are small, and filled with a thin colorless fluid, when they are termed *phlyctenulæ;* in others, they are larger, and contain fluid more like pus. It is not known whether there is any specific difference between the phlyctenular and the pustular cases; but it has been observed by Dr. M'Kenzie, of Glasgow, that the pustular cases are in general attended with less intolerance of light. The phlyctenulæ and pustules may be absorbed, and then, if situated on the cornea, they leave behind a white opaque speck—the effect of that effusion of lymph which surrounds every circumscribed abscess, but which in

6*

time generally disappears. Sometimes, however, a vascular speck is left, which is more difficult of removal.

Quite as frequently these pimples burst, and are converted into ulcers, sometimes superficial and considerable in extent, more commonly deep and funnel-shaped. If they happen to penetrate the cornea, the aqueous humor is discharged, and a small piece of the iris protrudes, and unites to the sides of the aperture, which is closed by an opaque indelible cicatrix, partially or entirely obstructing vision; but the cicatrix of a superficial ulcer may leave no permanent opacity.

The *excessive intolerance of light*, attending scrofulous ophthalmy, is one of the most distressing symptoms. The child is quite unable to open its eyes in ordinary daylight; and every attempt to look up instantaneously brings on a strong spasmodic contraction of the eyelids. The pain from the light is most severe in the morning; for, in the afternoon, the intolerance of it is sometimes so far lessened that the eye can be opened. Notwithstanding the violent suffering produced by light, there is frequently an insignificant degree of redness, and the cornea often remains perfectly transparent, or with merely one minute opaque speck upon it, and a few red vessels running over the sclerotica. The intolerance of light is always attended with *epiphora*, a gush of tears following every attempt to open the eye. Hence, the eyelids and cheeks are sometimes excoriated and swelled. Occasionally the disease is conjoined with iritis; but more frequently with ophthalmia tarsi, and other scrofulous complaints.

In the *treatment*, powerful antiphlogistic remedies are less necessary, than in some other inflammations of the eye. In the first stage, which is short, we may apply a few leeches, followed by a blister behind the ears, or on the nape of the neck. The secretions of the skin and alimentary canal are to be restored; for which purpose we may prescribe the liq. ammon. acetatis, combined with the vinum antimonii, and a small quantity of the syrup of poppies. Or we may give rhubarb and carbonate of soda, in equal parts, with or without a little of the hydr. c. cretâ. For the ulcerations on the cornea, the solution of nitrate of silver is the best application. The eye should be protected from the light with a green shade, or by darkening the room. If the cornea be opaque, calomel, or the blue pill, should be given, so as slightly to affect the system. After the first inflammatory stage is over, tonics are generally found beneficial, especially the sulphate of quinine, with light nutritious diet.

The best applications to the eye itself are slightly astringent lotions, used tepid; as the decoction of poppy-heads, with a small quantity of spirit of wine in it; or a weak solution of the acetate of ammonia, or a solution of one grain of the bichloride of mercury in eight ounces of distilled water. In France, the collyria for scro-

fulous affections of the eye frequently consist of a weak solution of iodine in distilled water, with a small quantity of hydriodate of potash.

INFLAMMATION OF THE EXTERNAL PROPER TUNICS

Is characterised by a great deal of external redness, pain, and intolerance of light, soon followed by increased lachrymal discharge and febrile disturbance. The redness begins on the front of the globe, immediately round the cornea, where it forms a red zone, to which numerous vessels proceed from the back of the eyeball. In inflammation of the conjunctiva, the redness begins at the circumference of the organ, its anterior part being at first free from it, and the sclerotica retaining its natural white appearance : the discharge is also of a mucous or puriform kind.

The redness is quite different in the two cases : in inflammation of the sclerotic coat, the vessels seen through the conjunctiva exhibit a pink color, or a lively carmine appearance, which forms a striking contrast to the bright scarlet tint of the vessels in the conjunctival inflammation. The vessels of the sclerotic always follow the motion of the eye, while those of the conjunctiva are capable of being moved, independently of the eye-ball. The distended vessels of the inflamed sclerotica run in straight lines forwards to the edge of the cornea; but those of the inflamed conjunctiva have no such distribution, as they are reticulated. However, the conjunctiva soon participates in the inflammation of the external proper coats, and the cornea looks dull. The eye feels dry and stiff, with a burning or aching pain, and feeling of tension, pressure, or as if sand were lodged in the eye. As the disorder increases, the pain grows more severe, and extends to the back of the head and nearest temple. Intolerance of light is a strongly-marked symptom of inflammation of the sclerotica, another feature in which it particularly differs from conjunctival inflammation.

Although the eye may be at first dry and stiff, the lachrymal secretion is soon restored, and even increased, so that whenever the eye is opened there is a considerable effusion of tears. In unfavorable examples, attended with chemosis, the cornea first turns greyish, then white and cloudy, and lastly yellow, as if pus were deposited in its texture. The yellow matter, however, is not fluid; neither does it make its way to the surface, like pus; but the cornea ulcerates, and the deposited matter is removed by ulceration. A similar deposit may take place in the anterior chamber, producing what is termed *hypopium*. When the whole cornea is thus affected, the ulceration may penetrate the anterior chamber at several points, the aqueous humor escape, and the iris either protrude or become adherent to the inflamed cornea.

The degree of danger will depend on the state of the cornea:

when this is only slightly affected, there is no danger; when chemosis is present, and the cornea is grey or white, or when a yellow deposit takes place in its texture, followed by ulceration and escape of the aqueous humor, sight will be impaired, and perhaps totally lost.

Before speaking of the treatment, I may as well describe

Inflammation of the entire eyeball, or *ophthalmitis*, for the practice in each of these cases is founded on the same principles. Common inflammation, seated both in the external and internal structures of the eye, when fully developed, is characterised by considerable pain, increased external redness, more or less swelling of the organ; at first dryness of the eye, but afterwards augmented secretion from the lachrymal gland; and redness and swelling of the upper eyelid. The pain is not confined to the fore part of the eye, but is deep-seated, and extends to the eyebrow, cheek, temple, and back of the head. At first, the redness is inconsiderable, and chiefly in the vessels of the sclerotic coat; but the conjunctiva very quickly participates in the inflammation, and the distension of its vessels produces the bright scarlet color, which conceals the fainter pink or carmine tint of the sclerotica. The conjunctiva then begins to swell, and a deposit of coagulating lymph takes place, not only in the texture of that membrane, but in the loose cellular tissue uniting it to the sclerotica. This red circular projection of the conjunctiva round the cornea, giving the latter membrane a sunk appearance, and even materially concealing it, receives the name of *chemosis*.

Light is very offensive, so that the pupil contracts to exclude it, and the eyelids are spasmodically closed. In a more advanced stage, the color of the iris is altered, its brilliancy disappears, and its usual motions in the different degrees of light are interrupted; the pupil diminishing and losing its clear black color. The cornea becomes more or less opaque, and vision is lost, sometimes from this cause and the closure of the pupil, sometimes from injury of the retina, as when the sight is destroyed, though the cornea and pupil do not completely obstruct the light, and frequently from all these circumstances together. Sometimes the thickened eyelids protrude, an ectropium of the lower one taking place, and a portion of the conjunctiva projecting in the form of a piece of red flesh.

So violent an affection of a vascular and sensible organ, situated in the immediate vicinity of the brain, necessarily produces a great deal of sympathetic inflammatory fever. If the disorder be not checked, suppuration of the eye occurs, preceded by severe throbbing and rigors; then no relief is experienced till the cornea bursts, and the matter is discharged, the vitreous humor and crystalline lens usually passing out at the same time. The eye next shrinks into the orbit; its form is completely destroyed, and its functions annihilated. When the disease does not proceed quite so far,

the patient escapes, perhaps, with opacity of the cornea, a closure of the pupil, or injury of the retina.

With respect to the prognosis, if chemosis be formed, the cornea cloudy, the color of the iris changed, and the pupil contracted, the eyesight is in considerable danger.

The *causes* of inflammation of the proper coats of the eye may be wounds; the irritation of extraneous substances lodged under the eyelids; exposure of the eye to a draught of cold air; immoderate exertion of the organ, particularly in the examination of minute shining objects, and in hard study by candle-light; and certain states of the atmosphere.   As predisposing circumstances, I may mention a full habit, or plethora; a disordered state of the digestive organs; intemperance; and costiveness.

Treatment of Inflammation of the External Proper Coats of the Eye, and of Ophthalmitis, or General Inflammation of the Eyeball.—1. The first indication is *to remove,* if possible, *the cause;* as, for example, extraneous substances.   The eye should be examined in a good light; and, if nothing be discovered on it, the lower eyelid should be depressed, and the inferior portion of the globe brought into view by the patient looking upwards.   If no particle of extraneous substance can be detected in this way, the patient should turn the eyeball downwards, and the upper eyelid be raised, so that the upper portion of the globe may be seen.   In most cases the extraneous body lodges in the concavity of the upper eyelid, which must then be everted.   The eyelashes are first to be taken hold of, and the eyelid drawn downwards; and while steady pressure is made against its upper part, by placing a probe across it, its ciliary margin is to be carried upwards and backwards.

When small particles of metal stick in the cornea, they should be removed with the point of a cataract needle.

Next to the removal of the exciting cause, bleeding is the chief means of subduing these forms of ophthalmic inflammation.   Venesection is to be practised, and from twenty to forty ounces should be drawn; and, after two or three hours, if the pain return, we should take away from twelve to fifteen ounces more without delay. The blood may also be taken from the temple or nape of the neck, by cupping, or from the temporal arteries.   The eye is to be guarded from the light with a green shade, or the room darkened.

Neither must we omit the repeated application of leeches, which are to be put on the temple, eyebrow, or just below the inner angle. We should also prescribe purgatives, with saline antimonial medicines; and, after depletion, have recourse to calomel and blisters.

With respect to topical applications, if the case be attended with violent headache, the decoction of poppy-heads may be used as a fomentation   In other instances, we may bathe the eye, in an eye-cup filled with tepid water, or with a warm collyrium, containing five grains of the sulphate of zinc. or acetate of lead, dissolved in four

or six ounces of rose-water. In proportion as the irritability of the eye lessens, the application may be used colder.

When the acute stage has completely subsided, we may introduce between the eye and eyelids, once or twice a day, two or three drops of the vinous tincture of opium; but, while much tenderness and aversion to light continue, its use must be deferred, and depletion repeated.

When there is risk of effusion, or opacity, I always give calomel and opium freely, and keep open a blister. Two grains of calomel. with half a grain of opium, four times a day, may be administered, until the mouth becomes sore.

For the cure of any remains of chronic inflammation, astringent applications, blisters, the occasional use of leeches, and the free exposure of the eye to the open air and daylight, are generally the right measures.

RHEUMATIC OPHTHALMIA.   SCLEROTITIS.

There are two remarkable forms of inflammation of the eye, most frequently arising in adults from atmospheric influences, viz. —the *catarrhal* and the *rheumatic*. The *catarrhal* is an affection of the conjunctiva; the *rheumatic*, of the albuginea and sclerotica, occasionally extending to the iris. In the *catarrhal*, the red vessels give a reticular appearance; in the *rheumatic* they are radiated, or in the form of a zone, and seated under the conjunctiva. *Catarrhal* ophthalmy is an inflammation of a mucous membrane, and attended with an increased secretion from it; *rheumatic* ophthalmy attacks the fibrous membranes of the eye, and is not accompanied by any morbid secretion from its surface. The pain in catarrhal ophthalmy is like that of sand under the eyelid, does not extend to the head, and is felt chiefly in the morning, or when the eyes begin to be moved. The pain in rheumatic ophthalmy is throbbing and deep-seated, not in the eye chiefly, but round the orbit, and is severely aggravated from sunset to sunrise. In catarrhal ophthalmy, there is little intolerance of light; in sclerotitis, a great deal.

Rheumatic inflammation is by no means a good name for the complaint, as it is not connected with a rheumatic constitution: it is a primary affection, and not the result of any transfer of rheumatism from other parts to the eye. *Sclerotitis* may be a better term. At all events, this inflammation only resembles rheumatism in its exciting causes, its accompanying pain, its exacerbations, and its treatment.

In sclerotitis, the fasciculi of distended vessels advance in radii towards the edge of the cornea, and sometimes even a little beyond it. They are of a bright red color, and the degree of inflammation in the conjunctiva itself is never such as to conceal them. In general, there is no tendency to chemosis, nor do the eyelids take

part in the disease; but there is a haziness of the cornea and pupil, attended with a slightly contracted state of the latter opening, and a sluggishness in the movements of the iris. The iris may even become a little discolored, and lymph be effused from it; but a severe degree of iritis seldom attends rheumatic sclerotitis. Suppuration and ulceration also rarely or never follow this affection of the eye; but there is a considerable degree of symptomatic fever, increasing with nocturnal paroxysms of pain. The digestive organs are deranged, the bowels confined, and the excretions morbid.

Treatment.—Blood is to be taken from the arm, and leeches afterwards applied to the forehead and temples. Calomel and opium are effectual in lessening the severe pain in and around the orbit. Two grains of calomel and one of opium may be given every evening till the gums are affected, when the calomel may be omitted, and ten grains of the compound powder of ipecacuanha administered in lieu of it. The forehead and temple may be rubbed with a mixture of olive oil and extract of opium, or with warm laudanum; and, in chronic cases, with equal parts of laudanum and tincture of cantharides. Blisters are likewise to be put behind the ear, or on the temple, or nape of the neck. Great benefit will be derived from mild purgatives and the warm foot-bath at night, with sudorifics.

I believe that, in rheumatic sclerotitis, the iris should be kept moderately under the influence of belladonna, either by smearing the moistened extract upon the eyebrow and eyelids every evening at bedtime, or by infusing $\mathfrak{Z}$j. of the extract in each ounce of the laudanum used for rubbing the forehead, eyelid, and temple.

In *chronic cases*, we may give small doses of sulphate of quinine; and, in old mismanaged ones, from three to ten drops of the liquor arsenicalis, three times a day.

Local applications have little effect. The lunar caustic solution, which is almost a specific for catarrhal ophthalmy, is decidedly injurious in rheumatic sclerotitis; but, when all painful and febrile symptoms are gone, and little more than chronic redness and weakness of the eye remains, the vinum opii may be dropped once or twice a day into the eye.

CATARRHO—RHEUMATIC OPHTHALMIA

Affects both the conjunctiva and the sclerotica. The feeling of roughness, or sand, between the eyelids and eyeball, and the secretion of a puriform fluid, indicate the participation of the conjunctiva in the disorder; while the nocturnal accession of racking pain in and around the orbit marks the affection of the sclerotica. In this case, chemosis is by no means uncommon, and the eyelids generally adhere together in the morning, from the thickened state of the Meibomian secretion. There is also considerable intolerance of light, with epiphora.

The cornea frequently ulcerates, or pus is effused between its layers, constituting what is termed *onyx*. In bad cases, the ulceration makes its way into the anterior chamber, the aqueous humor escapes, and the iris protrudes. There is also commonly, just before this state of things, an effusion of fibrine in the pupil; the iris changes in color, and the pupil is often obliterated. The pulse is generally quick and sharp, the tongue white, and the nocturnal pain prevents sleep.

Treatment.—1st. Venesection—from ten to thirty ounces, and repeated.

2d. Leeches to the temple.

3d. Scarifications are sometimes advised for the chemosis, and if practised, should be so, in the way noticed in the remarks on purulent ophthalmy.

4th. Calomel and opium every night.

5th. Opiate frictions about an hour before the expected attack of pain in the orbit.

6th. Pupil to be kept dilated with belladonna.

7th. Blisters behind the ear.

8th. Purgatives; a brisk dose of calomel and jalap at first, and afterwards mild laxatives.

9th. Sudorifics; liq. ammon. acet., warm diluent drinks, and the pediluvium.

10th. In the chronic stage, the sulphate of quinine and mineral acids.

11th. Local applications: the solution of from two to four grains of the nitrate of silver in an ounce of distilled water, dropped upon the conjunctiva once a day, relieves the painful feeling of sand, and speedily removes the other symptoms of conjunctivitis.

The eye is to be bathed three or four times a day with a tepid solution of the bichloride of mercury one grain to eight ounces of distilled water.

The edges of the eyelids are to be smeared with the ung. hydr. nitratis, weakened. If onyx take place, it is not to be punctured, as such practice would be followed by protrusion of the iris and opacity.

SCROFULOUS CORNEITIS

Is a slow disease, occupying weeks and months, and sometimes years. The conjunctival covering of the cornea, and substance immediately under it, are chiefly affected. The redness of the sclerotica is not considerable; the vessels are minute, and arranged in a zone round the cornea. Not unfrequently, there is a reddish ring at the circumference of the cornea, with red vessels extending to the centre of this membrane. In some cases the conjunctival covering is thickened, and reddened, so as to look like a piece of

red cloth, whence the term *pannus.* The cornea is more or less opapue and rough; sometimes only hazy, sometimes marked with white streaks or specks, sometimes uniformly white. Occasionally its convexity is increased; the pupil is not unfrequently dilated, with a tendency to amaurosis; there is not much intolerance of light—a striking contrast of this form of scrofulous inflammation of the eye to what is noticed in the pustular variety. In a few cases, however, the patient cannot endure the light, and there is epiphora. The pain is not very severe, and the complaint soon becomes chronic, especially after the cornea has become opaque. The pulse is especially quick, the patient restless at night, and the skin harsh and dry. The disease is most common in subjects about puberty, and often accompanied by symptoms of struma.

Treatment.—Leeches are to be applied and repeated; but not so as to weaken the patient. We may also try small doses of tartarised antimony, and then the sulphate of quinine, and Dover's powder at bedtime. Calomel, combined with opium, so as to affect the mouth, after the acute symptoms have ceased, has great effect in clearing the cornea. Colchicum, sarsaparilla, and elm bark, are useful as alteratives in scrofulous corneitis, but not generally equal to sulphate of quinine.

The *local applications* are fomentations with poppy decoction, and the steam of hot water, with a little laudanum in it. Blisters are productive of great benefit. The best *stimulating* applications, after all acute inflammation is over, are the vinum opii, a collyrium of the nitrate of silver, or a weak solution of iodine in distilled water, according to Lugol's formula. When there is any tendency to iritis, the pupil is to be kept dilated with belladonna. When the cornea is very convex, denoting an unusual accumulation of the aqueous humor, the discharge of this fluid is sometimes recommended, but rarely adopted.

IRITIS.

When we recollect, that the iris receives its supply of blood by the two long ciliary arteries, the external and internal, which are but little connected with the arteries of the other textures of the eye, we may readily conceive that inflammation of this organ is likely sometimes to exist without much inflammation in other parts of the eye. The danger of iritis chiefly depends upon its partaking of the nature of the adhesive inflammation, by which the pupil is apt to become, under the least neglect, completely and irremediably obliterated by the effusion of coagulating lymph. Iritis is, indeed, attended with a degree of inflammation in the sclerotic coat, the front layer of the capsule of the crystalline lens, and too often with inflammatory action in the choroid coat and retina; yet the iris is plainly

the focus of diseased action, the affection commencing on its pupillary margin, and other parts becoming subsequently affected.

Iritis is divided into *idiopathic* and *symptomatic*, *acute* and *chronic*, and into several *specific* varieties. Some common symptoms, however, characterise iritis, from whatever cause it may originate.

1. In the early stage we can discern minute red vessels, running in radii in the sclerotica to the edge of the cornea, where they form a red zone, while the rest of the sclerotica retains nearly its natural paleness, its vessels under the conjunctiva only presenting a pale pink color, which increases, however, as the iritis makes progress. The vessels of the conjunctiva in the anterior part of the eye soon enlarge; and, in violent cases, there is a uniform redness. Together with change of color, the iris loses its natural brilliancy; it becomes of a dull appearance; and the beautiful fibrous arrangement, so characteristic of it in the healthy state, is either confused or entirely lost. These changes begin in the pupillary margin.

2. Then, another symptom, common to every iritis, is a change of color in the iris: if naturally blue, it turns greenish; if dark-colored, it changes to a reddish brown. This is owing to the deposit of fibrine in its texture, and to the effusion of the same plastic substance upon its surface. Hence we frequently notice irregular tubercles, or masses, formed either at the edge of the pupil, or upon the iris itself.

3. Another symptom, noticed in every iritis, is a tendency to contraction, irregularity, and immobility of the pupil.

4. We also frequently remark an effusion of fibrine into the pupil and posterior chamber, and sometimes into the anterior. In rheumatic iritis, however, fibrine is more sparingly effused than in venereal iritis.

5. Considerable intolerance of light, accompanied by increased lachrymal discharge, is another effect of iritis in general; but much greater in rheumatic than syphilitic iritis.

6. In every iritis there is a disposition to the production of adhesions between the pupillary margin of the iris and the capsule of the lens; and sometimes between the iris and cornea, or even between the posterior part of the iris and the ciliary processes. Such adhesions are usually of a dark color, like that of the edge of the uvea.

7. Together with these common effects of iritis, the patient has dimness of sight, and sometimes total blindness.

8. Pain in the eye, the orbit, and forehead, are likewise invariable attendants on iritis, and often subject to nocturnal exacerbations.

Notwithstanding what has now been stated, iritis, if combined with amaurosis, may be accompanied by a dilated pupil.

Exposure to atmospheric changes, very strong light, syphilitic disease, scrofula, gout, rheumatism, wounds of the eye, may each be

a cause of iritis, which may be *acute* or *chronic*. When acute, the inflammation, beginning on the pupillary margin of the iris, quickly extends over its whole surface, and affects the external as well as internal tunics. In chronic iritis, the inflammation sometimes begins at the ciliary margin of the iris, whence it may be slowly propagated to other internal textures. Chronic iritis, however, sometimes produces effusion of fibrine, and adhesion of the edge of the iris to the capsule of the lens, without any perceptible inflammation of other textures of the eye. Between this slowly creeping chronic iritis, and the most acute form of it, we meet with numerous other cases, in which every gradation of the inflammatory process is exhibited.

The constitutional disturbance is different in different cases. Acute iritis is generally attended with headach, restlessness, a full and strong pulse, white tongue, thirst, loss of appetite, and costiveness. At the same time, it must be confessed, that, in some cases, which would be regarded as acute, such symptoms prevail only in a slight degree.

The *prognosis* is favorable, when the affection is recent and confined to the iris, without too close a contraction of the pupil, or organisation of the effused fibrine; or extension of the inflammation to the retina, and other textures behind the iris.

Syphilitic iritis is frequently, but not invariably, accompanied with effusions of fibrine, in the form of tubercles of a reddish or yellowish brown color; it is also characterised by a reddish brown discoloration of the inner circle of the iris, the remarkable nocturnal exacerbations of pain*, the previous occurrence of syphilis, and, in most instances, the concomitant existence of other syphilitic symptoms. There is an angular disfigurement of the pupil, which, according to Beer, is usually drawn towards the root of the nose; but, according to Mr. Guthrie, not more frequently in this direction than others. The form and situation of the pupil seem to Mr. Lawrence to depend upon the effusions of fibrine. With regard to the opinion, that mercury is the cause of iritis, Mr. Lawrence's observations are strongly against its correctness; in nine cases, related in his " Treatise on Venereal Diseases of the Eye," iritis came on where no mercury had been taken previously to its appearance. In some cases of syphilis, treated by Rose and Thompson, without mercury, iritis also occurred.

In *idiopathic iritis*, there is either no distinct deposit upon the iris, or it presents itself as a bright yellow elevation from the texture of the part, increasing to a certain size, and then breaking, so as to allow the escape of a yellow matter, which sinks to the bottom of the anterior chamber. Such yellow little abscesses are not observed in syphilitic iritis.

In *arthritic iritis*, or that connected with a gouty constitution,

---

* See Lawrence's Treatise on the Diseases of the Eye, p. 317.

fibrine is effused from the margin of the pupil, but not deposited in a distinct form, and the adhesions are generally *white*. Both in the *idiopathic* and *arthritic* iritis, the pupil is contracted; but generally retains its circular figure and central position in the iris. In gouty and rheumatic iritis, a white zone is distinguishable between the red one and the margin of the cornea; but frequently it is incomplete, being only noticed on each side of the boundaries of the cornea.

In the *treatment of iritis*, there are three principal indications :—

1. That of putting a stop to the inflammation.

2. That of preventing the effusion of fibrine, and promoting its absorption, if it has been already poured out.

3. That of preventing the contraction of the pupil, and the formation of adhesions between the margin of the iris and the capsule of the lens.

The *first indication*, or that of arresting the inflammation, is accomplished by antiphlogistic measures; bleeding, saline aperients, and tartarised antimony. If the inflammation is not checked, it will soon extend to the choroid coat and retina, and sight be endangered. We should have recourse, therefore, to venesection, or cupping from the temple, or nape of the neck. Sometimes bleeding and the exhibition of sulphate of magnesia, and tartrate of antimony, with other antiphlogistic means, will accomplish the cure of iritis, if duly followed up; but more frequently additional plans are requisite. Antiphlogistic treatment relieves the congestion of the blood in the eye, lessens the redness, and diminishes the fever; but it does not always succeed in preventing the effusion of fibrine, or in bringing about the absorption of what has been poured out.

This makes it necessary to consider how the *second indication*, or that of preventing the effusion of fibrine, and promoting its absorption when deposited, is to be fulfilled. Experience proves that the grand remedy for this purpose is mercury, employed quickly and freely, so as to affect the system. It must be used immediately after bleeding and other means of depletion have been practised. The effect of it is so to change this action of the vessels of the iris, that they lose their disposition to effuse plastic substance; and that which has been already effused becomes absorbed ; the natural color of the iris is restored, the cornea becomes clear again, the red zone round it fades away, and the power of vision returns. All this improvement is rapidly effected when the system is expeditiously put under the influence of mercury; and here it is advisable to let that influence be stronger, than what is usually deemed necessary in other cases of ordinary disease. Two grains of calomel with one third of a grain of opium, are to be given every four or six hours. In cases of long standing, it is necessary sometimes to keep the patient under the influence of mercury several weeks.

The *third indication*, or *that of keeping the pupil dilated*, requires the application of belladonna. Other narcotics will produce the same

effect, particularly stramonium and hyoscyamus; but belladonna is most effectual. One scruple of the extract should be dissolved in ℥j. of distilled water, and filtrated. This preparation is to be dropped, once or twice a day, into the eye. But, if the inflammation be acute, it is better to smear the upper eyelid, forehead, and eyebrow with the extract itself, a little moistened. The other, however, is the most prompt method, if the inflamed state of the eye will bear it, which is not always the case. This use of belladonna is very important; not only as tending to prevent the closure of the pupil, but as keeping its edges away from the capsule of the lens, and even making the iris so withdraw itself from the lens that, if adhesions be already formed, and the fibrine soft, they will give way, and the pupil still recover its natural size and mobility. This beneficial change is materially promoted by the simultaneous use of mercury. While the iris is highly inflamed, and the disease not checked, belladonna will not dilate the pupil; yet, if applied only to the skin, and not to the eye itself, Mr. Lawrence is of opinion that it will do no harm, and perhaps may even prevent further contraction of that opening. Other local applications are of secondary importance; poppy fomentations generally give most relief, but cold applications may be used, if preferred. Blisters are not advisable until the disease becomes chronic; or, not until bleeding has been freely practised, and mercury exhibited.

When there is severe nocturnal pain about the orbit, the forehead and temple should be rubbed with mercurial ointment combined with opium, in the proportion of four grains of the latter to one scruple of the former.

In *arthritic* or *gouty iritis*, mercury is less necessary than in the idiopathic and syphilitic forms of the complaint. Colchicum and magnesia, and, in the chronic stage, blisters, carbonate of iron, and quinine, are means on which some practitioners place their chief dependence. We should not imbibe the notion, that syphilitic iritis absolutely cannot be cured without mercury. Sometimes it may be cured by antiphlogistic treatment alone; and Mr. Hugh Carmichael, of Dublin, has published a series of well-marked examples of syphilitic iritis, which were cured by giving ℥j. doses of turpentine in the almond emulsion, three times a day. Yet he only resorted to this practice when mercury was inadmissible, in consequence of its injurious effect on the health.

CHOROIDITIS AND RETINITIS.

The *internal inflammations of the eye* may sometimes arise in one texture, and, at other times, in another; in one case, the retina may be first affected; in another, the choroid coat; and, in a third, the iris. From these individual textures, the inflammation may afterwards extend to every part of the eye.

7*

Retinitis is occasionally excited by long-continued immoderate exertion of the sight in the examination of minute microscopical objects, under a strong, and, perhaps, a reflected light. Such cases, however, are generally preceded by determination of blood to the head, or the eye. The same consequence may follow the effect of vivid flashes of lightning, or the sudden exposure of the eyes of persons to the light, who have long been confined in dark dungeons. *Chronic retinitis* is often regarded as weakness of sight, characterised by a morbid sensibility to light, and slight obscurity of vision, followed, after a time, by a gradual contraction of the pupil, immobility of the iris, and amaurosis.

The *treatment* of acute retinitis consists in keeping the eyes perfectly at rest, with the benefit of darkness, abstinence, and active depletion, followed by the quick introduction of mercury into the system, belladonna being also applied, as in iritis. The treatment, indeed, is essentially the same in both cases.

Having now finished the consideration of the principal inflammations of the eye, I proceed to notice some other affections which are consequences of an inflammatory process in that organ.

GLAUCOMA

Is so called from the greenish color reflected from the pupil, the iris becoming of a dull leaden or dirty green color, the pupil dilated, the eye painful, its vessels distended, and vision generally destroyed. In the early stage, the green reflection seems as if it came from the very bottom of the eye; but, as the disease advances, the apparent opacity, which is always of a greenish color, and often sea-green, looks as if it were situated in the centre of the vitreous humor, and at last appears to be immediately behind the lens. The opacity and green reflection are not the result of any change in the crystalline lens, but are more deeply seated. The change cannot be seen when the eye is inspected laterally, but only when we look directly towards the bottom of the eye.

Scarpa ascribes the glaucomatous state of the eye to inflammation and thickening of the retina; Beer to similar alterations of the vitreous humor; and other surgeons to morbid changes in both these textures. Dr. M'Kenzie, in dissecting some glaucomatous eyes, found the choroid coat, and especially the portion of it in contact with the retina, of a light brown color, without any appearance of pigmentum nigrum. The vitreous humor was in a fluid state, perfectly colorless, or slightly yellow, without any trace of hyaloid membrane. The lens was of a yellow or amber color, firm and transparent. In the retina, no trace of the foramen centrale and limbus luteus was distinguishable. No other change was noticed in the retina; for it was not thickened, nor changed in color; neither

was the vitreous humor thickened, or opaque, but perfectly fluid and transparent.

Glaucoma is always attended with a limited and sluggish motion of the pupil and other amaurotic symptoms. Ultimately, indeed, the pupil is greatly dilated, and the retina becomes insensible to light. The loss of sight, however, is generally gradual; and the want of pigmentum nigrum has been suspected to be capable of affording some explanation of the weakness of sight, which accompanies the early stages. This, however, may not seem satisfactory to every pathologist; nor are we sure, that a deficiency of pigmentum nigrum is an essential occurrence in every glaucoma.

Inflammation, leading to a destruction of the hyaloid membrane, may perhaps be set down as the proximate cause of glaucoma. The disease is much more common in old than young subjects, and is occasionally believed to come on chiefly in consequence of slow inflammation of the interior textures of the eye in gouty constitutions. Surgeons must be careful not to mistake glaucoma for cataract; the mere color of the eye is sufficient to prove that, at all events, the case is not one of simple lenticular cataract, for opacity of the lens alone is never green. Also, when the pupil is dilated with belladonna, the green appearance seems to be further behind the pupil, and uniform, not streaked, nor spotted like a cataract.

When glaucoma has commenced in one eye, we generally find it take place also in the other, the disease being often seen in different stages in the two eyes.

Complete glaucoma may be set down as absolutely incurable, though it is possible that, in the early stage of the disorder, its progress may be arrested, and even vision improved. I should say, however, that the prognosis is always peculiarly unfavorable. Mild antiphlogistic treatment, with calomel and opium, may be tried, or iodine given; but the prospect of benefit is very slight indeed.

Instead of mercury, Dr. M'Kenzie, of Glasgow, suggests the trial of carbonate, or sesqui-oxide, of iron and sulphate of quinine, directly after depletion, but I know of no fact in support of the practice. Dilatation of the pupil with the aqueous solution of belladonna will sometimes temporarily improve the sight.

ONYX, OR ABSCESS OF THE CORNEA,

Signifies a collection of matter between its lamellæ, and so called from its being of a semilunar shape, like the white mark at the root of one of the finger-nails. It is generally situated at the lower edge of the cornea, and, even when more extensive, may be readily distinguished from a collection of matter in the anterior chamber, called *hypopium*, by its form and situation remaining unchanged, whatever may be the position of the patient's head.

The treatment consists chiefly in the employment of remedies

called for by the kind of ophthalmy, of which the onyx is an effect. As the general rule, it is the best practice not to open any collections of matter in the texture of the cornea, as we thus rather increase, than lessen, the risk of opacity of that membrane, and prolapsus of the iris. When, however, the onyx has a tendency to spread over the cornea without bursting, it becomes necessary to make an opening with a cataract knife.

HYPOPIUM

Is a collection of matter in the chambers of the aqueous humor, especially the anterior. The matter is always first noticed at the bottom of that chamber; and it may increase gradually, till it not only covers the pupil, but fills the chamber, and even the pupil. Sometimes it shifts its position with every motion of the head; and, in other examples, its thick glutinous properties fix it in one place. If the case be neglected, the prominence of the cornea increases, and, at last, after most agonising pain, that membrane gives way: the suffering now ceases, and the iris falls forwards, protrudes, and becomes adherent to the cornea.

In the treatment, the principal indication is to lessen the inflammation, from which the hypopium has originated, whether of the cornea or the iris; for, if we succeed in doing this promptly, and then give mercury, absorption will often proceed so quickly in the anterior chamber, that the matter will soon be removed. The best general rule is to abstain from making an opening; for, in fact, the matter is a viscid kind of lymph, which will not flow out if a puncture be made.

If the eyeball were to suppurate extensively, things would be different, and then an opening for the discharge of the abscess would unquestionably be required.

Ulcers of the cornea are frequently the consequence of the rupture of an onyx or small abscess. In purulent ophthalmy, however, the ulceration generally begins externally, and penetrates more and more deeply, until it reaches into the anterior chamber. Sometimes ulcers of the cornea are produced by the irritation of extraneous substances on the eye, as quicklime, or pieces of glass. The ulcer is of a pale ash color; its edges high and irregular; its margin surrounded by a slight halo of lymph, or a cloudy appearance of the cornea; it gives acute pain, discharges a thin lymph, and is disposed to spread. To the deposit of lymph around the sore, a fasciculus of vessels proceeds from the sclerotic conjunctiva.

When the ulceration extends superficially, the transparency of the cornea may be destroyed; and when it penetrates the anterior chamber, the aqueous humor escapes, and a prolapsus of the iris takes place. If the opening be large, even the vitreous humor and

lens may be discharged, and the eye destroyed. Then, if less mischief occur, the cicatrix frequently produces indelible opacity of the cornea, and more or less injury of vision.

Treatment.—Our first endeavor should be to stop the ulcerative process by means calculated to lessen the inflammation, which is the cause of it. Local bleeding is proper, so long as there is an appearance of active inflammation, and much pain is felt in the eye. The bowels are to be kept open, and opium administered. In strumous cases, we may give the sulphate of quinine, and wash the eye with a collyrium containing iodine, according to the formula of Lugol. In the chronic superficial ulcer, we may prescribe calomel. In almost all cases, counter-irritation is useful. When the ulcer is kept from healing by the irritation of the motion of the eyelids, and it protracts the inflamed state of the eye, lunar caustic is the grand means of relief.

OPACITIES AND SPECKS OF THE CORNEA

Receive different names according to their degree and mode of formation. The slightest degree of opacity is termed *nebula*, in which the cornea presents a diffused cloudiness, a hazy or milky appearance, that has no distinct boundary, but is gradually lost in the surrounding transparent portion of that membrane. It is often accompanied by an enlarged and reddened state of the vessels of the conjunctiva, some ramifications of which extend into the delicate layer of this membrane, spread over the cornea.

Opacities of a more circumscribed and complete kind are exemplified in *Albugo* and *Leucoma*, which consist of a deep extravasation of dense lymph in the substance of the cornea. They are of a clear white or pearl color, and only differ in one respect; namely, that the albugo is the consequence of some description of ophthalmy, or of an abscess, or ulceration of the cornea, while the leucoma is the opaque speck or mark occasioned by a wound of that texture. For some time after the completion of the healing process, the opacity continues to diminish; but this improvement can only take place in a certain degree, and an indelible speck will yet remain, though considerably smaller than the original wound which was the cause of it.

Numerous red vessels are sometimes observed running into an albugo from the conjunctiva; and, when this is the case, the opacity is apt to spread, and is somewhat raised above the level of the cornea, the delicate layer of the conjunctiva spread over this membrane being much thickened. This variety of albugo is occasionally seen in scrofulous adults, and sometimes in children.

The remedies, calculated to do good to specks of the cornea, in their early stage, are those which have the effect of removing the inflammation that has given rise to them. At the same time, there

are both general and local means peculiarly adapted for hastening the absorption of opaque deposits in the cornea; such are mercury and iodine. We have likewise various applications for quickening the action of the absorbents in the removal of specks, if employed at the proper time. If we commence their use too soon, that is, before the cause of the opacity is removed, we shall do more harm than good. For instance, if in an albugo, arising from scrofulous corneitis, and still attended by considerable vascularity, we were directly to attack the opacity of the cornea with stimulating powders and strong solutions of nitrate of silver, oxymuriate of mercury, or iodine, we should not only fail in accomplishing the object in view, but create a great risk of rendering the patient totally blind. But, if we begin with attacking the strumous inflammation, which still lingers in the eye, and that chiefly with constitutional remedies, we shall not only disperse the redness, but often find the cornea begin to get clearer from day to day, and the eyesight to be proportionally improved.

The best local means for dispersing opacities of the cornea are, a solution of the nitrate of silver, from two to five grains, in an ounce of distilled water; a solution of one or two grains of oxymuriate of mercury in an ounce of distilled water; the vinum opii; the ung. hydr. nitratis; or a finely levigated powder, consisting of ℨj. of red precipitate and one ounce of white sugar. The latter is generally blown on the speck through a quill. The useful effect of iodine collyria must also not be forgotten. The vascular forms of albugo sometimes require the trunks of the vessels distributed to them to be divided, and mercury or iodine to be exhibited.

STAPHYLOMA.

Is a term applied to various protrusions or projections on the front of the eye, in consequence of their fancied resemblance to a grape, *staphyle* being the Greek word for that fruit. Thus, a protrusion of a portion of the iris through an ulcer, or wound of the cornea, used to be called *staphyloma racemosum*, but now more properly *prolapsus of the iris*. At the present time, the term *staphyloma* is usually restricted to protuberances of the cornea and sclerotica. Staphylomatous affections of the sclerotica, however, are so rare, in comparison with those of the cornea, that it is only the latter which need detain us. When the cornea becomes staphylomatous, it looses its natural transparency, rises above its proper level, and even projects between the eyelids, in the form of a whitish, pearl-colored, or bluish tumor, attended, when the whole cornea is affected, with loss of sight. To this grievance are added, in bad cases, all the evils which unavoidably result from the projection of the cornea: inability of closing the eyelids; exposure of the eyeball to the air and extraneous matter suspended in it; irritation and inflam-

mation from this cause and the friction of the eyelashes; and soreness and excoriation of the lower eyelid and cheek from the constant stillicidium lachrymarum. Even the other eye is often sympathetically affected, becoming tender, and sometimes truly inflamed.

Staphyloma of the cornea is either *partial* or *total*. Although the most evident symptoms are opacity and projection of the cornea, a common effect of the disease is adhesion of the iris to the diseased cornea and consequently a diminution or total obliteration of the anterior chamber.

Where a partial staphyloma neither covers nor involves the pupil, the patient may be able to see objects placed above him or on a level with his eye; but he is generally affected with epiphora and painful sensibility of the organ. In more unfortunate cases, all the margin of the pupil is adherent to the opaque and projecting portion of the cornea; and it is only by the formation of a lateral artificial pupil, that any degree of vision can be recovered.

Partial staphyloma is sometimes confounded with leucoma; but it is to be recollected, that in general the iris is firmly adherent to the whole extent of a partial staphyloma, but either quite unconnected with a leucoma, or connected to it by a mere point. In partial staphyloma, the whole cornea inclines to a conical form, the apex of which is the centre of the staphyloma; whereas, in leucoma, the general spherical form of the cornea remains unaltered.

If either from closure of the pupil, or from the partial staphyloma being situated over it, no vision exits, we should try to lessen the staphyloma itself, and then consider whether, by an operation for artificial pupil, the eyesight can be restored.

Now, the safest plan of reducing a partial staphyloma is to apply to its apex the muriate of antimony with a camel-hair pencil, while the eyelids are kept widely separated. Then, before the eye is shut, the surface of the staphyloma should be washed with a large camel-hair pencil dipped in tepid water or milk. The caustic is not to be repeated till the slough has come away, and the inflammation, caused by the former application, subsided.

In one form of total staphyloma, the tumor is *spherical;* in the other, it has the shape of a *blunt cone.*

As there is no possibility of restoring sight to a patient afflicted with total staphyloma, even in cases where the lens, vitreous humor, and retina are sound, the only thing we can usefully do is to lessen the protuberance of the cornea, which is not only a great disfigurement, but a cause of the serious annoyances already specified. This is done by an operation, which consists, first, in the formation of a flap with the cataract knife: and, secondly, in completing the circular excision of the most prominent portion of the tumor with a pair of curved scissors. The lens and viteous humor escape; the eye shrinks into the orbit; and, though the organ is destroyed,

the patient is freed from a disease, which, besides being attended
with total loss of sight, was a source of great misery and suffering.

SYNECHIA

Is a term employed to signify a morbid adhesion of the iris.   When
the adhesion is to the cornea, the case is called *synechia anterior;*
when to the capsule of the crystalline lens, *synechia posterior.*   The
former is often the consequence of a wound, or ulcer of the cornea,
attended with escape of the aqueous humor; the latter is more fre-
quently brought on by iritis.

Partial and recent adhesions of the iris to the capsule of the lens
may sometimes be separated by the use of belladonna and mercury.
In some instances of partial synechia anterior, and even of com-
plete synechia posterior, which is mostly attended with closure of
the pupil, vision may be restored by the formation of an artificial
pupil.

The adhesion of the iris to the cornea produces a change in the
size, position, and shape of the pupil; and when the result of in-
flammation, or of a prolapsus of the iris, the cornea mostly becomes
opaque.

PROLAPSUS OF THE IRIS,

Sometimes termed *staphyloma racemosum,* is a protusion of the
iris through a wound or ulcerated opening in the cornea.   It is
necessarily of the same color as the iris, brown or greyish, and its
size varies from that of a pin's head to that of a small pea.   As the
cornea is rarely perforated at more than one point, the prolapsus is
usually single, and its base is generally surrounded by an opaque
circle of the cornea.

The inconveniences of a prolapsus of the iris, are, pricking pain
in the eye, inflammation of the organ, intolerance of light, a devia-
tion of the pupil towards the seat of the prolapsus, and a lessening
of its diameter.   In cases of long standing, the protruded portion
of the iris becomes less sensible, and the distress experienced less
acute.

When the prolapsus is quite recent, and the consequence of a
wound, no doubt can exist about the propriety of reducing the iris
into its right situation again.   In other examples this is impractica-
ble, and then the inconveniences of the projection of the iris are to
be relieved by touching the tumor repeatedly with the nitrate of
silver, until it is sufficiently levelled and the ulcer healed; while
the obstruction of vision itself, caused by the displacement and ul-
ceration of the pupil, and the partial opacity of the cornea, may
sometimes be removed by the formation of an artificial pupil.

When the protruded piece of the iris is large, it may be necessary to snip off a part of it with scissors, before the nitrate of silver is applied.

CLOSURE OF THE PUPIL, AND FORMATION OF AN ARTIFICIAL PUPIL.

A permanent contraction, or a closure of the pupil, is most frequently a consequence of inflammation of the iris, but sometimes it follows operations for the removal of cataracts, coming on slowly and insidiously at some indeterminate period afterwards, without any marked inflammation in the eye. The iris becomes motionless, assumes a radiated wrinkled appearance, and, when the lens is free from opacity, a small black point is seen in its centre. Under these circumstances, if the retina be sound, the patient may sometimes regain a considerable power of vision by the formation of an artificial pupil. The pupil may also be obstructed by the effusion and organisation of coagulating lymph from inflammation; or there may be such a displacement of the iris from prolapsus as causes an alteration in the shape and position of the pupil, attended with serious obstruction of vision.

The several varieties of operation for the formation of an artificial pupil may all be referred to three principal methods; the first is *a simple cut through the iris*, without the removal of any portion of it, termed *coretomia*. The second is an incision in the iris, and the removal of a part of it—*corectomia*. The third consists in separating some of its external margin from the corpus ciliare—*coredialysis*.

It is manifest that none of these operations can be performed with a reasonable prospect of success, except when the changes in the condition of the pupil are the only defect in the eye. Thus, unless the retina were sensible, it would be doing no good to make a new opening in the iris. The patient should always be capable of discerning the difference between light and darkness; and, if he had not this power, the operation would hold out little prospect of success. This state, however, does not amount to an absolute prohibition of it, because sometimes the iris is so thickened, the posterior chamber so full of dense lymph, and the transparency of the lens so affected, that the power in question may be annihilated, yet the retina itself not be incapable of resuming its functions. The experiment, though unpromising, may be made.

An artificial pupil should never be formed in one eye, so long as the patient is able to see with the other. Nor ought the operation to be attempted if the eye be affected with inflammation, preternatural hardness, dropsy, or atrophy.

When a part of the cornea is opaque, the place for the artificial pupil must, of course, be determined by the situation of the trans-

parent portion of that membrane; and if the operator has the choice of placing it behind either the nasal or the temporal edge of the cornea, the former situation is to be preferred, as affording a more useful degree of vision.

Whenever the lens and capsule are transparent, one chief caution in the operation is to leave those parts completely undisturbed.

As an artificial pupil possesses no power of contraction and dilatation, care must be taken to make it neither too large nor too small. Too small an opening would not be very serviceable; and if it were too ample, the quantity of light admitted into the eye would dazzle vision, and the new aperture be comparatively useless.

The limits of this work prevent me from describing all the modifications of operations, rendered necessary by the infinite variety of circumstances attending a closure of the pupil. The state of the pupil itself; its being filled or not by opaque fibrine; the condition of the cornea; the state of the lens; and the disease being complicated or not with prolapsus and adhesion of the iris, are several principal considerations materially influencing the particular mode of operating.

Coretomia, or the simple division of the iris, may be performed with an iris-knife, or couching-needle, that has a sharp edge only on one side; or else with a minute pair of scissors, one blade of which has a sharp point, the other an end, like that of a small probe. The iris-knife, which is but little larger than a common couching-needle, is introduced through the sclerotica, about a line and a half from the cornea; and, after perforating the iris on the side towards the temple, its point is conveyed across the anterior chamber nearly as far as the ciliary margin of the iris towards the nose. Then the sharp edge is to be turned backwards, and pressed against the iris as it is withdrawn, so as to make a transverse cut in the iris.

Another plan of dividing of the iris is performed by making an incision near the side of the cornea, and introducing small scissors, one of the blades of which has a sharp point, the other a probe point. The sharp point is then passed through the iris, near its ciliary margin; while the probe point is passed under the cornea, the requisite distance, when the blades are to be shut, and the necessary division of the iris executed.

These methods of operating are proper when the iris has a tense appearance, when the cornea is transparent, and there is no crystalline lens, or when the closure of the pupil has followed extraction of the cataract.

The *excision of a portion of the iris*, termed *corectomia*, is another method. It is performed in different ways. Thus, we may puncture the cornea, draw out a piece of the iris by means of a minute hook, made for the purpose, and snip it off. This was Professor Beer's way, which appears quite as good as that adopted by

the late Mr. Gibson, who made an incision in the cornea, so as to let out the aqueous humor, after which he made a piece of the iris protrude by means of gentle pressure, and cut it off. The iris then receded into the eye with the new circular opening formed in it.

These last plans are proper when the centre of the cornea is densely opaque, but the whole, or a portion of its circumference, transparent, and the lens and its capsule sound.

The operation of separating a portion of the outer margin of the iris from the corpus ciliare, *coredialysis*, was first done by Scarpa, on the side towards the nose; but, as the opening did not continue to be permanent, this plan was abandoned in favor of Reisinger's method, which is executed by means of a very fine double-hook forceps, capable of being put into the form of a single hook by slight pressure. A small puncture is made in the cornea near its margin, the double-hook forceps introduced, and conveyed, with the points turned downwards, as far as the place where the iris is to be separated, but always as near as possible to the ciliary edge. The points are then to be slightly opened, and made to enter the iris. The blades are now to be shut, and the instrument slowly drawn outwards, by which means a sufficient piece of the iris will be detached, which, having been disengaged from the instrument, is to be left strangulated in the wound of the cornea. In fact, this operation is a combination of coredialysis with corectomia. In this country, coredialysis is not much in favor, surgeons generally preferring either *coretomia* or *corectomia*.

HYDROPHTHALMIA, OR DROPSY OF THE EYE

Seems to be generally a local disease, or, at all events, is never connected with, or dependent upon, ascites, anasarca, or other dropsical affections; and, if it depend upon constitutional causes, their nature has not yet been made out. There may be dropsy of the chambers of the eye, that is, an increase in the quantity of the aqueous humor; or there may be a preternatural accumulation of the vitreous humor; or, lastly, there may be a collection of serous fluid between the sclerotic and choroid tunics.

The symptoms of dropsy of the anterior and posterior chambers are a greater prominence of the cornea than natural, and an increase in its diameter, attended in the advanced stages with loss of its transparency. The iris is soon rendered motionless, and of a darker color than usual. At first, the eye is far-sighted, but afterwards the power of seeing becomes considerably impaired, or lost. When this variety of hydrophthalmia follows injuries of the eye, it may be combined with a tremulous state of the iris, and partial amaurosis.

In the treatment, we may try blisters on the temple, or behind the ear; mercury, iodine, and purgatives. In inveterate cases, paracen-

tesis oculi has sometimes been practised. If this plan be adopted, the best instrument is a grooved needle. I had a case in University College Hospital, in which I punctured the eye seven or eight times at intervals with such a needle, so as to discharge the fluid, and at length to diminish the size of the organ, and relieve the patient from the severe pain previously experienced.

If the existence of *subsclerotic dropsy* could be made out, the discharge of the fluid by puncture would be indicated.

Dropsy of the vitreous humor is attended with enlargement of the posterior part of the eyeball, a conical projection of the cornea forwards, advance of the iris towards the cornea, deep blue color of the sclerotica, and shortsightedness, followed by complete amaurosis, the eyeball becoming hard and motionless.

As the eyesight is totally lost, all that the surgeon can do is to relieve those inconveniences which arise from the distended state of the eye, and its pressure. If puncture with the needle were insufficient, a piece of the cornea might be cut off, and the humors discharged.

AMAUROSIS, OR GUTTA SERENA,

Is an obscurity or loss of vision, arising from a more or less insensible state of the retina. Either the retina, the optic nerve, or the brain, may be the part first and principally affected. The expression *gutta serena* is only applied to cases of total blindness, plainly derived from the circumstance of the pupil having no opacity in it, and being apparently clear, though the patient is blind.

The symptoms of amaurosis are of two kinds : first those which the *surgeon* notices in the form, color, texture, consistence, vascularity, and motions of the different parts of the organ, or in the general condition of the patient; secondly, those which the *patient* himself experiences, as impaired or deranged vision, headache, vertigo, peculiar sensations in the eye, &c.

The first symptom, and one that never fails to be present, is the patient's want of a proper control over the eye affected, the pupils of the two eyes not being directed harmoniously to the objects looked at; and hence, there is a kind of staring and vacancy in the countenance. This symptom may exist at first only in a very slight degree; but, in some cases, it amounts to an actual squinting, or strabismus; while, in others, such is the want of control over the eye, that it is either affected with oscillation or stands quite motionless in the orbit. The motions of the eyelids, as well as those of the eyes, are likewise not unfrequently interrupted; sometimes the levator of the upper eyelid being palsied, and sometimes the orbicularis palpebrarum.

The eye may also form a greater prominence than the other, or be otherwise changed in its shape. Its color is seldom that ex-

hibited in the healthy state, the sclerotica being yellowish, bluish, or ash-colored, and often streaked with varicose vessels; while no symptoms of amaurosis is more to be depended upon, than an increase or diminution in the natural firmness of the eyeball.

Another usual symptom is a sluggish and limited motion of the iris, generally attended with dilatation of the pupil, but occasionally with contraction. The early and incomplete stages of amaurosis are, indeed, rarely accompanied by a widely dilated pupil; but, after the perception of light has become further weakened or extinct, the opening is commonly expanded and quite motionless. Yet, cases sometimes present themselves, in which the pupil of a completely amaurotic eye will move briskly, according to the degree of light acting upon the opposite or sound eye; though, if the amaurotic eye alone were exposed to its influence, the pupil of it would remain perfe tly motionless and greatly dilated. Hence, it is a rule in surgery, always to close and cover the sound eye during the examination of the state of the iris and pupil of an eye suspected to be amaurotic. Other examples still more curious occur, in which, though the patient is totally blind, both pupils vary in diameter, according to the changing degrees of light, exactly as they do in the perfect state of the eyes.

Besides the motions of the iris, which must be examined in each eye separately, and with the opposite eye excluded from the light, the shape and situation of the pupil should be noticed, and the inclination of the iris considered; for sometimes the pupil is irregularly dilated, and sometimes moved towards a particular point of the circumference of the iris, while this membrane itself may either bulge out towards the cornea, or sink back, so as to present a concave appearance.

When amaurosis is an effect of hydrocephalus in a young subject, the pupil may exhibit its naturally black hue; but in elderly subjects, amaurosis is almost constantly accompanied either by some degree of glaucoma, or a dull glassy, or horny appearance in the pupil.

As for the symptoms or effects, of which the patient alone is conscious, there is, first, impaired vision, the progress and degree of which vary in different cases; for, in some instances, the patient becomes suddenly and permanently blind, while, in others, the sight diminishes in a very slow and gradual manner, without ever terminating in total blindness.

Hence, the distinctions of *complete* and *incomplete* amaurosis. Frequently, in the commencement of the disease, the failure of sight is only occasional, or for a short time, or periodical, assuming the form of *night blindness* or *day blindness*, or coming on after any great exertion of the eyes. A few lines of a printed book may perhaps be read, after which the letters appear completely confused. The failure of sight may extend to the whole field of vision, or only to a part of it. Thus more or less of the page of a book may

8*

be visible (visus interruptus), or only the half of objects may be seen (hemiopia). Sometimes objects can be seen only when placed exactly in one particular direction (visus obliquus). To some amaurotic patients all objects seem disfigured, crooked, enlarged, diminished, or even inverted (visus defiguratus).

Then another common sign of amaurosis, which the patient perceives, is what are termed *ocular spectra*, as *sensations of flashes of light* in the eye (photopsia), or of insects or cobwebbs flying about before the eye (muscæ volitantes); or of colors which are not before the eye. *Double vision* is also another frequent effect of the disease in its early stage. As the complaint advances, however, vision is obscured by one uniform cloud or network.

In the early periods, the patient has sometimes an unwonted sensibility to light, which even gives him pain; while, in other more usual cases, he always courts it from the very beginning. Pain in the eyes, head, and face is another important symptom in amaurosis, denoting the probability of the existence of slow inflammation of the retina, or of organic disease within the cranium itself. In fact, several of the incurable forms of amaurosis depend on causes, which act on the nervous structure of the eye from within the skull. Such are collections of fluid in the ventricles of the brain; disease or tumors of this organ, situated near that part of it where the optic nerve is connected with its base; while other swellings or diseases may affect the optic nerve in its course either within the cranium, or in the orbit.

Loss of sensibility in the retina, and a complete annihilation of its functions, may be the effect or accompaniment of other diseases of the eye ; as, for instance, of the severe varieties of ophthalmy affecting the interior texture of the eye, glaucoma, hydrophthalmy, melanosis, and fungus hæmatodes. These examples, in which the retina suffers, in common with other textures, are named according to the primary disease, or to their most prominent symptoms; and when we use the term *amaurosis*, we commonly understand a case, in which the retina, or nervous apparatus of sight, is the part of the eye first affected.

Immoderate exertion of the eye, more especially on small objects, and in persons either of plethoric constitution, or intemperate habits, producing a determination of blood to the head, may be set down as frequent causes of a slow inflammation of the retina, ending in an alteration of its texture, and in impairment or abolition of its functions. Hence printers, watchmakers, engravers, tailors, and other classes of workmen, whose eyes are employed on minute objects and needlework, are frequently afflicted with amaurosis.

Amaurosis is sometimes divided into *functional* and *organic*, the first implying the interruption of the functions of the retina, independently of any organic disease. Whether such case really occurs has sometimes been disputed; but if we admit that amaurosis

may arise from sympathy of the eyes with disease or irritation in distant parts, we must, I believe, admit the doctrine of functional amaurosis. Thus amaurosis may arise from gastric disorder, the presence of worms in the bowels, the irritation of dentition, or that of a carious tooth. The disease may also be excited by a wound of the scalp, caries of the skull, disease of the antrum, abscesses about the face, the suppression of the menses, or the effect of particular aliments in persons of peculiar idiosyncrasies.

With respect to the prognosis, the functional amaurosis must leave a greater hope of cure than the organic. A suddenly formed amaurosis is generally less unfavorable, than one that has developed itself slowly. Complete inveterate amaurosis, attended with organic change of the retina, or optic nerve, may be deemed incurable. The distorted appearance of objects in the early stage is always a bad omen, because indicative of diseases in the brain.

Amaurosis may be combined with glaucoma, or with cataract. The characteristic differences between the latter and amaurosis will be explained under the head of *Cataract*.

Treatment.—No doubt much of the difficulty of curing amaurosis arises from our frequently being ignorant of its causes; to their being in many instances various, complicated, and incapable of removal; or, if removable, to the impossibility of obviating their effects on the retina.

When amaurosis is attended by signs of determination of blood to the head, such as headache, vertigo, flushed countenance, and arterial throbbings of the temples; when the pulse is full, and the subject young and plethoric; general and local blood-letting, purgatives, and low diet, are indicated. If the case be altogether dependent upon vascular distension, these means conjoined with rest of the organ, will probably effect a cure. If, along with vascular fulness, there be effusion, depletion will also be the most likely means of relief, and the best preparation of the patient for other remedies, more especially for the use of mercury.

When functional amaurosis depends upon disorder of the chylopoietic viscera, habitual costiveness, and an increased flow of blood to the head, purgatives, assisted by bleeding, are found to answer better in this country than nauseating doses of tartrate of antimony, so highly praised by Ritchter and Scarpa. We may give the blue pill at night, and a mild saline aperient mixture in the morning; and, after having continued this treatment for some time, tonics may be prescribed with advantage, as sulphuric acid, bark, and steel medicines.

Many examples of amaurosis depend upon the effects of chronic inflammation on the retina, or upon a slow and gradually-produced deposition of lymph in various situations affecting the immediate organ of vision. Now, for the diminution and removal of such effects, we know of no medicine that is at all equal to mercury. I

fully agree with Mr. Lawrence, that the right treatment of most ca-
ses of amaurosis turns upon two points, viz.—the employment of
ordinary antiphlogistic means, and letting these be quickly conjoined
with, or followed up by, the use of mercury. Here it acts in the same
way as it does in iritis; and, in order to give it a fair trial, the system
must be kept under its influence for a month or six weeks. The
influence should also be such as is indicated by a moderate degree
of salivation. Perhaps, I may say, with respect to nine out of
every ten cases of amaurosis, that if they will not yield to a com-
bination of antiphlogistic and mercurial treatment, they will yield to
nothing that has yet been discovered.

We ought, indeed, to modify such treatment according to cir-
cumstances. Thus, if the patient were of weak frame, and appa-
rently affected with more gastric than cerebal disorder, we should
employ, perhaps, local bleeding, rather than venesection; and
moderate doses of the blue pill, or compound calomel pill, with
saline medicines, in preference to the active exhibition of calomel,
or the free use of mercurial ointment.

In some cases, we may apply a blister, or seton, to the nape of
the neck or temple.

The plan of treating amaurotic eyes with electricity, or stimulating
applications, and tonics, is found to be generally unsuccessful. The
idea of amaurosis being essentially connected with debility is erro-
neous. The only exception to this remark may be the amaurosis
from suckling, and from profuse loss of blood. However, galvanism
has now and then been applied to the frontal nerve with advantage.
If a delicate female were to lose, first, her health, and then become
amaurotic from suckling a hearty child, of course the best plan
would be to wean it, and give her tonics and a light nutritious diet,
with a small quantity of wine daily. In some instances, applying
from half a grain to two grains of strychnia, to a blistered part of
the skin behind the ear, or over the frontal nerve, has been produc-
tive of decided benefit.

HEMERALOPIA, OR NIGHT BLINDNESS,

Is an incomplete and periodical amaurosis, exemplifying, according
to my judgment, the reality of functional cases. The patient enjoys
good vision all the day; but after twilight he becomes blind. No
sooner, however, does the sun arise, than the affection of the optic
nerve and retina goes off, and the patient then sees very well again.
It is only in the tropics that hemeralopia is likely to be met with:
in this climate, examples of it are rare, and, when they do occur,
are generally relapses in persons who have been previously affected
in hot countries. The disorder is easily cured by blistering the
temples, and mild antiphlogistic treatment.

NYCTALOPIA,

Signifying blindness during the day and vision by night, is described by writers, but is so rare, that few surgeons have ever seen an example of it. Larrey records a case of it in an old man, one of the galley-slaves at Brest, who had been shut up in a dark subterraneous dungeon for thirty-three years. When he was released, he could only see in the shade of night, and was completely blind during the day. Ramazzini also mentions an epidemic day blindness, which, in his time, attacked boys in Italy, about ten years of age. But, though we do not meet with nyctalopia in England as an original disease, we know that great intolerance of daylight is one of the common effects of scrofulous ophthalmy. The *photophobia*, or aversion to light, exemplified in the *albino*, is familiarly known. Day-blindness is also noticed as a symptom of *mydriasis*, or a simple preternatural dilatation of the pupil. Patients, who have incipient cataracts, see very little in the brightness of day, but much better in the evening, when the light is diminished and the pupil expanded.

CATARACT

Is usually defined to be a weakness or interruption of sight, produced by opacity either of the crystalline lens, its capsule, or the fluid of Morgagni. Occasionally, however, the term is used in a more comprehensive sense, implying every perceptible obstacle to vision, situated between the vitreous humor and the uvea and pupil.

When the disease is seated in the lens, its capsule, or the fluid of Morgagni, it is called a *true cataract*; but, when it consists of opaque matter deposited in front of the lens, it is denominated a *false cataract*. The terms, *lenticular*, *capsular*, and *capsulo-lenticular cataracts*, express some of the distinctions referred to. The Morgagnian may be dismissed from present consideration, its separate existence not being generally credited.

Cataracts are also distinguished into *idiopathic*, or such as arise from internal, but generally unknown causes,—and into *accidental*, which originate from external violence, or active inflammation. In general, the idiopathic, sooner or later, affect both eyes; but an accidental cataract is frequently restricted to one eye.

The symptoms of a cataract are of the following description:— 1st. All objects, especially white ones, seem to the patient as if covered with a mist, a circumstance that generally precedes any visible opacity behind the pupil. 2d. The decline of vision bears an exact proportion to the degree of opacity. 3d. The opacity is almost always first noticed in the centre of the pupil, the examples, in which it first presents itself at the circumference, being much

less frequent. 4th. When the iris is light-colored, the more apaque the cataract is, the more plainly a blackish ring is seen at the edge of the pupil; and such a ring is particularly conspicuous when the cataract is soft and large, as it then propels the margin of the uvea forwards. 5th. As a cataract generally begins at the central point behind the pupil, objects placed directly in front of the eye are most difficultly seen, even in the early stage of the disease; but those, which are on one side, may yet be discerned, particularly if the light be not strong, which would make the pupil too diminutive to let the rays pass through the thinner transparent edge of the lens. 6th. What I have just observed likewise explains why patients, having an opacity in the centre of the lens, are sometimes complete-ly blind in a strong light, though they may enjoy a useful degree of vision in the shade, or in moderately dark places. 7th. The eyesight of patients, affected with incipient cataract, may be ma-terially assisted with convex glasses, because objects are magnified by them. 8th. To patients in this state, the flame of a candle seems to be obscured in a white misty halo, which always becomes broader the further the patient is from the light. When the cataract is more advanced, the flame cannot be discerned, but merely the place of the light. 9th. The action of the iris is not affected.

In amaurosis, the horn-like or glaucomatous appearance is more deeply seated in the eye than the opacity of a cataract, and is somewhat concave. It is frequently of a greenish color, while the opacity of cataract is usually greyish, white, or amber-colored. The decline of vision, also, is not in a ratio to the opacity, and the patient may be entirely blind, with little appearance of defect in the eye. The pupil is likewise generally dilated and motionless, with its pupillary margin somewhat irregular. The temporary increase or decrease of blindness, a circumstance so common in patients with incomplete amaurosis, depends upon circumstances which de-press or excite the system, and not, as in cases of cataract, upon the degree of light, and the corresponding alterations in the size of the pupil.

The misty halo, seen by amaurotic patients round the flame of a candle, is not like a whitish cloud, as in cases of cataract, but ex-hibits all the colors of the rainbow. To amaurotic patients spec-tacles are of no service; and objects situated on one side are not better seen by such persons, than those which are directly in front of the eye. Neither is there any temporary increase of the power of vision obtained by the use of belladonna, as in cataract.

Whiteness denotes either a dissolved lens or a capsular cataract; a grey color, a lenticular cataract; an amber color or dark grey, a firm lens; and light grey, a soft one. If the whole extent of the pupil is uniformly opaque, the cataract is probably one of the lens; if the opacity is streaked or speckled, it is likely to be one of the capsule. If the opaque streaks radiate from a centre, the posterior

layer of the capsule is probably affected. If the form of the opacity is convex, either the anterior capsule or the lens is the seat of it; if concave, the posterior part of the capsule. With the light concentrated on the pupil by means of a double convex glass, all these particulars may be ascertained. I believe, that the size of a cataract is a better criterion of its consistence than its color is; and, at all events, that the smaller the lens is, and the darker its color, the more solid its substance will generally be; while the larger and more protuberent it is against the iris, the greater is the probability of its being soft.

A cataract of the lens itself, as I have already explained, is termed a *lenticular cataract*, which may vary much in its consistence. Thus, such a cataract may be *hard*, as it is often found to be in elderly persons, with an amber color, the tint being deeper in proportion as the cataract is firmer.

A lenticular cataract may be *soft*, that is to say, of a cheesy, gelatinous, or even milky consistence. Soft cataracts are more bulky than hard ones, so that they project nearly into the pupil. Hence, sight is more considerably interrupted than when the cataract is hard, and the power of distinguishing colors frequently quite abolished. The capsular cataract has a smooth and glistening surface, with streaks upon it, and it lies close to the edge of the pupil.

When the lens is present, a capsular cataract is rarely unaccompanied by a lenticular one; but an opaque lens may be removed or taken away by absorption, and a capsular cataract may be left. In this case, as the opacity is merely a thin layer of the capsule, the cataract makes no projection against the iris, and the anterior chamber is not lessened by the advance of the iris towards the cornea.

In children, cataracts are never hard : but in adults, we meet with both hard and soft ones.

Cataracts may occur in any period of life, and are sometimes *congenital*. They are most frequent in elderly persons, and mostly arise without any manifest cause, or any thing wrong in the rest of the eye, or the constitution at large. The capsulo-lenticular cataract is alleged to form very commonly under circumstances denoting a determination of blood to the head and the eye, accompanied by uneasy sensations in those parts; but generally we cannot refer the origin of a cataract to any particular causes. There is an exception, with respect to cataracts following a wound of the lens, or its capsule. Experience proves that the slightest prick of these parts will lead to their opacity, or rather, I should say, that the capsule inflames, and becomes opaque, and the lens itself is afterwards absorbed; so that the result is, in fact, a capsular cataract.

A cataract is termed *simple* when accompanied by no other disease of the eye likely to impair its functions, or with no particular constitutional disease; *complicated*, when joined with other diseas-

es of the eye, as adhesion of the crystalline capsule to the iris, amaurosis, glaucoma, or a gouty, rheumatic, or syphilitic state of the system. The circumstances denoting glaucoma have already been explained. If, in addition to a sluggish or immoveable iris, the patient is totally incapable of distinguishing the least glimpse of light, the cataract is combined with amaurosis.

When a cataract is free from every complication; when it is not attended with frequent headache, nor pains in the eye; when the pupil retains its regular circular shape; when the iris possesses its natural power of motion in the different degrees of light; and when the patient can readily discern the difference between light and darkness, and even perceive bright colors, and the outlines of objects, in shady places where the pupil naturally expands—the prognosis is favorable.

There are no medicines, nor applications, capable of dispersing an opacity of the lens, or its capsule. The cases, injudiciously blended with the subject of cataract, under the name of *false cataracts*, which are only obstructions of the pupil with fibrine, effused in consequence of inflammation, may indeed sometimes be benefited, or even cured, by the means recommended for the cure of iritis; but no real analogy exists between such cases and opacity of the lens and its capsule. In all examples of true cataract, it is only by an operation that sight can be restored.

Whether an operation should be performed when the cataract is single, and the other eye in the enjoyment of good vision, is a question on which some difference of opinion is entertained. Diversity in the refracting powers of the eyes after the removal of the lens from one of them, and the apprehension of confused vision, as the result, are the reasons usually urged against the practice, which has, however, to a certain extent, proved successful; while the continuance of a cataract in one eye not only gives a disposition to the origin of the same kind of opacity in the other, but permanently impairs the sensibility of the retina itself for want of exercise.

It is a general rule, and I believe an excellent one, never to operate upon both eyes at the same time. In particular, when extraction is to be done, this maxim universally prevails. It is also a maxim to let the patient have the benefit of preparatory treatment before he undergoes the operation. His diet should be lowered and his bowels emptied.

In cases of congenital cataract, ought the operation to be delayed till the patient has attained the age of docility and reason? Or ought it to be practised in early infancy? Every consideration seems, I think, to be in favor of an early performance of it. If it be postponed, the eyes, having no distinct perception of external objects, acquire such an inveterate habit of rolling, that for a long time after the pupil has been cleared by an operation no voluntary effort can control this irregular motion. The retina, too, by a law

common to all structures of an animal body, for want of being exercised, becomes more or less deprived of power. From the age of eighteen months to that of two years is deemed an advantageous period for operating on congenital cataracts.

Persons blind from congenital and other cataracts of long duration, and habituated to live with four senses, are generally confused and perplexed on the restoration of vision. They have a difficulty in combining the action of the eye with that of the other senses. Hence Dupuytren has often found it necessary to deprive them, for a time, of the use of one or two of the other senses, in order to enable them to use the organ of vision. He has applied this principle to infants, by closing their ears, as it was noticed that they suffered themselves to be guided by sound, and by impressions received by the hands, which they thrust out before their bodies like tentacula.

There are three kinds of operation for cataract. 1st. The method formerly termed *couching*, and which is simply the removal of the cataract out of the axis of the vision, leaving it still in the eye. It is now frequently called *displacement*; and has two varieties, *depression* and *reclination*. 2d. Surgeons practice *extraction of the cataract*; that is, they take the opaque lens completely out of the eye. 3d. Another method often adopted consists in the *division of the cataract into fragments*, which, being exposed to the aqueous humor, become absorbed.

By *depression* and *reclination*, we change the situation of the cataract. In *depression*, the lens is pushed directly below the level of the pupil. In *reclination*, the lens is made to turn over into the middle, and towards the bottom of the vitreous humor; so that the surface of the lens, which was previously directed forwards, is now placed upwards, and what was the upper edge is turned backwards. Over the lens, displaced in this manner, the vitreous humor will close much more completely than over the simply depressed lens, so that its ascent behind the pupil again will be less likely to happen. Nor will the retina be so liable to be pressed upon by the cataract as after depression; yet, reclination unavoidably does more extensive injury to the hyaloid membrane of the vitreous humor.

Extraction is the complete removal of the cataract out of the eye through an opening made in the cornea. The incision for this purpose must form the segment of a regular circle, be smooth, and, at the same time, of sufficient size to permit the easy passage of the cataract through it. Both in this first period of the operation, and in the subsequent one of opening the capsule, the iris should remain entirely free from injury.

One of the chief dangers of extraction is that of loss of the vitreous humor, which, if due care be not taken, is apt to be suddenly forced out of the eye along with the cataract.

Another risk is that of the iris being wounded. Sometimes the

operation is followed by a prolapsus of this organ, and occasionally by a closure of the pupil from the inflammation excited in the iris by injury of its texture.

The *division*, or breaking of a cataract piecemeal, may be done with a needle, either through the sclerotica or the cornea. It has the recommendation of being the most easy, but sometimes needs repetition. Opaque portions of the capsule, however, frequently resist absorption, and must, after all, either be extracted or displaced. The division of a cataract, when performed by passing the needle through the cornea and pupil, is termed *keratonyxis*.

No method of operating for the cure of cataract should be exclusively preferred; each having its advantages in particular cases.

Depression and Reclination through the Sclerotica.—Each of these operations has three stages :—

In the *first*, the needle is introduced through the coats of the eye into the vitreous humor.

In the *second*, the instrument enters the posterior chamber, and is applied to the cataract.

In the *third*, the displacement is effected.

It is only in the third stage that reclination differs from depression.

The patient is generally seated on a low stool, with his head supported on the breast of an assistant, who stands behind him ; and, if the operation be about to be done on the left eye, he puts his right hand under the patient's chin, while with the index and middle fingers of the left hand, applied to the margin of the upper eyelid, he keeps it raised against the supercilliary ridge of the frontal bone, without making any pressure upon the eyeball itself. In all operations on the eye, performed with the needle, the pupil should be first dilated with belladonna, because the more expanded this opening is, the better the surgeon can see what he is doing. The pupil should also generally be kept dilated for some time after the operation, in order to let the aqueous humor have free access to the lens, and to prevent the pupillary margin of the iris from contracting adhesions.

The operator sits in front of the patient, on a seat of such height that the patient's head is opposite to his breast. If it be the left eye which is to be operated upon, he takes the needle in his right hand, while, with the left fore-finger, he depresses the lower eyelid, and at the same time puts the end of the middle finger just below the caruncula lachrymalis, so as to prevent the eye from rolling inwards.

First Stage.—With the little finger resting on the patient's cheek, the surgeon introduces the needle one eighth of an inch behind the temporal edge of the cornea, so as to avoid the ciliary processes, and one line below the transverse diameter of the pupil, so as to avoid wounding the long ciliary artery. For the purpose of avoiding the lens and ciliary processes more surely, the needle shoud

be directed towards the centre of the vitreous homor, but only to the depth of one fifth of an inch, as it would be wrong to injure the vitreous humor to an unnecessary extent.

Second Stage.—One flat surface of the needle is now to be turned forwards, the other backwards, and its handle inclined towards the temple, so as to bring its point between the cilary processes and the circumference of the lens.

The instrument is next to be carefully introduced between these parts into the posterior chamber, across which its point is to be conveyed, till it arrives behind the nasal portion of the iris.

Third Stage.—When depression is the method chosen, the flat side of the end of the needle is now to be placed upon the upper part of the lens, the handle gradually elevated, and the point carried downwards, and a little outwards and backwards, the proper direction in which the lens should be depressed, but no further than is necessary to remove it from the axis of vision. The needle should be kept for a minute or two on the lens, and, before it is withdrawn, we should observe whether the cataract rises again.

Some operators turn the point towards the pupil, and move it freely in it, in order to be sure that the capsule, if left behind, will be so lacerated that it will give no further trouble.

When *reclination* is preferred, the surgeon alters the plan of proceeding in the third stage; and then, instead of placing the end of the needle on the vertex of the cataract, he applies the instrument to its front surface, a little above its centre, and makes pressure on it downwards and a little outwards, by which manœuvre it is made to fall backwards, as it were, into the vitreous humor.

If displacement be attempted on a soft fluid cataract, no sooner is the capsule opened with the needle, than its contents mix with the aqueous humor. In a day or two, however, this fluid will become clear again; but, unless we break the anterior portion of the capsule, before we withdraw the needle, vision will still be interrupted by the capsular part of the cataract.

After the operation, the eyes are to be shaded by means of a slight compress, pinned to the nightcap. The room is to be kept moderately dark, and a low diet and quietude strictly enjoined. After three or four days, a green shade may be put on; but the eyes are not to be used at least for a fortnight.

Extraction of the cataract through an incision in the cornea is divided into three stages :—

In the *first*, the cornea is opened with a knife ;

In the *second*, the anterior layer of the capsule is divided ;

In the *third*, the cataract is taken out of the eye, or extracted.

The eye is to be fixed, as already explained; unless the surgeon choose to place the patient in the recumbent position, with the intention of dividing the upper segment of the cornea, while he fixes the upper eyelid himself: a plan which has its advantages, and the

merit of first practising which belongs, I believe, to Mr. Alexander.

First Stage.—1. The point of the knife is to enter the cornea very near the sclerotica, and a little above the horizontal diameter of the cornea.

2. It is first to be directed rather towards the iris, until it reaches the aqueous humor, so that there may be no risk of its gliding between the layers of the cornea, and not entering the anterior chamber at all.

3. As soon as the point is in the anterior chamber, the handle is to be inclined backward, and the point directed towards the place at which it is intended to make it pierce the corcea on the side towards the nose.

This place should be rather above than below the horizontal middle diameter of the pupil, and very near the edge of the cornea.

4. Having performed the *punctuation* and *counter-punctuation* of the cornea, as they are termed, the eye is completely under our control. At this particular period all pressure is to be removed, and therefore the finger, placed on the caruncula lachrymalis, shifted to the lower eyelid. Just before the section is finished, the upper eyelid is to be allowed to fall, the room rather darkened, and nothing more done till the patient has had a short time given him to become composed again.

Second Stage.—For opening and lacerating the anterior layer of the crystalline capsule, a lance-shaped, sharp, double-edged needle, is the best instrument. The assistant is cautiously to raise the upper eyelid, without touching the eye in the least. The operator draws down the lower eyelid, and presses it very gently against the eyeball, so as to make the cataract advance a little, and the pupil expand, but not so forcibly as to burst the hyaloid membrane. The needle is then to be introduced under the flap of the cornea, and through the pupil to the anterior layer of the capsule, which is to be freely cut and torn in various directions: then the needle is to be withdrawn, and the eye again closed.

Third Stage.—If the pressure made on the lower part of the eyeball in the second stage were continued, the lens would come out of the eye on withdrawing the needle; and many surgeons allow this to happen. Others let the pressure cease for a minute or two, and close the eye again after having divided the capsule. They then take the curette in the hand which held the needle; and having opened the eye, and renewed the pressure, they see the whole lens pass into the anterior chamber, and then through the incision in the cornea. The curette is only used, if necessary, to facilitate its passage through the wound.

The patient is now to close his eye again, and the operator, having received the lens on his finger nail, examines whether it is entire.

After having once more opened the eyelid, and ascertained that the sides of the incision in the cornea are accurately in contact, and the pupil clear and circular, the eyes are to be shut, and a light fold of linen is to hang down from the cap, to which it is to be pinned.

The patient should afterwards be kept perfectly quiet, in a room somewhat darkened, with a nurse to watch him, so that he may not rub the eye with his hand during sleep. The incision may be looked at on the third day, and on the fourth the patient may be allowed to sit up. On the fifth a shade may be put on; but the eye should not be used for at least ten days, and then only on large objects. The bowels are not to be disturbed for a day or two after the operation, but the patient should be restricted to low diet for eight or ten days. If pain and inflammation follow the operation, we are to bleed the patient freely, and give calomel. Many surgeons always bleed the patient before and after the operation.

The kind of operation to be preferred must depend upon the species of cataract, and the sort of eye which is to be dealt with. I put out of present consideration the difference of skill in different operators. No doubt, extraction is the right method, when the cataract is hard, and the practice not contra-indicated by the cornea being remarkably flat, the iris too convex, the eyeball small, and sunk in the orbit, or the space between the eyelids very narrow. When there are adhesions between the cornea and iris, or between the iris and the crystaline capsule, extraction should not be attempted. A very small pupil, not admitting of being much dilated, even with belladonna, which would be another reason against extraction.

The operation of division is most applicable to caseous or fluid cataracts, and especially to such as occur in children. If the cataract were hard, but not proper for extraction, owing to the general form or state of the eye, depression should be practiced.

The loss of the crystalline lens necessarily produces a considerable diminution in the refracting power of the eye, and in its faculty of adapting itself to the different distances of objects. These defects are palliated by the use of convex glasses of different foci. Their use however, must not commence too soon after the operation, and never while vision continues to be improving without them.

MALIGNANT DISEASES OF THE EYE

Are three; namely, *Cancer*, *Melanosis*, and *Fungus Hœmatodes* or *Medullary Cancer*.

Cancer frequently begins in the conjunctiva, whence it afterwards extends to the eyelids, caruncula lachrymalis, and the eye itself. The lachrymal gland, I believe, is not so often implicated as was once supposed; though it is prudent to remove it with the rest of the contents of the orbit, when the eye is extirpated on account of cancer.

As cancer commences on the external parts of the eye, and, therefore, in its early stage, may admit of effectual removal, it is a less formidable disease than *fungus hæmotodes*, which first attacks the optic nerve and retina, the pupil becoming dilated, of a dark amber or greenish hue, the iris motionless, and the sight seriously impaired or destroyed from the very first. In an early stage of the disease, a white shining substance, compared to burnished iron, may be seen through the pupil, at the back part of the eye. As the disease advances, this substance is found gradually to extend more and more forwards, and to be of a solid nature. It is, indeed, a medullary mass, occupying the whole of the interior of the eye behind the iris, and presenting an amber or brown appearance. Next, the form of the eyeball begins to deviate from what is natural; the sclerotica becomes of a dark blue or livid color; and the medullary mass get into the anterior chamber. Lastly, the cornea or the sclerotica ulcerates; so that, in the former event, the medullary substance protrudes; and, in the latter, it forms a tumor covered by the conjunctiva. It is generally rapid in its growth, often attains a considerable size, is of a dark red or purple color, and is frequently attended with hæmorrhage and sloughing of its most prominent part. The absorbent glands about the parotid and under the jaw are also frequently involved. The disease, which begins in the optic nerve and retina, and corresponds in its ungovernable and fatal nature to fungus hæmatodes, or medullary cancer in other situations, is very much restricted to children.

With few exceptions, the operation of extirpating the eye for this disease has been of no avail.

With respect to *melanosis*, or the deposition into the eye of a peculiar black substance, attended with total disorganisation of it, if it be confined to the eyeball, and the optic nerve is not implicated, the eye may, perhaps, be removed with some little more prospect of success, than for medullary cancer. The prognosis, however, would be bad.

DISEASES OF THE EAR.

What is called *earache* frequently proceeds from inflammation of the meatus auditorius, or the tympanum itself. The pain is often remarkably severe; a circumstance observed to attend inflammation of all textures, whose nature and situation prevent them from readily yielding to the swelling, which is commonly the result of that affection. Inflammation within the ear may proceed to suppuration, the abscess make its way out through the meatus auditorius externus,

the Eustachian tube, or the membrana tympani, or even behind the ear, with or without having pervaded the cells of the mastoid process, and occasioned caries of the bone. According to my experience, the worst suppurations of the ear occur in scrofulous children, in whom they are frequently accompanied by partial destruction of the membrana tympani, and disease of the bony parts of the organ, followed in some instances by necrosis and separation of the ossicula. But inflammation and suppuration, within the ear, may not only cause these consequences, and more or less complete deafness, but extend their effects to the dura mater, and destroy the patient. When exfoliations occur, they most commonly consist of the meatus externus, or of the outer laminæ of the mastoid process.

Acute inflammation of the ear demands rigorous antiphlogistic treatment. In adults, copious venesection should be resorted to; and, in children, leeches. With these means, fomentations and purgatives are proper, which should be followed up by blisters.

If after the reduction of the inflammation, the discharge of matter should continue, and the patient appear to be scrofulous, alterative medicines, as iodine internally and iodine lotions, or an injection of a weak solution of the nitrate of silver, may be employed. When diseased bone is present, of course the discharge will not cease till exfoliation is completed.

The *meatus auditorius is frequently blocked up*, and the external side of the membrana tympani covered *with hard dry masses of cerumen*, so as to render the patient entirely deaf. Such hardened pellets of wax, if neglected, may ultimately cause a great deal of irritation, followed by inflammation and ulceration of the membrana tympani and lining of the passage, and they always give rise to a sensation of false confused sounds in the ear, which are truly distressing.

The cure consists in washing out the meatus auditorius by means of a syringe, capable of holding at least four or six ounces of warm water. This should be thrown into the passage, so as to make it regurgitate with considerable rapidity. We generally have to do this several times, before the pellets are loose enough to be washed out.

[The best method for removing masses of wax from the meatus is, to direct the patient to put a few drops of sweet oil into the ear, for two or three nights, and afterwards to syringe out the passage, with a tepid solution of carbonate of potash. The alkali unites with the oil and forms a soap, by which the hardened wax is softened, and easily detached. It is wrong in these cases, to inject water or other liquids with *much force*.—Ed.]

The meatus anditorius is occasionally the seat of *polypi* and *other excrescences*. When situated near the orifice, they may be taken hold of with a hook, and cut away; but, in other cases, it is best to

extract them with forceps, and apply the nitrate of silver, or tinctura ferri muriatis, to the part to which they were attached.

Extraneous Substances in the Meatus Auditorius Externus.—When insects get into the ear, if they can be seen, the best plan is to take them out at once with a pair of forceps. If not, we employ a piece of lint, dipped in honey or oil, and put on the end of a probe; these, on account of their adhesiveness, will entangle any small insect, and bring it out. Then the passage is to be washed out with a syringe. Syringing the ear I deem the best method of all, not only for insects, but for the removal of peas, small pebbles, &c.

The regurgitation quickly brings them out, when all other means fail. One day, when I was visiting the Fleet Prison Infirmary, a child was brought to me with a pebble in each of its ears, that had been there a twelvemonth, and had now excited violent pain and inflammation, attended with total deafness. Various surgeons had failed in their attempts to get these foreign bodies out. I immediately tried what could be done with a large syringe and had the satisfaction of soon bringing the pebbles so near the external orifice, that they admitted of being hooked out with a bent probe. In some instances, it has been judged necessary to divide the soft parts of the meatus; but a real necessity for this proceeding must rarely occur.

[There is sometimes great difficulty in removing foreign bodies from the meatus. After other means have failed, we have succeeded in accomplishing our object, by filling the passage with some mucilaginous substance, and then applying the pipe of a pint syringe, and making strong suction.—Ed.]

Almond or sweet oil, dropped into the ear, soon destroys any insect lodged in it.

Deafness from more internal causes than those which I have specified, forms too long and complicated a subject for consideration in a work like the present. It may arise from obstruction of the Eustachian tube by mucus, as happens in severe catarrh; by the pressure of a tumor, as is sometimes exemplified in cases of polypi, or swelled tonsils, or in the effects of syphilitic ulceration, or sloughing sore throats.

For the removal of deafness, caused by permanent obstruction of the Eustachian tube, Sir Astley Cooper suggested the practice of making a small puncture in the anterior and inferior part of the membrana tympani; a method that has been attended with a degree of success, but which should not be undertaken without mature consideration, and a proper discrimination of the cases, to which alone it is applicable.

Diseases of the labyrinth, or of the complicated apparatus composing the internal ear, are the cases which, generally speaking, completely baffle the art and science of surgery. We scarcely ever have any clue to their cause, or even to the precise parts affected,

so that no surprise ought to be entertained at the little success with which such kinds of deafness are treated.

Amongst the varieties of disease to which the labyrinth is liable, I may mention,—

1. Disease of the fenestra ovalis and fenestra rotunda, as ulceration and thickening.

2. Malformation of these apertures.

3. Inflammation of the nervous membrane lining the labyrinth.

4. Malformation of the labyrinth, especially of the semicircular canals. In two cases, examined by Mr. Cocks, the extremities of the semicircular canals, opening into the vestibule, were perfect, but the central portions were impervious, or rather did not exist at all. See Med. Chir. Trans. vol. xix.

5. Alteration or deficiency of the liquor of Cotunni.

6. Affections of the nerve of hearing, analogous to amaurotic diseases of the eye.

When one eye is diseased, the other is disposed to fall into the same condition; but a similar fact does not prevail with respect to the ears. Numerous persons are more or less deaf on one side, but the other ear usually continues its functions very well, and even as long as if the other ear had no defect.

Every kind of deafness from malformation of the labyrinth is incurable.

Nervous deafness ought perhaps to be treated on principles analogous to those adopted for the cure of amaurosis. Inveterate cases of long standing must, of course, be hopeless.
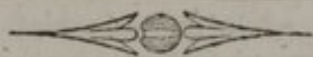
DISEASES ABOUT THE FACE.

LUPUS, OR NOLI ME TANGERE,

Begins with a tubercular induration in the tissue of the true skin, or mucous membrane, or, perhaps, in the subcutaneous, or submucous cellular tissue. A single tubercle may be formed, or several appear together. While the tubercular induration is making slow progress to the surface, the skin assumes a livid color, which extends itself in proportion as the tubercular affection spreads, and is almost always followed by ulceration. After a time, the cuticle cracks, and a coarse laminated scab is produced from beneath which ichorous matter exudes. The scab, which is very closely adherent to the tubercle, continues to enlarge, occasionally falling off, and exposing a very foul inveterate ulceration, which is found to be larger at each successive detachment of the crust, the limits of which it even

sometimes exceeds. Dr. Houghton, who has drawn up an excellent description of lupus, chiefly founded on the observations of M. Biett*, notices three varieties; 1. Lupus, in which the ulcerative process detroys principally in depth. 2. That in which the destruction and cicatrisation do not produce any open ulceration, but are accompanied by hypertrophy of the skin. 3. Lupus, which spreads chiefly superficially. The first, or the *deep erosive lupus*, is more particularly that of the nose. In many cases, the ulceration is accompanied by a constant discharge of thin fetid matter from the nostril of the side affected. The disease sometimes, indeed, commences in the mucous membrane, though more commonly upon one of the alæ, or the tip of the nose. It may even cause a great deal of internal mischief, without the skin itself being implicated; but, as it extends itself from within outwards, at length it approaches the skin, which then assumes a livid color. But, whether it be in the cutaneous or mucous tissue that the disease begins, its progress after a short time is the same. The subjacent cellular tissue and the muscles are destroyed by ulceration; the cartilages, in their turn, share the same fate; and frequently also the bones. The destruction is generally complete in one of the alæ, or the point of the nose, before it spreads further on its surface; but sooner or later, the disease extends so as to embrace both sides; and wherever it advances, it is by the same kind of tubercular deposit with which it began. Sometimes, after having destroyed the tip of the nose, or one of the alæ, it forms a puckered cicatrix, and seems to be nearly healed up; but it rarely stops in this manner, and more generally, after a time, new tubercles are developed in the midst of the cicatrix itself, which ulcerate and destroy with all their original virulence. In general, while the mischief is spreading externally, the internal parts are not spared, the inner surface of the alæ, and especially the septum narium, being attacked. In such cases, the discharge is constant, and the crusts which collect on the septum and turbinated bones nearly block up the nostrils. In the end, if the disease be not checked, all the soft parts of the nose are destroyed, and the septum broken up, leaving only a square aperture in place of the nose, partially divided by a partition. Nor is this all the possible mischief; for it is not uncommon for the ossa nasi to suffer, and, in some instances, the superior maxillary bones.

All the varieties of lupus are rare after the age of forty. The disease is more common between the ages of six and sixteen than at earlier or later periods. The female sex is more subject to it than the male. The superficial lupus is frequently considered as a scrofulous disease.

---

* Abrégé Pratique des Maladies de la Peau, d'apras les Auteurs lés plus estimés, et surtout d'après les Documens priæ dans la Clinique, de M. le Dr. Biett, par MM. Cazenave et Schedel.

In the treatment, general as well as local means are, for the most part, proper. If the patient be manifestly scrofulous, and the lupus superficial, the medicines and regimen in repute for this state of the system should be employed. In such cases, the use of iodine lotions, made in the manner directed by Lugol, were found by Dr. Houghton to produce striking amendment. The proto-ioduret of iodine, in the dose of quarter of a grain twice a day, is one of the best preparations for internal use. Iodine, however, is only useful in the superficial variety of lupus. The chloride of barytes, which was believed by Bateman to have influence in dispersing the tubercular formation, is not at present so frequently prescribed as the chloride of lime, which agrees better with the stomach.

The tinctura ferri sesqui-chloridi, and the sesqui-oxide of iron were formerly praised as useful medicines in cases of lupus; but I am not aware of their possessing any specific power over this disease.

Arsenic has considerable influence in checking the progress of the tubercles, and altering the character of the ulcerated surface. Small doses of the liq. arsenicalis may be prescribed, beginning with not more than two or three drops thrice a day; but gradually increasing the dose to ten, if no deleterious effects are produced.

Another medicine in repute is the bichloride of mercury, prescribed in minute doses, so as gently to affect the gums.

External applications constitute the most important means of cure. Sometimes the progress of the lupoid tubercle may be arrested, and ulceration prevented by the application of leeches to the inflamed skin round its base, followed by evaporating lotions, and alterative doses of calomel. Thus the disease may often be reduced to a chronic state, in which friction with ointment of the ioduret of zinc, or mercury, may be employed to promote its absorption. Biett uses the ioduret of sulphur, made into an ointment, in the proportion of fifteen grains to an ounce of simple ointment. In the hypertrophic lupus, these resolvent ointments are particularly indicated. When the tubercles are once ulcerated, the ung. hydrarg. nitratis, or the liquor arsenicalis, is often used; but generally escharotics now become necessary, and arsenic is the substance frequently preferred. Sir Astley Cooper uses an ointment composed of ℥ j. of spermaceti cerate, ℨj. of sulphur, and ℨj. of white arsenic. When the action of arsenic is impeded by the thickness of the cuticle over indolent tubercles, a small blister is sometimes first put on the part, or the following ointment applied: ℞ ung. cetacei ℥ss., oxydi arsenici ℨj., empl. cantharidis ℨiij.; M. ft. ung. Sometimes an arsenical paste is applied. That of Frère Côme is made by moistening arsenic, cinnabar, and burnt leather. Being a very powerful application, this paste demands particular caution нot to let it act on more than a small area, lest the patient be poisoned by it. Indeed, no arsenical dressing should be allowed to come in contact

with a surface of greater extent than a shilling. The above paste is apt to bring on erysipelas of the face. A milder, safer, and better arsenical paste is that recommended by Dupuytren, composed of calomel and oxyde of arsenic, moistened with mucilage in the proportion of from six to twelve parts of arsenic in every 100. The same eminent surgeon also used an arsenical powder, made of ninety-six parts of calomel and four of arsenic. These applications, however, he applied but to a small surface at a time. The nitrate of silver, sulphate of copper, and muriate of antimony, are likewise escharotics in great repute; and so is the concentrated nitric acid for cases where the ulceration invades the deep layers of the skin and the cellular tissue. At the Hôpital St. Louis, a solution of ʒj. of the protonitrate of mercury in an ounce of nitric acid is employed with great success, by Richerand and Cloquet.

I have known lupus cured by excision of the diseased part of the skin.

When the nose has been destroyed, a new one has often been successfully formed from the skin of the forehead.*

LIPOMA OF THE NOSE.

The integuments of the apex and alæ of the nose are sometimes enormously thickened by interstitial deposit, so that a true hypertrophy of them is occasioned, forming, as Mr. Liston correctly states, a lobulated reddish-blue mass, intersected by fissures.† The sebaceous follicles are so expanded, that they will admit the point of a quill. The ramifications of many turgid superficial veins are seen on the part. The disease, besides being productive of vast deformity, may attain such magnitude that vison, the passage of air though the nostrils, and the introduction of food into the mouth, are more or less obstructed.

The only mode of relief is that of removing the hypertrophied skin. If both sides of the nose are affected, the nostrils may be distended with lint, and then a perpendicular incision made through the morbid skin, in the mesial line of the nose. The edge of the divided integument may then be taken hold of with a pair of forceps, and the diseased structure carefully cut away. The bleeding is generally copious: some of the vessels will require ligature; the others will cease to bleed on pressure being applied.

POLYPI OF THE NOSE

Are swellings arising from the mucous membrane of the nose, and

---

* See Dr. Houghton's Article on " Noli me Tangere," in the Cyclopædia of Practical Medicine.
† Elements of Surgery, part ii. p. 179.

generally consisting of a soft substance easily torn, streaked with a few vessels, and of a light yellowish or grey color, and not endued with much sensibility. The disease is most common in persons between forty and fifty, though occasionally met with in younger subjects. The polypi, which have the character now enumerated, are not of a malignant nature; and whatever inconvenience may be produced by them is caused by their obstructing the nostril, and by their pressure on the adjacent parts. They are commonly of a puriform shape, though, if they are large, their figure is in a great measure determined by that of the cavity in which they grow; but whatever may be their shape, they are invariably connected to the mucous membrane by a narrow stalk or pedicle, sometimes termed their *root*. They rarely or never grow from the septum nasi, but usually from a point at or near the upper os spongiosum.

The polypi, whose texture corresponds to what I have mentioned, are those mostly met with, and often named *soft* or *gelatinous polypi*; or occasionally *mucous polypi*, from their structure bearing a considerable resemblance to the mucous membrane from which they originate; or *benign polypi*, in consequence of their having no dispositon to assume a dangerous morbid action. Sometimes they are of a firmer consistence and fibrous texture, when they are termed *fleshy polypi*; but these are more frequently noticed in the uterus than in the cavity of the nose, and grow not from the lining of the uterus, but under it, in, or connected with, the substance of the womb itself. Another kind of disease is improperly called the *malignant polypus*, because it is not truly a polypous excrescence at all, but a tumor, partaking in every respect of the nature of medullary cancer.

In many cases, several polypi of different sizes occur in one or both nostrils. Sometimes we meet with only one; and, in particular examples, the nostrils are filled with a peculiar kind of polypi, consisting of cysts or vesicles, filled with a colorless fluid: these are *vesicular* or *hydatid polypi*, as they are termed, and are not uncommon in children and very young persons.

Truly cancerous polypi are said, occasionally, to take place in elderly persons; but the malignant polypi, which I have seen, were evidently specimens of medullary sarcoma.

The common pendulous *soft benign kind of polypus* generally grows from the external side of the cavity of the nose, and, in many examples, from the mucous membrane covering the ossa spongiosa. The growth of a polypus from the septum narium, if it ever occur at all, is so uncommon, that some surgeons of the most extensive practice have never seen an instance of it. The commencement of the disease is attended with a feeling of obstruction in the nose, like what is usually felt in an ordinary catarrh, the obstruction being more considerable in wet, than dry weather. These polypi, when under a certain size, may be made to advance or recede by the force

of the breath in inspiration and expiration. The sound of the voice is nasal, and there is generally some uneasiness felt about the frontal sinuses.

Sometimes, when a polypus becomes large, it passes towards the velum pendulum palati, over which a part of it hangs towards the pharynx; or if it originate towards the back of the nares, it may take the same direction, instead of towards the nostril. In certain examples, polypi project in both directions.

Common polypi cannot be cured by local applications; caustic only acts upon their surface, and cannot get to their root. They grow indeed faster than any caustic can destroy them.

Extraction, excision, and the *ligature* are the three means of curing nasal polypi. Extraction is the method usually preferred in this country, and is accomplished with forceps made for the purpose, and of different shapes and sizes. Some are slightly curved, and formed with oval excavations on the inside of the ends of the blades, and also with an aperture in each of them. Others are straight, and the inner surfaces of the blade furnished with projections, or teeth. Some are constructed with serated blades, which, when shut, meet in the manner of a suture of the cranium.

The patient being seated opposite a strong light, the surgeon first examines the extent and situation of the polypus with a probe, endeavoring in particular to make out the point of its attachment and the place of the pedicle. This cannot always be done; but we know that the os spongiosum superius, and the outer and upper side of the nostril, are the common situations for the attachment of the polypus. We therefore convey the forceps in that direction, and endeavor to seize the pedicle. If we succeed thus far, the best plan is not to pull it directly outwards by a jerk, but to twist the tumor from its connection. The hæmorrhage from soft benign polypi is never dangerous, though it may be copious. Sometimes, a layer of bone comes away with the polypus, a circumstance often regarded as favorable, inasmuch as the root of the tumor will then have been taken away. After the operation, the nostril and nares should be washed occasionally with an astringent lotion, containing alum, or the muriate of ammonia.

When a polypus projects backward, towards the throat, it is sometimes taken hold of with a pair of curved forceps, introduced from the mouth, and extracted. But frequently another part extends forwards, which we may begin with. In this manner, the pedicle is sometimes broken, and both portions may then be readily extracted. Much of the operation is necessarily performed, as it were, in the dark; for, after the bleeding begins, nothing can be seen. Supposing only a fragment of the polypus to be at first taken out, we should not stop, but try to extract the rest, either piecemeal or in one mass, just as may be practicable.

Excision is a plan occasionally applied to large polypi extending

back towards the throat, and having a pedicle, the situation of which can be felt and reached with a pair of long probe-pointed scissors. The bleeding need not be feared; but, so far as my experience goes, we seldom know the precise situation of the pedicle, or can reach it sufficiently well with scissors to make this method advisable.

The *ligature* has also been applied to similar polypi extending towards the throat. The noose of a ligature, or piece of wire, is introduced through the nostril to the back of the throat, where it is put over the tumor with the aid of a pair of forceps. The ends of the ligature, or wire, hanging out of the nostril, are then passed through a double cannula and twisted. It is a practice rarely adopted in this country. The best instruments for this operation are those of Graefe, which may be procured of Weiss.

Vesicular or *hydated* polypi generally grow again. We may clear the nostril from them, but they return. One plan, to which they will sometimes yield, is that of applying strong astringent lotions to them. They should be first removed, and the lotion then applied by means of lint.

With respect to the malignant kinds of polypi, they are out of the power of surgery; all that can be done is to lessen the patient's sufferings by narcotic medicines, opium, hyoscyamus, or hemlock, and to diminish the fœtor of the discharge by means of lotions, containing the chloride of soda, or lime, or a proportion of creosote.

SALIVARY FISTULA.

An opening in the cheek, from which the saliva escapes, arising from a wound, ulceration, or phagedenic disease, involving the parotid gland or duct, is called a *salivary fistula*. The duct has also been burst by violent blows. We sometimes meet with cases, in which the parotid duct becomes obstructed by a calculous formation within it, just in the same way as the salivary ducts under the tongue become occasionally blocked up with calculous matter. Calculi in the parotid duct, if not removed, may, of course, enlarge, and excite inflammation and an abscess in the cheek. This bursts, and the flow of saliva from the opening immediately draws the surgeon's attention to the state of the parotid duct; a probe is introduced, and the calculus felt. Here the first indication is to extract the extraneous substance, and then endeavor to heal the ulcerated opening in the cheek.

If the parotid duct is recently wounded, the sides of the wound should be brought together, and pressure applied. Thus a salivary fistula may often be prevented altogether: either the divided ends of the duct re-uniting, and the saliva resuming its original course, or, what is more probable, the wound in the face healing at every part, with the exception of a small fistulous track, which serves as

a continuation of the duct into the cavity of the mouth. This is supposing the wound to have extended quite through the cheek.

When a salivary fistula is already formed, it may be cured by passing a seton from the fistulous opening into the mouth, keeping it there a certain time, and, after withdrawing it, applying the nitrate of silver to heal the outer opening. The caustic alone will frequently succeed. Another ingenious plan is that of Béclard, who passed a leaden style into the orifice of the portion of parotid duct connected with the gland, and then united the outer wound with the twisted suture. This is a quicker mode of cure than the seton, and more sure than simply closing a recent wound and applying pressure.

DISEASES OF THE ANTRUM.

The antrum, or rather its mucous lining, is subject to *inflammation* and *suppuration*. A darting pain is felt in the side of the face, usually supposed to be the toothache, and, indeed, mostly connected with a carious state of the neighboring teeth. If an abscess form, and the matter be prevented from passing into the nose by accidental obstruction, it may produce an expansion and attenuation of the sides of the antrum; and at length discharge itself either through the cheek, or, what is more common, into the mouth.

The indications are, to lessen inflammation and pain by antiphlogistic soothing means; to provide a speedy outlet for the matter, when an abscess forms; to check the discharge, and maintain cleanliness by the use of tepid slightly astringent injections; and, if there should be any dead bone or carious teeth present, to remove them as soon as circumstances will allow; the teeth as soon as the inflammation has somewhat abated, and the dead bone when exfoliation is sufficiently advanced.

When there is a carious tooth below the antrum, its extraction, and the perforation of the socket, are sometimes considered the best mode of making an outlet for the matter. In other cases, the third or fourth grinder may be drawn and the socket perforated. Another method is that of detaching the cheek from the front surface of the antrum, and applying a small trephine, or other perforating instrument, to the bone. The cheek is to be raised up so as to expose the membrane covering the gum on the side of the face, and a transverse incision made down to the bone. The instrument, preferred by Sir Benjamin Brodie for the perforation of the bone, is a pair of sharp-pointed strong scissors. This plan is applicable to cases in which the socket is filled up with bone.

In one case of inflammation of the antrum, recorded by Sir Benjamin Brodie, where the severity of the symptoms made him suspect the presence of matter in that cavity, he made a perforation, but no pus was met with. Two grains of calomel and half a grain

of opium were then given three times a day, and, on the gums becoming sore, a cure speedily ensued.

COLLECTION OF MUCUS IN THE ANTRUM

Is more rare than one of puriform fluid. The cause of such an accumulation is probably an accidental obstruction of the natural communication of the antrum with the nostril, between the two turbinated bones. The manifest indication is, to make an outlet for the confined fluid, which is producing the swelling and pain of this part of the face. In one interesting case, related by Sir B. Brodie, he made an opening with a knife in the swelling above the gum, which opening continued ten years afterwards, the patient wearing a plug in it.

MEDULLARY DISEASES OF THE ANTRUM

Produces a gradual expansion of it, and then such pressure on other parts as leads to an immense degree of suffering and often fatal consequences. Thus, the pressure may render the eye amaurotic, or even displace it from the socket; it may force out all the neighboring teeth; make its way through the palate and alveolary process into the mouth; fill up the nostril; protrude through the integuments of the face in a frightful form; or through the cribriform plate of the ethmoid bone, or the orbital process of the frontal bone into the cranium itself, when the patient soon dies in a comatose state. I have seen one case, however, in which the patient did not die, or even become senseless, till the mass of the tumor in the cranium had attained the size of an orange.

When the character of the disease is known beforehand, and especially when the soft parts are implicated, an operation is not likely to be of any service, the disease almost always returning. However, if the new growth were entirely restricted to the antrum, and the patient, after a candid explanation of the nature of the disease, and the bad chance of benefit from an operation, were anxious to take that chance, the surgeon would be justified in performing the excision of the upper jaw. This is to be preferred to the plan of opening the antrum, and attacking the disease in that situation, as Desault appears sometimes to have done. I do not, at the present time, recollect how far the cases published by Desault amount to a satisfactory proof of the permanency of the cures; but, in one example recorded by Dr. Anderson of Glasgow, no recurrence of disease in the antrum had taken place five years and a half after the operation, as was ascertained by a *post mortem* examination. The actual cautery had been employed after the knife had done its duty; a measure very essential for the prevention of a relapse. However, I should be sorry to advocate the removal of medullary tumors from the an-

trum.   No doubt, the disease in this situation presents little chance of benefit from such or any other proceeding; but fibrous tumors hold forth more prospect of permanent success.

HARE-LIP

Is for the most part a congenital malformation; but it is now and then produced by accidental wounds.   It is mostly met with in the upper lip, and very seldom in the lower.   Sometimes there is only one fissure; on other occasions too, the hare-lip being then termed a double one.   In some cases, the fissure only extends partly towards the nostril; in others, it reaches into that aperture, which is then much expanded.   The fissure is of course to one side of the mesial line; and its edges, which are covered by a continuation of the prolabium, are rounded off below.   Besides the fissure in the lip, there is frequently so large a cleft in the upper jaw and palate bones, as to convert the mouth and nose, as it were, into one cavity.   A double hare-lip is particularly often accompanied by a fissure in the bones of the palate.   Sometimes, but not usually, there is a fissure in the soft palate.   In certain examples the jaw bone, or teeth, project forward into the cleft of the lip.

A hare-lip, besides being a great deformity, is attended with a defect in the speech; and when the fissure extends through the palate, there is more or less impediment to sucking and swallowing.

In ordinary cases, the cure is easy; the surgeon pares off the margin of the fissure, brings the fresh cut surfaces into contact, and keeps them in this position until they have grown together.

As infants are very subject to convulsions after operations, many surgeons think it best to defer the cure of a hare-lip till the child is about two years of age, or even rather older.   The youngest subject on which I ever operated, was only five months old, but the case was perfectly successful.

In the operation, the wound should be as clean and regular a cut as possible, in order that it may the more certainly unite by adhesion, and of such a shape that the cicatrix may form one narrow line. The margins of the fissure, therefore, ought not to be cut off with common scissors, which always produce some degree of contusion; though what are called knife-scissors, which are employed by some operators, are said to answer well.

Sometimes a bit of pasteboard is placed under the lip; and while this is supported and fixed upon it, the edge of the fissure is cut off with a sharp bistoury.   Or the lip may be held with a pair of hare-lip forceps, in such a manner that as much of the edge of the fissure as is to be removed, is situated at the side of the upper blade of the forceps, so that it can be cut off with one sweep of the knife, which will be guided along the instrument, as along a ruler.   This is to be done on each side of the cleft, the two incisions meeting

at an angle above, thus $\wedge$, in order that the whole of the wound may admit of being brought together, and united by the first intention. Particular care should be taken to remove completely the rounded corners at the lower part of the fissure; for if this be not done, an unseemly notch is left in the prolabium. Mr. Liston's mode of operating I commonly prefer to any other, as being the neatest, quickest, and most easily accomplished: it consists in passing a straight bistoury from without inwards, so as to penetrate the membrane of the mouth, above the angle of the fissure. The part is stretched by the fingers of an assistant, whilst the instrument is carried downwards, so as to detach the edge and rounded corner of the fissure. A similar proceeding is then adopted on the other side. Hemorrhage is prevented by the assistant making gentle pressure whilst the surgeon stitches the lip.

As the lips are exceedingly moveable, and it is essential to heal the wound by adhesion, the twisted suture is generally employed for keeping its surfaces in contact. Two steel pins, or silver pins made with steel points, are introduced through its edges, and a piece of thread is then repeatedly twisted round the edge 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 end of the lower on the opposite side, &c. Thus the thread, being made to cross as many points of the wound as possible, maintains the edges in contact. If silver pins are used, the points which are made to slide on or off the instruments, are now removed; or if steel pins are employed, the points are taken off with a small pair of cutting forceps. A great deal of exactness is requisite in the introduction of the pins, in order that the edges of the incision may afterwards meet correctly: and, as it is of great consequence to make the red parts of the lip correspond precisely, this object is secured by introducing the lower pin first. The pins ought never to extend more deeply than about two-thirds through the substance of the lip; and they should be removed in three or four days, the support of sticking plaster being then sufficient.

When the case is a *double hare-lip*, and the intervening portion of skin is sufficiently broad and long, it should be preserved in the operation; but if narrow and short, it should be cut away. In the latter event, the rest of the operation is the same as for the single hare-lip. But, when the middle piece of skin is to be saved, a union between it and the lip on one side is first to be accomplished by an operation like that for the single hare-lip, and then, in a few weeks, a second operation of the same description is to be performed on the opposite side.

Hare-lips are frequently complicated with a fissure in the roof of the mouth. When it is confined to the upper maxillary bones, it generally closes, by slow degrees, after the operation; but when it

reaches along the palate bones and velum pendulum palati, its entire closure rarely or never takes place. Sometimes one upper maxillary bone exceeds the level of the other. When the hare-lip is double, a distinct part of the jaw may push forward the middle portion of the skin. In certain cases, one of the maxillary bones incline backwards, and its alveolary process juts out. In other examples, an impediment to the union of the hare-lip arises from the projection of a tooth, which must then be extracted.

When the jaw itself projects, the common preliminary step to the operation for the hare-lip consists in cutting away the bony prominence. But, according to Desault, this measure is seldom proper; for when the original congenital deformity is removed, a disfigurement of the face yet follows, from the upper lip having no proper support. The diameter of the upper jaw is also liable to diminish so considerably, in proportion as the two maxillary bones coalesce, that the upper and lower jaws no longer correspond, and the same kind of inconvenient mastication is produced, which is often noticed in old people. Hence, Desault preferred reducing the projection of the jaw, by means of the pressure of a tight bandage; for, as there is a fissure in the roof of the mouth, the bony prominence has little support, and readily yields. In one instance, I made the necessary pressure with a small spring truss, which, in a few weeks reduced the bony projection sufficiently to let the operation be undertaken. In another instance lately brought to me from the country, I advised the same plan to be tried.

[Surgeons sometimes fail in obtaining complete success, in their operations for hare-lip, by cutting the edges into an improper shape. It matters but little, whether the knife or scissors be employed, if they only be sharp. The edges after being pared, should be concave. A fine cambric needle should be used, to support the lower margin in nice coaptation, and the interrupted suture or sutures for the remainder of the fissure. It is obvious, that if the margin be convex, then the prostomeon cannot be brought into perfect adjunction.—Ed.]

CANCER OF THE LIPS.

The lips are frequently the seat of troublesome and obstinate ulcerations, sometimes connected with disorder of the general health, but more commonly prevented from healing by the constant motion and friction to which they are subjected.

Some ulcers of the lip having a foul, and even a malignant appearance, will yield to liquor arsenicalis, iodine, the iodide of potassium, the extract of hemlock, the compound decoct. sarsap., or the compound calomel pill, with occasional purgatives. The most eligible dressings are generally the ointment of the nitrate of mercury, or that of the nitrate of silver, 10 grs. to an ounce. In one case in University College Hospital, I tried both the carbo-

nate of iron and Dupuytren's arsenical powder, and found the latter answer better than the former.

When cancer takes place, it is almost always in the lower lip; and it is not an uncommon opinion, that the pressure and irritation of tobacco pipes give a disposition to the disease, which usually commences as a small tumor in the cellular tissue between the mucous membrane and the skin. The swelling and induration make the disease obvious before the villous surface of the lip cracks transversely, and a thin fluid oozes out. The part then ulcerates and scabs by turns, and the disease ultimately penetrates more deeply, and throws out a fungus. The patient is generally a male subject, above the middle age, and, as I have said, accustomed to smoking. The skin, mucous membrane, and labial glands now form a close compact mass, and the submaxillary lymphatic glands become affected.

Whenever any malignant disease of the lips resists alterative plans, it should be extirpated with the knife, before its effects extend to the lymphatic glands. The disease may be removed by an operation resembling that for the cure of hare-lip, or by a simi-lunar incision through the lower lip, as practised by Dupuytren, by which a freer removal of the part may be made than can be effected in the other way. The commissures of the lips, however, should always be spared. A moderate breadth of the lip may thus be taken away with much less deformity than might be apprehended.

DISEASES OF PARTS IN THE MOUTH.

Wounds of the tongue are generally transverse, and caused by the violent and spasmodic closure of the teeth, while the tongue is out of the mouth, as sometimes happens in epilepsy, and falls on the the chin. Wounds of the tongue, thus produced, may give rise to profuse hemorrhage ; such as would prove fatal if not soon suppressed. As for taking up one of the lingual arteries for this purpose, it would not generally answer, because the wound almost always affects the branches of both. Sometimes, in order to stop the hemorrhage, the surgeon has been compelled to apply the actual cautery, or even to pass a double ligature through the centre of the tongue, behind the wound, and then tie each side of the organ. With the aid of a tenaculum forceps, however, the tongue may be kept steady, and drawn sufficiently forwards to facilitate the application of the ligature to any bleeding vessel. This plan is always the most eligible, when practicable.

INFLAMMATION AND PRODIGIOUS SWELLING OF THE TONGUE.

The tongue, when in the state of inflammation, may swell so enormously as entirely to fill the cavity of the mouth, protrude be-

tween the teeth, and obstruct deglutition and respiration in a most dangerous degree. I remember a soldier's wife at Brussels, whose life was in urgent danger from such an affection of the tongue, brought on by the use of mercury.

Common antiphlogistic treatment will not afford sufficiently prompt relief. The right practice consists in making two or three longitudinal incisions in the dorsum of the tongue. The copious bleeding, which ensues, soon reduces the swelling. In bad cases, all medicines and food ought to be given through an elastic gum tube, introduced down the pharynx from the nostril.

ULCERS AND INDURATIONS OF THE TONGUE.

Putting out of consideration the effect of mercury, the irritation of carious teeth, with points and inequalities, is one of the most frequent causes of ulceration of the tongue. Here, it is clear enough, that the right treatment consists in extracting such teeth, or filing away their sharp projections.

Hard tubercles sometimes grow on the dorsum of the tongue, having a narrow pedicle, and a broad mushroom-like head. These may be snipped off with a pair of scissors, or tied, and the parts afterwards touched with the nitrate of silver.

I have seen the whole surface of the tongue covered with hard tubercles, some of them in a state of ulceration. On this form of disease, I find that mercury has considerable effect. Some inveterate ulcerations of the tongue may be cured by the same alterative plans, as I have advised for similar sores on the lips. Venereal ones I have noticed with the subject of syphilis.

CANCER OF THE TONGUE

Commonly begins as an irregular, rugged, unyielding knob, generally situated in the anterior third of this organ, midway between its raphe and its edge, the mucous surface being puckered and rigid, and the patient experiencing severe pains in the part, which shoot towards the ear. Sometimes the knob acquires considerable size before ulceration commences. Persons, about the age of forty, are most subject to cancerous disease of the tongue. The glands of the neck after a time become swollen and indurated, and profuse bleedings are disposed to take place from time to time, whereby the patient becomes extremely weakened and reduced.

There are two methods of extirpating cancerous portions of the tongue: one by the knife: the other by a double ligature passed through the centre of the part by means of a sharp-pointed curved needle fixed in a handle, one portion of the ligature being firmly tied over one side of the organ, and the other portion over the other side. In this operation, some surgeons first take hold of the

tongue with a pair of hook forceps, so as to fix it.   The objection to the knife is the hemorrhage, which, if profuse, and not capable of being stopped by the methods noticed in the remarks on wounds of the tongue, would require some extraordinary means for its suppression, such as the application of the actual cautery, or even securing the lingual artery as it passes over the cornu of the os hyoides.   When the extirpation of a cancerous induration can be accomplished by removing a piece of this organ in the shape of the letter V, the best mode of stopping the bleeding is to bring the sides of the wound closely together with a suture.   The tongue may also be removed by an incision, made under the jaw, between its symphysis and the hyoid bone.   If the portion to be removed be drawn out through the wound, and the rest held with a tenaculum, the requisite incision may be performed, and the arteries tied. In this way, also, the extirpation with a ligature may be performed further back, than in the common mode.*

Relapses are frequent after operations on cancerous tongues; a fact that should make us cautious in the judgment we give, respecting the chances of a cure.

OF DIVIDING THE FRÆNUM OF THE TONGUE.

Children are not so frequently tongue-tied as nurses and mothers imagine; and we may be sure, that when once an infant has been able to suck properly, whatever may be its present inability to do so, it does not proceed from the confinement of the tongue by the frænum, but probably from the large size of the nipple, excoriation of the lips, or other causes, which should be investigated.

When the frænum really ties the tongue too closely to the bottom of the mouth, the surgeon will find, that he cannot raise the tongue to the palate with his fingers.   Sometimes, however, the frænum is really so short that it interferes with the requisite movements of that organ in sucking, deglutition, and the articulation of words.   The surgeon is then called upon to divide it, which may be done with a pair of blunt-pointed scissors, care being taken to direct the incision downwards, so as not to injure the raninal vessels.

An immoderate cut gives rise to two dangers: one is, that of hemorrhage; the other, that of the tongue being left so unfixed, that it may be thrown back into the pharynx in the act of deglutition, and cause suffocation.   A similar danger has been exemplified after the operation of removing the lower jaw.

With respect to hemorrhage, children are constantly disposed to suck and swallow whatever comes into their mouths, and hence they sometimes die with their stomachs full of blood, even when

---

* Arnott, Med. Chir. Trans. vol. xxii. p. 20.

only the branches of the raninal artery are wounded, and not the trunk itself. Nay, it is alleged, that the veins have sometimes yielded a dangerous quantity of blood, which has been swallowed.

RANULA

Is a tumor situated under the tongue, and commonly believed to arise from a dilatation of the duct of the submaxillary salivary gland. The swelling is usually situated on one side of the frænum, and, when large, extends forwards, under the apex of the tongue. Its contents are generally a glairy fluid, resembling white of egg; but if the tumor has been of long standing, their consistence may be much thicker, and even blended with calcareous matter. Neglected ranulæ may attain a considerable size, and not only obstruct the movement of the tongue, but even produce serious annoyance and mischief to the teeth and lower jawbone by their pressure. In general, however, when they have become as large as a walnut, they burst; the opening heals up; and then they fill and burst again.

Some ranulæ arise from obstruction of the duct, the orifice of which, therefore, should be examined; and if a piece of calculus can be felt with a probe, it should be removed: this alone would lead to a cure. In ordinary cases, the disease may be cured by opening the swelling and snipping off a portion of the sac, so as to prevent the part from closing again. Merely opening the cyst, without the excision of a portion of it, will not always suffice. It is also a good plan to apply a bit of lint, dipped in a weak solution of lunar caustic, to its inner surface. I lately attended a young lady for a ranula, that would not yield to any ordinary modes of treatment. I opened it, and removed a considerable piece of the cyst, filling the cavity with lint; but this plan failed. I then cut away a second piece of the cyst, and dressed the cavity with lint dipped in a solution of nitrate of silver: this also was followed by a relapse. I then passed a seton through the ranula, and kept it applied for two or three weeks in vain. Lastly, I made a small opening, and put into it a little silver tube, which was worn about five or six weeks, and the disease never returned. The latter treatment of ranula by puncturing it, and placing in the opening a small tube not quite half an inch long, and made with a rim, by which it is retained in the part, was frequently adopted by Dupuytren.

DISEASES OF THE TONSILS.

When the tonsils are so considerably swollen from an attack of acute inflammation that deglutition and respiration are seriously obstructed, they should be freely scarified; after which, the bleeding from them, assisted by venesection, leeches, and other antiphlogistic means, will in general quickly bring down the enlargement.

If the same inconvenience should arise from the formation of matter, the abscess should be opened with the long narrow sharp-pointed bistoury, the blade of which may be partly covered with lint to keep the edge from wounding the tongue.

The tonsils are also liable to chronic enlargement, more especially in scrofulous subjects. It is a mere hypertrophy, without any tendency to cancerous or malignant action. The tonsils may, indeed, swell to such a magnitude as to close the aperture between the mouth and pharynx, and create a total impediment to swallowing, and much difficulty of breathing.

If these enlargements resist the internal use of iodine, or small doses of the bichloride of mercury, with tinct. rhei, or tinct. cinchon, and the application of lunar caustic, or nitric acid, the tonsils, or rather the redundant portion of them, should be extirpated by means of a ligature or cutting instrument. Cheselden's plan of passing a ligature through a diseased tonsil, by means of a crooked needle fixed in a handle, and with an eye near its point, is not a bad method. Graefe has also invented a most ingenious instrument for the purpose. Excision of part of the tonsil, however, is a better practice, and may be safely performed with a hook and straight probe-pointed bistoury, for the hemorrhage will never be serious, if the knife be directed downwards and inwards away from the carotid artery.

[The instrument best adapted for the removal of the tonsils when enlarged, is one invented by Mr. George Tiemann, an ingenious surgical instrument maker, of the city of New-York.—Ed.]

ELONGATION OF THE UVULA.

The uvula is sometimes thickened and considerably elongated, producing great uneasiness about the throat, and irritation of the epiglottis. If the disease cannot be remedied by astringent gargles, or touching the uvula with the tincture of the sesquichloride of iron, the best plan is to snip off the superfluous length of the part with a pair of long blunt-pointed scissors. I once attended a gentleman with a phagedenic venereal sore throat, whose uvula was so deeply attacked at its root with the same kind of ulceration, that it remained attached only by a few fibres, so as to hang down, and irritate the eppiglottis in a most distressing manner. Under these circumstances, as it could not be saved, I immediately cut it off, to the great relief of the patient.

DISEASES OF THE GUMS.

The gums in the natural and healthystate are not very sensible: they may be divided with a lancet without much pain; and the

pressure of hard substances against them in mastication is not productive of any injury. When, however, they become inflamed, in consequence of decayed teeth, a cold, or any other cause, they cannot be touched or pressed upon, in the slightest degree, without the patient being put to a great deal of suffering. Some diseases of the gums originate from those of the teeth; while others have no connection with this cause.

THE GUM-BOIL, OR PARULIS,

Is merely an abscess of the gums, generally arising from the irritation of a diseased tooth, though sometimes from disease of the alveolary process, or from splinters of this part left after the extraction of a decayed tooth. These abscesses are to be treated on common principles, and opened with a lancet as soon as matter is formed: afterwards, when the part has become quiet, the decayed tooth, if there be one, should be taken out.

If the gum-boil become fistulous, it must be freely laid open, and a solution of lunar caustic applied.

EPULIS, OR EXCRESCENCE FROM THE GUMS.

The fibro-vascular texture of the gums is much disposed to produce fungous and other excrescences. Any kind of irritation, as that of bad teeth, or a severe blow, will sometimes lead to the growth of considerable tumors from the gums; and occasionally they arise without any manifest exciting cause.

The texture of an epulis is generally soft, spongy, and vascular; but sometimes hard, fibrous, incompressible; and not endued with much vascularity.

A soft vascular epulis mostly originates from the gum itself; while that which has a fibrous or fibro-cartilaginous structure frequently grows from the alveolary process. When the excrescence first makes its appearance between sound teeth, which it afterwards loosens and forces out, it may be concluded, that the disease originates from the periosteum and interior of the socket.

As tumors of the epulis kind have no disposition to recede, and, when they originate from the periosteum or bone, are disposed to assume a malignant character, I cannot too strongly insist upon the necessity of an early operation for their complete removal. The knife is the best means for the purpose. Any teeth in the way should be first extracted; the whole substance of the swelling removed; the bone and periosteum scraped; and even a portion of the jaw (if diseased) removed with Hey's saw, or a pair of cutting forceps. After the removal of a cancerous epulis, many foreign surgeons apply the cautery.

The manner of removing the diseased portion of alveolary pro-

cess is, to make a perpendicular cut through the bone on each side of the tumor with a fine saw, after which its separation may be completed with a strong pair of forceps. The bleeding is profuse, but may be stopped by pressing into the wound a dossil of lint dipped in the tincture of sesquichloride of iron; the application of which, or of a solution of lunar caustic, may be repeated, if necessary, at each succeeding dressing.

WOUNDS OF THE THROAT

Are cases of frequent occurrence in persons who attempt to commit suicide. Some merely penetrate the integuments, and are not of any particular importance. Others extend more deeply, and divide some of the primary branches of the external carotid, especially the lingual, and superior thyroid arteries. Others make an opening into the mouth by separating the os hyoides and tongue from the thyroid cartilage; while others are situated lower down, so as to penetrate the thyroid cartilage, or betwixt that cartilage and the cricoid, and sometimes through these into the œsophagus. Surgeons meet with more wounds of these parts, than of the trachea itself; for persons, who aim at suicide, generally make the wound high up in the neck, and, unless they cut with great determination and violence, they do not reach the carotid, or internal jugular vein, because they hold their heads back at the time, and thus render the larynx and trachea prominent. Some individuals, however, in a desperate state, reach these vessels, even high up in the neck, dividing nearly every thing down to the vertebræ. Under these circumstances, they are, of course, immediately destroyed by hemorrhage.

A simple incised wound of the trachea, unaccompanied by injury of other important parts, provided all hemorrhage has ceased, or can be controlled, is generally much less dangerous than a wound of the larynx—especially one that penetrates the thyroid cartilage, so as to approach to vocal cords and edges, of the glottis, which may be involved to such a degree in the subsequent inflammation, as to put a stop to respiration.

Mr. Ryland, whose work contains the best observations on the present subject with which I am acquainted, divides wounds of the larynx and trachea, 1st, into those which interest that part of the larynx which is situated above the attachment of the vocal cords to the thyroid cartilage; and 2d, into others, which penetrate the cavity of the larynx or trachea. Wounds in the former situation are comparatively free from danger, because, unless very deep,

they do not reach the track through which the air passes in respiration, and therefore the risk of hemorrhage into the trachea is absent. The effusion of blood into the air-tubes is generally the immediate source of danger in wounds of the larynx, or trachea, and life is more frequently lost by this occurrence than by external bleeding.[*]

In ordinary cases, when there is much bleeding, it is from the lingual, or superior thyroid artery. Then also the patient, if not promptly assisted, may die from loss of blood, but more frequently he faints, and this is followed by a temporary stoppage of the hemorrhage; and time is thus afforded for a surgeon to be sent for.

I have known a patient die in about twenty minutes after cutting his throat, though no artery of any size was wounded, and the hemorrhage on the whole was very trifling. Thus, a prisoner in the Queen's Bench cut his throat, dividing the trachea and the external jugular vein. As he did this when he was alone in his room, the occurrence was not known to any other person for nearly twenty minutes after it had taken place, and when the gentleman who assists me in the duty arrived, the patient was at his last gasp. On examination after death, it was found that no large artery had been cut, but the stream of blood from the external jugular vein had passed into the trachea, and caused suffocation. Bleeding even from some of the numerous veins in front of the trachea, below the thyroid gland, might have the same fatal consequence.

I had another patient in the same place, who, after the nurse had retired to rest, took out his razor and cut his throat. A girl accidentally entered the infirmary directly afterwards, and seeing the stream of blood which went as far as the middle of the room, she gave the alarm, and a surgeon in the prison immediately secured the superior thyroid artery that had been divided. In all cases of this kind, the bleeding vessels are to be secured by ligatures; and the edges of the wound are not to be immediately brought together, because, as Mr. Ryland justly remarks, "when the immediate danger from bleeding into the windpipe has past away, secondary hemorrhage may occur, either on the establishment of reaction, or from the effects of ulceration; and this is more likely to be attended with fatal results, when the edges of the wound have been brought together, and no outlet is left for the escape of the blood."

Wounds between the hyoid bone and the thyroid cartilage may injure the epiglottis, the anterior wall of the pharynx, or the lips of the glottis, and the arytenoid cartilages. The epiglottis may be severed from the tongue and hyoid bone by a division of the hyothyroid membrane, and by then falling over the rima glottidis cause danger of immediate suffocation. Such a case is recorded by Dr. Houston, who extricated the patient from this first danger by rais-

---

[*] Frederick Ryland, on Diseases and Injuries of the Larynx and Trachea. 8vo. Lond. 1837. p. 234. A work of great merit.

ing up the epiglottis, bringing it over the edge of the thyroid carti-
lage, and fixing it there with a single stich*. Loose portions of the
mucus membrane, I have known cause similar distress.

Certain cases recorded by Larrey prove, that the destruction of
the epiglottis seriously injures the voice; that immediately after its
occurrence, the power of swallowing is lost; but that, in time, the
lips of the glottis are able to prevent solid food from penetrating
into the larynx, though liquids will still produce much inconveni-
ence.

Wounds between the hyoid bone and thyroid cartilage may prove
fatal by exciting inflammation of the glottis, and consequently se-
rous infiltration of the submucous cellular tissue of the epiglottis and
superior aperture of the larynx.

When the knife or razor penetrates deeply into the hyo-thyroid
space, the anterior wall of the pharynx will be opened; an occur-
rence soon manifested by the passage of liquids, taken by the mouth,
through the external wound. If the opening in the pharynx be
large, so as to be followed by a frequent escape of the alimentary
matters through the wound; or if deglutition be attended with diffi-
culty, an elastic gum tube should be introduced into the œsophagus
from the nostril, or mouth, and food injected through it into the
stomach.

I have seen cases, in which the epiglottis, and also the arytenoid
cartilages and vocal chords, were injured. In one example, re-
corded by Sir Charles Bell, the divided aritenoid cartilage, sus-
pended merely by a membranous connection, slipped into the rima
glottidis, and caused suffocation.† A man who committed suicide,
and died in University College Hospital, made an oblique incision
in the thyroid cartilage, extending upwards with such force, that the
os hioides was cut in half.

Wounds penetrating the air-tube cannot be attended with ob-
structed respiration so long as the external wound remains open;
but in others only interesting parts above the rima glottidis, death
may be occasioned by this circumstance in a few hours. At the
same time, as Mr. Ryland explains, there can be no doubt, that
wounds which penetrate either the larynx or the trachea are attend-
ed with much greater risk to life, than those which merely injure
the epiglottis, the anterior wall of the pharynx, or the hyo-thyroid
membrane. In the former cases, death may ensue from hemor-
rhage into the trachea; from suffocation, caused by excessive gra-
nulations; or from a chronic thickening of the mucous membrane,
as happened some weeks after the accident in one of my patients
in University College Hospital, when the outer wound and that in

---

* Dublin Hospital Reports, vol. v. p. 315.
† Surgical Obs. vol. i. p. 44.

the air-tube had been perfectly healed; or from extension of the inflammation around the wound to the lungs and plura.

With respect to wounds of the trachea or larynx, complicated with a wound of the pharynx or œsophagus, it is remarked, that, upon the whole, the pharynx is less frequently wounded than the œsophagus, because it is so protected by the larynx, that it cannot be reached unless the thyroid or cricoid cartilage be cut through. When the trachea is completely cut across, the œsophagus is generally injured.

Certain cases, quoted by Mr. Ryland, show that the escape of fluids taken by the mouth, through a wound in the trachea or larynx, is not an absolute proof that the pharynx or œsophagus is injured. He conceives that the circumstance is to be ascribed to some defective action in the epiglottis from the injury.

In the *treatment*, the first indication is to stop the bleeding by tying the divided vessels, if large enough to require it, whether arteries or veins.

Until this has been done, no wound communicating with the trachea or larynx is to be closed; because, if the hemorrhage continue, the blood, not being able to pass outwards, will flow into those tubes, and death be likely to be produced by suffocation.

As soon, however, as all risk from bleeding is over, the wound may be closed by position, sutures, plaster, or bandage. The edges of wounds in the hyo-thyroid space may generally be brought together by means of position alone. The patient is to lie on his back, and the chin is to be approximated to the sternum with a bandage, the upper ends of which are to be fastened to each side of the back part of a night-cap, while the lower are attached to a band placed round the chest. High pillows are also to be placed under the head. Adhesive plaster, or water dressing, may be applied to the external wound.

In wounds of the hyo-thyroid space, penetrating the pharynx, the patient is to lie upon his back, in order to lessen the flow of saliva and mucus towards the wound, and an elastic gum tube should be passed from the mouth or nostril, for the injection of nourishment and medicines into the stomach.

If urgent difficulty of respiration should come on within a few days after the infliction of a wound in the hyo-thyroid space, and this apparently from extension of the inflammation of the injured parts to the lips of the glottis, bleeding and calomel should be immediately resorted to, and if not promptly effectual, bronchotomy should be practised.

Wounds of the larynx require very similar treatment to that recommended for those of the hyo-thyroid space. I have rarely employed sutures, though Mr. Ryland considers them necessary, if the thyroid cartilage be cut in more places than one, and the pieces separated.

When the wound is made in the space between the thyroid and cricoid cartilages, the pharynx is more likely to be reached, than when the knife first meets with the thyroid cartilage. Here the use of an œsophageal tube is required. With respect to sutures, if, in this case, the gaping of the wound in the larynx be considerable, one or two stitches will be advantageous, on condition that they be taken out immediately any obstruction of respiration occurs. In wounds of the trachea, if the whole of its circumference be not divided, no sutures are necessary; the head is to be kept forwards; and adhesive plaster, or the water dressing, applied. When the division of the trachea is complete, position may not suffice to bring the separated parts together, and then one or two sutures will be indispensable.

If the œsophagus be wounded, the œsophageal tube should be introduced.

The danger of closing the external wound before the oozing of blood has entirely ceased, and the risk of its passing into the trachea is over, has been already insisted upon. So has the necessity of having quick recourse to bleeding, and calomel, when difficulty of breathing follows a wound of the air-tube, and depends upon obstruction of the rima glottidis from inflammation and thickening, or œdema, of the lining of the larynx, quickly followed up, if relief be not speedily obtained, by the performance of tracheotomy.

All patients with wounds of the throat, inflicted for the purpose of suicide, should be closely watched, lest they repeat the attempt. They should be kept perfectly quiet, and their minds soothed by good advice. In many instances, we find great depression of the system, especially where the loss of blood has been considerable, or the individual is under the influence of some deplorable domestic calamity. On this account, and also that air of too low a temperature may not pass direct into the trachea through the wound, the chamber should be kept at a moderate temperature. In other instances, where much reaction supervenes, bleeding and other antiphlogistic means may be called for.

During my service in the army, I had opportunities of seeing many extraordinary wounds of the throat and neck. Thus, after the battle of Waterloo, one man was brought into the military hospital, who had received the thrust of a lance in the throat, by which the mouth was laid open, the tongue dreadfully lacerated, and several of the primary branches of the external carotid were wounded; consequently it became necessary to tie the common carotid artery. This operation, performed by Mr. Collier, suppressed the bleeding, and the patient recovered. After the attack on Bergen-op-Zoom, I saw a soldier, the whole of whose lower jaw, with the soft parts attached to it, had been carried away by a grape-shot. This poor fellow recovered, and was much indebted for this favorable result to the aid derived from elastic gum catheters. In another example,

a musket ball had injured the carotid, in the lower part of the neck, which gave way about ten minutes after the soldier had been placed in the hospital. No blood escaped outwardly, but the man died of the pressure of the effused blood on the trachea, so suddenly, that there was no time to make any attempt to save him.

FOREIGN BODIES IN THE ŒSOPHAGUS,

Requiring extraction, are such as might create bad symptoms, if pushed down into the stomach, in consequence of their hardness, indissolubility, pointed shape, or other hurtful qualities. On the other hand, those which are not likely to produce harm, and are capable of being digested, may be at once pushed down into the stomach. They most frequently lodge about the upper or lower orifice of the œsophagus; seldom in its middle portion. When low down, the surgeon is often compelled to force them into the stomach, though their quality is such as would render their extraction desirable. In many instances, they are situated in the pharynx. Hence, it is an important rule, always to press down the tongue, and examine the back of the throat, before any thing else is attempted. Thus, they may frequently be discovered, and extracted with the fingers or forceps, when, from the patient's account, one would conjecture that they had descended much further.

When a foreign body is situated about the upper orifice of the œsophagus, it may often be felt with the surgeon's finger, and if incapable of being removed with it, it may sometimes be easily extracted with a pair of forceps, provided the patient extend his head as far back as possible, so as to bring the mouth and pharynx nearly into the same line. In this position, with a pair of long-bladed forceps, like those invented by Dr. Bond of the United States, foreign bodies, nearly down to the cardiac orifice of the stomach, may be taken hold of, and extracted. A common instrument for the removal of foreign bodies from the œsophagus is a kind of hook, constructed of flexible wire, doubled and twisted together, and the bent end forming a noose. In general, small bodies, like needles, fish-bones, &c., are more easily extracted with a piece of sponge, introduced beyond them. The art of employing compressed sponge in the most advantageous manner, consists in taking a piece about the size of a chestnut, and introducing a strong ligature through it. The ends of the ligature are then to be passed through a flexible catheter, and fastened to that end of it which the surgeon holds. The sponge is then to be introduced down the œsophagus beyond the foreign body, and water is to be injected down the tube, in order to wet the sponge and make it expand. The ligature is then to be firmly drawn, for the purpose of pressing the sponge against the extremity of the tube, and making it spread itself out in a still greater degree. The tube is now to be withdrawn, together with the sponge,

the instrument being twisted to the right and left in this part of the operation.

When the foreign substance cannot be extracted with this instrument, a probang may be tried, to the end of which a bunch of thread is fastened, doubled so as to make an immense number of nooses. In this way, fishbones, and other substances, frequently admit of being entangled, and extracted, after other modes have failed.

Some practitioners are in the habit of giving emetics; but this method must be improper when the foreign body is pointed, and is seldom of much use in any case, as patients usually make efforts to vomit of their own accord.

When foreign bodies produce urgent symptoms, and cannot be extracted, it becomes necessary to push them into the stomach, whatever may be their nature or quality; and here it should be mentioned, that substances which one would imagine likely to produce alarming symptoms by being put into the stomach, frequently occasion, after they are in that organ, no dangerous symptoms, and even not the smallest inconvenience. A whalebone probang is the instrument for this purpose.

When foreign bodies can neither be extracted, nor pushed down, the consequences are not invariably dangerous. When the extraneous substance is small and pointed, it frequently excites suppuration, becomes loose, and is either carried into the stomach, or ejected from the mouth. Sometimes it makes its way to the surface of the neck, occasioning there an abscess, out of which it is extracted.

In some instances, foreign bodies, especially needles and pins, after making their way through the œsophagus, travel a great way about the body, and, at length, arrive under the skin of remote parts, behind the ears, at the shoulders, feet, &c., where they produce an abscess, that leads to their discovery and extraction. Surgical authors mention a variety of examples, in which pins and needles, after being swallowed, continued in the body many years. In one instance, recorded by M. Hevin, in the Memoirs of the French Academy of Surgery, a needle that had been swallowed, remained in the body eighteen years before it made its appearance under the skin, during all which time not the slightest inconvenience was experienced.

When the foreign body is large, impedes deglutition, dangerously obstructs respiration, and can neither be pushed down into the stomach nor extracted by the mouth, the only means of saving the patient's life is œsophagotomy, which is directed by Lisfranc to be done as follows: the patient's head having been inclined backwards, an incision is to be commenced at the inner edge of the left sterno-mastoid muscle, opposite the superior edge of the thyroid cartilage, and continued down to the lower edge of the cricoid. An assist-

ant is now to draw the carotid sheath towards the outer side of the wound, while the operator cautiously dissects through the cellular tissue close to the trachea, until the œsophagus is exposed, where it inclines to the left side of the windpipe. A long, slightly-curved cannula, with a grooved stilet, is now to be introduced from the mouth down the œsophagus, and its point, being inclined to the left, may readily be felt in the wound. The stilet is then to be pushed forwards through the œsophagus; the operator ascertains, by passing his finger along the concave end of the instrument, that no arterial branch lies over it, and then puts a bistoury into the groove, under the guidance of which the œsophagus is opened. The foreign body, lodged in this canal, is now to be extracted with a pair of forceps. The only example of œsophagotomy in this country, within my recollection, was performed by Mr. Arnott. The operation was perfectly well executed, but did not ultimately save the patient, who was a child of tender age.

[STRICTURE OF THE OESOPHAGUS, is another disease of which Mr. Cooper makes no mention. This is a disease of the passage, by which its calibre is contracted, and often to such an extent as to cause starvation. It is found at various points in the canal, but most frequently behind the cricoid cartilage, at the junction of the neck with the thorax, and where the œsophagus passes through the diaphragm. It is rarely met with until after middle life, and then is generally cancreous in its character. At times, however, some mechanical cause is concerned in its production, as in the following case.

A. B. aged eight, some two years previous to coming under my care, had swallowed a cent; it seemed not to pass into the stomach at once, and she was never conscious of its passing from her. Almost immediately she began to experience some difficulty in swallowing solid substances, and at length, she could get down but the smallest quantity of liquids. She became very much emaciated, had cough, and death seemed near at hand. I made an attempt to pass a probang, and failed with the smallest. I however succeeded in passing a small bougie, and afterwards the smallest sized probang, through the stricture, and continued to dilate the contraction till at the end of three months, she was able to swallow nearly as well as ever, fattened up, and seemed well. In this case, the stricture must have been produced by inflammation, followed by thickening and contraction of the walls of the œsophagus, caused by the cent.

The *symptoms* of this disease, are generally well marked, and the case can always be made out, by the aid of the probangs.

The *prognosis*, in most cases, is unfavorable; as the stricture generally depends upon a scrofulous or cancerous diathesis.

There are *three* modes of treatment which are resorted to, when any thing is attempted to be done.

First. *Dilatation*, as in the case given above; and this avails nothing when the disease is malignant; but when the narrowing of the passage is caused by common inflammation, then it succeeds.

Second. *Caustic* is employed by some surgeons; but I have very

little confidence in its use, in the management of strictures in any part of the body.

Third, we have *Œsophagotomy*, as performed by Dr. John Watson, one of the Surgeons of the N. Y. Hospital, in May, 1844, and this I believe to be the only case on record, in which this operation has been performed for the cure of this disease.—Ed.]

WRY-NECK. CAPUT OBSTIPUM.

In this complaint, the head is drawn towards one of the shoulders. In general, the face is turned towards the opposite side; but, occasionally, towards that to which the head inclines. The affection, when in a high degree, renders the head quite immoveable, so that neither the patient, nor any other person, can place it in its proper position. Hence, when the patient wishes to look in any direction, except immediately before him, he is necessitated to turn his whole body. Sometimes the head can be moved, but not brought into a straight posture. In other instances, the patient, with exertion, can manage to keep his head straight for a short time; but it soon becomes inclined again towards the shoulder. The disorder mostly arises from irregular action in the muscles of the neck, especially the sterno-cleido-mastoideus, or else from the contraction of a cicatrix, or from deformity of the cervical vertebræ.

When the cause is irregular action of the sterno-cleido-mastoideus, this muscle, on the side to which the head is drawn, has a hard, tense, unyielding feel; every attempt to bring the head into its right position exciting the muscle to make greater resistance, and to assume a more stretched appearance. Frequently the sterno-cleido-mastoid muscle of one side is paralytic, and the wry-neck is then occasioned by the healthy ordinary action of its antagonist. It may be inferred, that the cause of the deformity lies in an alteration of the vertebræ, when the muscles are free from the above-mentioned appearances, the patient is scrofulous and ricketty, and the head more moveable than in the preceding case.

The *prognosis* depends on the cause and duration of the deformity. In young subjects, if the cause lie in the muscles, the prognosis is favorable. When, however, the case has existed a long while, and particularly when it began in early childhood, and continued during growth, the cervical vertebræ are sometimes distorted, altered in shape, and even anchylosed: in which circumstances, the disease is incurable. This participation of the vertebræ in the disorder does not constantly exist, at all events in an irremediable degree, even though the disorder may have begun at an early period of life, and prevailed a considerable time. Richter and Chelius refer to several instances in which wry-necks of the most unpromising description were cured; cases, in which the head had been quite im-

moveable, the disease of twelve and sixteen year's duration, and its origin had taken place in infancy.*

When the deformity follows the contraction of a cicatrix, the cure is by no means easy. A transverse incision is made through the integuments and the head is afterwards kept in a straight posture by some mechanical contrivance, until a certain period after the wound is perfectly healed. The apparatus being left off, the distorted position of the head is generally disposed to return. It was on this account, that Mr. Earle proposed the removal of the whole of the cicatrix, and having recourse to treatment already noticed in the observations on burns. In some instances, however, where the chin was nearly in contact with the breast, in consequence of the effect of severe burns, I have known considerable amendment follow the division of the longitudinal folds in the cicatrized parts, and the long continued use of mechanical means for preserving the head in an even position.

In common examples, depending chiefly upon a loss of equilibrium between the muscles of the opposite sides of the neck, and especially upon a rigid contraction of one of the sterno-cleido-masto-idei, the means of relief, usually tried, are camphorated mercurial frictions over the rigid muscle, even till salivation occurs; the application of the nitrate of silver to the skin; the internal exhibition of opium, together with mercurial frictions; electricity; stimulating embrocations; the shower-bath; blisters; issues, &c. These remedies should be assisted with mechanical contrivances, for gradually bringing the head into a straight position. The best appartus which I know of for this purpose, is that invented by Professor Jörg.† It consists of a pair of leather stays, and of a band or fillet, which goes round the head. On the centre of the forepart of the stays is a kind of pulley, or groved wheel, which can be turned round with a key in one direction, but not in the other, as it becomes fixed by means of a spring. From this pulley, or wheel, a band proceeds up the neck to the fillet on the patient's head, to which it is fastened directly behind the ear, close to the mastoid process. The band lies in the same direction as the lengthened sterno-cleido-mastoideus muscle, and, when drawn towards the breast by means of the wheel, it produces the same effect as would arise from an increase in the action of that muscle. In short, it pulls the mastoid process downwards and forwards towards the sternum, counteracts the opposite muscle of the same name, and rectifies the position of the head. The apparatus is to be constantly worn.

When, by perseverance in the use of this simple invention, and other means, the position of the neck has been improved, the head

---

* Ansfangr de Wundarzn. b. iv. p. 276. M. J. Chelius, Handbuch der Chirurgie, b. i. p. 796, 8 vo. Leipzig. 1826.
† Ueber die Verkrümmungen des Menschlichen. Körpers. 4to. Leipzig, 1816.

is generally found to have a disposition to incline too much forwards; an effect which the contracted sterno-cleido-mastoideus, and its antagonist, the band, both tend to promote. In order to hinder this, Professor Jörg removes the end of the band from the breast, carries it under the arm, and through a ring at the side of the corsets, or stays, and thence to the fillet on the head, where it is fastened close to the mastoid process. The ring hinders the band from chafing the axilla, and following the motions of the shoulder.

If, when the disease originates from irregular action of one of the sterno-cleido-mastoidei, Sharp's operation of dividing the muscle be determined upon, it will generally be prudent at first only to cut through the clavicular portion of it. A transverse incision having been made over this part of the muscle, the operation is completed by passing a director, and blunt-pointed curved bistoury, under the place where the division is intended to be made. In one example, Dupuytren passed a bistoury behind the muscle, and divided it by cutting forwards, leaving the skin uncut, in order that the patient, who was a female, might not have the disfigurement of a scar in the neck. The position of the head was then regulated by a bandage; and the result was successful.

When a wry-neck depends upon paralysis, or weakness of one sterno-cleido-mastoideus, while the other retains its natural power, electricity, the application of a grain or two of strychnia to the skin which has been blistered, setons, blisters, liniments, the cold bath, and tonics, are indicated. The state of the bowels and digestive organs should also be carefully regulated. During the trial of these remedies, the head should be kept in a straight position, as paralytic muscles are more likely to recover their tone in a tense, than a relaxed state. When such treatment fails, a partial division of the healthy sterno-cleido-mastoideus has been suggested, as a means of restoring the equilibrium of the head. At the present day, we rarely hear of operations of this kind.

BRONCHOCELE,

Signifies an indolent enlargement of the thyroid gland; the tumor, when not accidentally inflamed, is free from pain; and in its incipient state, has a soft, elastic consistence. When it has existed some time, the gland loses its natural figure, assumes a firm fleshy feel, being firmer, however, in some places, than in others, spreading towards the sides of the neck, and sometimes attaining a prodigious magnitude. When the adjacent cellular tissue, and lymphatic glands, participate in the disease, the base of the swelling may extend from one side of the neck to the other. In a few instances, only one lobe is affected.

Bronchocele is endemic in several mountainous countries; as, for

instance, Switzerland, Savoy, the Tyrol, Derbyshire, &c.; and is most frequent in young females. The disease is sometimes a mere hypertrophy of the thyroid gland; sometimes an excessively indurated, or even a partly ossified condition of it; and, in other instances, the swelling consists of many cysts of different sizes, filled with transparent viscid fluid, or matter of various kinds. The tumor sometimes creates no particular inconvenience, and is merely a deformity. When large, however, it is frequently attended with considerable obstruction of the speech, respiration, and deglutition. It has little tendency to become malignant, that is to say, cancerous, and is not very liable to inflammation and its consequences, though these changes sometimes happen. In Mr. Langstaff's museum is a fine specimen of fungus hæmatodes of the thyroid gland, which had been mistaken for bronchocele.

The causes of bronchocele are involved in great obscurity. At one time, it was conjectured, that drinking water, obtained from melted ice or snow, frequently gave rise to the disorder. The disease, however, is frequent in Sumatra, where ice and snow are never seen; while it is entirely unknown in Thibet, where the rivers are exclusively supplied by the melting of the mountain's snow. Bronchocele has been regarded as a scrofulous complaint; but this doctrine is denied by Prosser*, who argues, that the disease is often seen in persons entirely free from every mark of scrofula; and that, while boys are as subject to scrofulous diseases as girls, bronchocele seldom occurs, except in young females.

Formerly, the medicine commonly given for the cure of bronchocele, was burnt sponge, in the dose of a scruple, two or three times a day, either made into an electuary with syrup, or prescribed in the form of a lozenge, the efficacy of which was thought to be greatest when it was placed under the tongue, and allowed gradually to dissolve there. A mercurial purgative was usually given about once a fortnight. The good effects of burnt sponge are now well known to depend upon the iodine which it contains, and, consequently, at the present day, iodine itself is commonly prescribed. Its efficacy is promoted by the previous application of leeches to the swelling, and a low regimen.

With such treatment, external means are to be combined; as repeated frictions of the swelling with strong camphorated or ammonia liniment, or, what is still better, the ointment of the iodide of potassium, with or without a proportion of mercurial ointment blended with it.

From the foregoing description of the very different conditions of

---

* An Account and Method of Cure of the Bronchocele, or Derby-neck, 3 edit. p. 5. 4to. Lond. 1782.

the thyroid gland in different instances, it is manifest, however, that iodine will not cure every form of it.

Accident has sometimes furnished useful suggestions in the practice of surgery: bronchoceles have occasionally festered, or ulcerated, and the result sometimes been the dispersion of most of the swelling. Hence, the plans of forming issues and setons, as a mode of cure. Valuable information, respecting the effects of setons, may be collected from a paper by Dr. Somerville, describing the practice of Quadri at Naples, and inserted in the Med. Chir. Trans. vol. 10.; and from another paper in the eleventh volume, drawn up by Mr. Copland Hutchinson. The seton was often employed by Dupuytren. It should never be made, except when iodine has decidedly failed, and the complaint is beginning to be very oppressive. If a seton be passed through the thyroid gland, the hemorrhage is always profuse, and might prove dangerous, were it not checked by cold applications, and pressure. In general, the seton must be kept in several months, before the swelling is completely reduced. It will not cure the hardest forms of bronchocele; but it will cure hypertrophy, cysts, and hydatid formations, which iodine and other specifics frequently fail to disperse.

If this latter measure, or the formation of an issue, should not be deemed advisable, and the patient's life be rendered miserable, or seriously endangered by the pressure of the swelling on the trachea, œsophagus, and veins returning the blood from the head, it will be for the practitioner to consider, whether he will imitate Blizard, Walther, Wedemyer, Graefe, Coates, Brodie, &c. in tying one or both of the superior thiroid arteries, or follow the example set by Gooch, Desault, Theden, Vogel, and Hedenus, who ventured to extirpate the enlarged thyroid gland. The latter surgeon has performed this bold operation, at least six times, with complete success. The most essential rule in the operation would be to secure every large artery directly after it was cut, so that the patient might not be lost by hemorrhage, ere the complete detachment of the swelling had been effected. The ligature of the superior thyroid arteries is generally followed by some diminution of the tumor, but this amendment has not always been permanent. In some of the cases on record, the patients died either of inflammation and its consequences, or of secondary hemorrhage.

In one example that occurred in University College Hospital, Mr. Liston exposed a large prominent portion of the tumor, and after carrying the dissection as far as he deemed safe, passed a double ligature through its base, and thus effected its destruction.

WOUNDS OF THE CHEST

Are divided into *superficial* and *penetrating*. The former do not materially differ from common wounds of the skin and muscles in other situations, and therefore do not here require particular notice.

When we consider the important organs contained in the chest, we should hardly suppose it possible for a bullet or a sword to pass across it without inflicting a mortal wound. Yet, recoveries from such injuries are frequent, and this notwithstanding they may be complicated with a wound of the lungs. Nay, facts are recorded, which leave no doubt, that even wounds of the heart itself are not always fatal, balls having been found encysted in its substance, after death from other causes, long after the receipt of the wound.

When, in respiration, the air passes alternately into and out of a wound in the parietes of the chest, we know that the weapon must have penetrated beyond the pleura costalis. In the expansion of the thorax by the muscles of inspiration, the air enters the wound; in its contraction by the muscles of expiration, the air is pressed out in a more or less forcible current. When the communication between the cavity of the pleura and the atmospheric air is free and ample, the lung generally collapses, unless prevented by adhesions; and the knowledge of this circumstance led to the belief, that if direct openings were made simultaneously into both cavities of the pleura, the patient would inevitably die of asphyxia produced by the collapse of both lungs. Experience proves, however, that this is not the fact, and that recoveries may follow wounds penetrating the two sides of the chest, even where the admission of air to the cavities of the pleura is free and direct. Three chief sources of danger present themselves in all penetrating wounds of the chest.

1. The risk of profuse internal hemorrhage, by which the patient is sometimes destroyed at once; or by which he is more slowly cut off, generally in consequence of the extravasation in the pleura producing too much pressure on the lungs, or becoming combined with inflammation of those organs.

2. Other patients fall victims to inflammation within the chest, without any effusion of blood, though sometimes the inflammation is followed by abscess, or, as it is here called *empyema*.

3. Another cause of danger, when the lungs are wounded, is *emphysema*, or the inflation of the cellular tissue, sometimes of the greater part of it throughout the body.

The symptoms of *a wound of the lungs* are, bloody expectoration *immediately* after the receipt of the injury, frequent coughing, great difficulty of breathing, a feeling of suffocation, and a sudden alteration of the countenance, which exhibits paleness and marks of great anxiety. Here the immediate danger is either from the quantity of blood withdrawn from the circulation by internal hemorrhage;

or from the passage of that fluid into the bronchi and air-cells of the lungs; or into the cavity of the pleura, so as to cause suffocation. Hence wounds of the root or upper part of the lungs, where the vessels are large, are always the most dangerous.

With regard to the *treatment*, it is a general rule to close all such wounds without delay. We ought, however, to extract any splinters of a broken rib, a ball, a portion of the clothes, or any other extraneous substances wich lie near the surface, and can be easily reached without too much irritation. With respect to *a wounded intercostal artery*, all the best modern practitioners disapprove of the introduction of various instruments and contrivances into the wound or chest for the suppression of the bleeding. Dr. Hennen had heard of examples, in which the intercostal artery was taken up with a teaculum. But supposing this were not practicable, I believe, that less danger would arise from closing the wound and applying a compress over it, than from the introduction of extraneous substances round or within the rib. I attended, with Mr. Frogley of Hounslow and Mr. Broxholm of Sunbury, a young gentleman, one of whose intercostal arteries was wounded by a small knife. The result was a prodigious effusion of blood under the muscles of the back, followed by large collections of matter, and very urgent danger; but, in the end, the patient recovered. No attempt was made to secure the vessel. About eight ounces of blood flowed out of the orifice of the wound directly after the accident; the outward hemorrhage then ceased; but the blood accumulated in the cellular tissue; great swelling ensued, and, in about eight days, such a quantity of matter and putrid blood was suddenly discharged from the external wound, that the patient lay in a kind of pond, extending from his feet to his neck. Incisions were occasionally practised to facilitate the exit of the matter. It was some months before the discharge ceased, and the wound closed. In the early inflammatory stage, leeches and venesection were freely employed.

In all penetrating wounds of the chest, and especially those extending into the lungs, the free use of the lancet is the only thing that can be depended upon in the beginning. It is by this means that internal hemorrhage is to be checked; and inflammation of the lungs prevented or subdued. Here, as in certain injuries of the head, moderate bleeding will not suffice. We may perhaps be required to bleed the patient more than once a day for six or eight days in succession. The first bleeding should be copious; and, if the patient faints, should not give him cordials, but allow him to revive gradually without them.

When the oppression of breathing returns, and the pulse rises, accompanied by pain in the chest, and spitting of blood, venesection should be performed again; and thus the lancet is to be used as often as the state of the circulation, the pain, and oppression of

breathing, or other circumstances call for it.   If we neglect this rule, we are certain of losing the patient.

When the paroxysms of pain, the sense of suffocation, and the internal hemorrhage are lessened, but the cough is severe, we may prescribe digitalis or hyoscyamus, with small doses of the acetate or muriate of morphia, and saline medicines.

When much cough and pain in the chest continue, after bleeding has been carried as far as practicable, a blister may often be applied to the chest, with great benefit; and, sometimes, leeches or cupping may yet be ventured upon, though venesection itself is not any longer admissible.

When matter forms in the cavity of the pleura, after a wound of the chest, constituting *empyema*, or when the extravasation of blood in the chest causes urgent danger by its pressure, the indication is to make an outlet for the discharge of such fluids; but, if the wound should not be closed, we ought to avail ourselves of the opening already existing for this purpose; and, with this view, direct the patient to lie in a posture that will render the wound depending.

In former days, when *blood* was *extravasated in the chest*, surgeons used to make themselves particularly officious about its evacuation, sometimes using tubes and syringes for the purpose. But, at present, we never hear of such schemes being put in execution.   This part of surgery, however, is sometimes attended with a great deal of perplexity; for we have two dangers to contend against,—one is that of letting the patient die of suffocation from the pressure of the blood on the lungs and diaphragm, if no opening be made for its discharge; the other is that of seeing him fall a victim to continued hemorrhage if such opening be made.   I believe, however, that the experience of army surgeons, who are the best and most experienced judges of this subject, will justify me in saying, that we shall generally act with most prudence if we do not hastily adopt schemes and contrivances for discharging blood from the chest, but rely upon rigorous antiphlogistic treatment.   The diagnosis also is rarely so clear, with regard to an extravasation of blood, as to justify the performance of an operation for its evacuation.   At all events, we should not be in too great a hurry to make an opening in the chest; but give nature an opportunity of doing her best, under the assistance of the treatment which I have advised.

Sometimes wounds of the chest are complicated with protusion of a portion of the lungs: one such case was brought to me at Brussels after the battle of Waterloo.   The protruded piece of lung was of a long, narrow, tongue-like form, and severely contused. The wound had been made with a lance.   I thought at first of cutting the protrusion off, but the bleeding made the inclusion of it in a ligature necessary.   The patient, I believe, did not ultimately recover.

EMPHYSEMA,

Or the inflation of the general cellular tissue, is frequent in cases of
fractured ribs with wounded lungs, because the air has no outlet,
the skin being entire. It seldom occurs as a complication of a
free and direct wound, but chiefly of those, whose orifices are nar-
row, and whose direction is oblique, as is the case with punctured
wounds in general. It is not uncommon in cases of gunshot
wounds of the chest, their orifices being blocked up by the swel-
ling around the wound, and the sloughs within it. Emphysema is
not confined to examples of penetrating wounds of the chest, or of
broken ribs, but may take place in any situation in the vicinity of
the organs and apparatus of respiration. Hence, emphysema of
the eyelids from fractures of the os ethmoides, os unguis, or fron-
tal sinus, or from a laceration of the mucous membrane of the
nose.*

The symptoms of emphysema are, great oppression of the
breathing, inability to lie down, or a preference to an upright or sit-
ting posture; a colorless, elastic, crackling tumor, beginning near
the wound or fractured rib, and often extending with great rapidity,
so as to cause sometimes an enormous distension of the cellular
tissue of every part and region. The chief cause of danger, how-
ever, is not this diffusion of air in the subcutaneous cellular tissue,
but its insinuation into the interlobular cellular tissue of the lungs,
and its accumulation in the cavity of the pleura,—two circumstan-
ces causing a perilous obstruction of the function of respiration.
Emphysema is also frequently combined with the danger depending
upon inflammation, effusion of blood, or lodgment of foreign bodies
in the chest.

Experience proves, that when emphysema is restricted to a mode-
rate space, and only a few cubic inches of air are within that space, it
is readily absorbed again. But circumstances are different, when it
has passed, not only into the whole of the cellular tissue under the
skin, and between the muscles, but into that of the viscera of the
thorax, and even of the abdomen; and likewise into the great cavi-
ties lined by serous membranes. The mechanism, by which the
air is impelled into the cellular tissue, is an interesting part of the
subject. When, in consequence of previous inflammation of the
chest, there exist organised adhesions between the two pleuræ, and
a continuity of tissues is thus formed between the surface of the
lung and the parietes of the chest, emphysema is very easy of com-
prehension. The air then passes from the interior of the lungs into

---

* See Dupuytren, Leçons Orales, t. i. p. 123. A footman, in the service of the
Duke of Sussex, was lately under my care in University College Hospital, with a
fracture near the inner side of the right orbit, accompanied by emphysema.

the interstices of the new organisation, and afterwards, gradually making its way through the parietes of the chest, gets into the submuscular and subcutaneous cellular tissue. Here we are supposing the weapon, or point of a fractured rib, to have pierced the lung precisely in the seat of such adhesions. But, when there are no adhesions, the air, which is inspired, partly escapes from the breach in the surface of the lung, and passes at first into the surrounding tissues and cavity of the pleura. Thence it is next forced by the influence of the contraction of the chest in respiration. The expansion, or act of inspiration, draws the air first from the breach in the lung into the cavity of the pleura, and thence it is propelled into the cellular tissue adjoining the wound in the side, by the diminution in the capacity of the chest in each expiration. In other words, each inspiration draws it out of the rent in the lung into the cavity of the pleura, and each expiration pumps or compresses it out of that cavity into the cellular tissue, for it cannot return into the air-cells, on account of their being already full of air themselves. Its progress over the body is also, no doubt, facilitated by its own elasticity. The quantity of it, thus diffused, is sometimes enormous, filling not only the parietes of the thorax and abdomen, the upper and lower extremities, the loose cellular texture of the scrotum, the neck and head, but also the pleuræ, the mediastina, the pericardium, and even the interlobular cellular tissue of the lungs.

The *treatment* varies according to the degree of emphysema, and the urgency of the symptoms arising from it. In cases of only moderate extent, attended with broken ribs, a compress may be applied over the swelling, and then a bandage round the chest, followed up by venesection and opening medicines. The object of the bandage is to suspend the action of the intercostal muscles, and to make the patient breathe entirely by the diaphragm, so as to promote, on the one hand, the union of the fractured rib, and, on the other, to resist, as much as possible, the causes of emphysema. In emphysema of great extent, as I have explained, one principal risk proceeds from the accumulation of air in the cavity of the pleura,—a state indicated by a metallic tinkling sound, compared to the dropping of shot into a porcelain basin; and, therefore, when scarifications do not give relief, and there is reason to believe, that air is confined in the chest, we should make a deeper and freer incision over the broken part of the rib, or enlarge the original wound, and puncture the pleura costalis.

Slight scarifications and a bandage round the chest will tend to prevent the increase of emphysema in the common cellular tissue: and may, indeed, be of important utility in hindering its extension into this texture so far as to reach the interlobular cellular substance of the lungs. Yet, in more aggravated cases, I believe with Baron Dupuytren, that they are inefficient means, and also that the pressure of the bandage would really make the state of the breathing

worse.   In urgent or rapidly increasing cases, therefore, perhaps, the most prudent plan is to make an incision, and then cautiously puncture the pleura costalis.   However, nothing will answer, if the cellular tissue of internal organs is already much inflated.

The place for the incision and puncture is determined by the fracture, or original wound, where the air first escapes from the chest; but, when the intention is to let out blood, water, or purulent matte, we are to divide the integuments over the space between the sixth and seventh ribs, where the indigitations of the serratus magnus meet those of the obliquus externus, and, having cut through the intercostal muscles, cautiously puncture the pleura.

The incision through the intercostal muscles should be made away from the lower edge of the rib, where the chief branch of the intercostal artery runs.
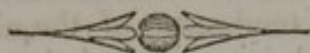
DISEASES OF THE BREAST.

The classification of diseases of the breast, adopted by Sir Astley Cooper, is,

First, into diseases, *the result of common inflammation,* whether *acute,* or *chronic.*

Secondly, into diseases *accompanied by peculiar* or *specific action,* but which are *not malignant,* and *do not contaminate other structures.*

Thirdly, into others, which not only *consist in local, malignant, and specific actions,* but *are connected with a peculiar and unhealthy state of the constitution,* and affect with similar disease, besides the part originally attacked, others in the neighborhood, and even sometimes remote parts.

The first class of diseases comprehends: 1. *Acute inflammation* of the breast, and the *milk abscess.*   2. *Chronic inflammation,* terminating at length in *suppuration.*   3. The *lacteal tumor,* so called by Sir Astley Cooper, on account of its arising from obstruction of one of the lactiferous tubes, as an effect of chronic inflammation. To this arrangement I shall confine myself, after noticing a few diseases of the nipple.

DEFICIENCY OF THE NIPPLES, OR THEIR NUMBER GREATER THAN USUAL.

Sometimes there is *congenital absence of the nipple;* sometimes it is *accidentally obliterated* by wounds, pressure, a burn, venereal, or other forms of ulceration.   Under any of these circumstances, there is an impediment to the excretion of the milk, which can only

be determined from the breast, as much as possible, by the action of purgatives.

The *nipples may exceed their usual number*; for instance, there may be two on each breast, or even as many as five.* The removal of the superfluous nipples is evidently the proper measure; but, as there is a risk of mistaking the natural nipple itself for the abnormal ones, Boyer may be right in advising the operation to be deferred until after the birth of the first child, when the true nipple will be ascertained.

Sometimes the *nipple is imperforate* from birth. This condition may not become known until after the subject of it has been delivered of her first child. Such a case is generally incurable.

EXCORIATIONS.

The greater number of women who suckle for the first time, experience, more or less, tenderness of the nipple. But, frequently, in consequence of being incessantly irritated by the child's mouth and the lodgment of milk upon it, it inflames, and becomes *excoriated*.

Various plans of relief are adopted for *excoriations of the nipple*. One consists in letting the infant suck only at longish intervals, and keeping the part covered with a piece of fine soft linen. If this should not answer, the nipple may be bathed several times a day with the lotio plumbi acetatis, or the linementum calcis. Sir Astley Cooper prefers an application, composed of ℥ j. of borax, ℥ ss. of alcohol, and ℥ j. of water. M. Velpeau, if simple ointments fail, employs a weak solution of the nitrate of silver, or sulphate of zinc, or an ointment containing white precipitate.

But it is always to be recollected, that the child's suction is the exciting cause of the complaint, and that several of the applications above specified, would be productive of inconveniences, if allowed to remain on the nipple when the infant sucks. Hence, under such circumstances, an artificial nipple, made to fit accurately, is sometimes deemed one of the best means of relief. With the aid of this, and cleanliness, and some of the applications enumerated, a cure is generally accomplished in a few days.† In some cases, the child should take milk chiefly from the opposite breast.

ULCERATED FISSURES, OR CRACKS IN THE NIPPLE,

Which arise from the same causes as excoriations, may occur on different points of the areola, or on the nipple itself. In consequence of being stretched and irritated whenever the infant sucks,

---

* Acta Havniens, vol. iii. Obs. 98.
† See Velpeau, Mal. du Sein. p. 4 8vo. Paris. 1838.

they extend more and more deeply, and cause acute suffering. Sometimes they become so large and deep, that, whenever disturbed by the child, they bleed profusely; and, occasionally, they penetrate the base of the nipple so far, that the latter part is in danger of being completely detached. Hence, from the severity of the inflammation the secretion of milk and suckling are sometimes quite interfered with.*

The treatment should be like that of excoriations; artificial nipples being here even more necessary. The applications in common use are the calomel and lime water lotion: zinc ointment; or the nitrate of silver; with which all the surface of the fissures should be carefully rubbed at intervals. I concur with M. Velpeau in thinking lotions of the bichloride of mercury improper, as likely to poison the infant.

In women, who have long ceased to suckle, the nipple is sometimes attacked with a combination of *chronic eczema* and *psoriasis*. In two cases, recorded by M. Velpeau, the disease had continued for several years, attended with itching, and thick greenish, or yellow scabs, but no inflammation. He ascribes its commencement to the friction of the corsets against the breast. One patient was cured by the use of an ointment, containing white precipitate; the other submitted to the excision of the diseased nipple.

THE LACTEAL SWELLING,

Is confined to the nipple, and consists of a large collection of milk, partly fluid, and partly coagulated, often mixed with pus, in one of the lactiferous tubes, the aperture of which has been stopped up by chronic inflammation. It is a disease analogous to ranula. The swelling presents a distinct fluctuation; the cutaneous veins are large; but the color of the skin is not changed. If a slight puncture be made, it soon heals, and another accumulation takes place; or, if a small ulcerated opening form, a little way from the nipple, it continues during the period of suckling, and the milk, instead of passing into the child's mouth, is lost.

The origin of the lacteal tumor is referred by M. Velpeau to sudden exposure of the breast to cold; too abundant a secretion of milk; and too long retention of it. Rough suction of the nipple, and the free use of cordials, will also promote its occurrence.

A puncture of moderate size will suffice, if the child is weaned; if not, a larger opening must be made, so as to let the milk escape while the child is sucking, until the secretion of milk ceases, or the child is weaned. This is the advice given by Sir Astley Cooper.

If a small *lacteal fistula* were to be left after the puncture, or to

---

* See Velpeau, Op. cit. p. 6.

follow an abscess communicating with one of the lactiferous ducts, M. Velpeau is in favor of touching it at intervals with the nitrate of silver, and applying astringents. This practice he finds almost always successful. If it should not be so, he recommends injecting, twice a day a weak solution of nitrate of silver, or alum, or lotions containing tincture of iodine, or red wine. Were this plan not to succeed, he would dilate the orifice in the skin, and apply the nitrate of silver freely to the inside of fistula. By one or the other of these methods, M. Velpeau has never met with a lacteal fistula that was not cured. If the patient were not obliged to suckle, these means would cure the fistula still more quickly. Compression, and internal medicines might also be employed.* Dupuytren gives an account of cysts filled wih a *milky* or *buttery matter*, which he had found in the breast†; and which contained a milky substance either in a liquid, half-liquid, or imperfectly curdled state; but M. Velpeau is not aware that solid tumors, really formed by the milk have been hitherto described. Certain irritations of the texture of the breast, he conceives, may lead to infiltration of the milk out of the lobules or excretory ducts of the mammary gland, so as to form abnormal collections of it, just as blood is extravasated from its vessels as a consequence of blows. M. Velpeau, in 1838, attended a woman, whose breast was transformed into a spongy, highly-sensible mass; an exploratory puncture was made in it, and a quantity of milky fluid was discharged, which manifestly issued from the cellular tissue. But he is of opinion that the actual escape of milk from its proper vessels is not essential to the production of true accumulations of it. The lactiferous tubes may be dilated, and transformed into cysts of considerable size.

[This enlargement arises from a closure of one of the lactiferous tubes, the true glandular structure, with which the tube is connected, being in a normal state. It occurs only during lactation, is rather slow in its growth, and is unaccompanied by pain. Whenever the gland secretes, the milk is thrown into the obstructed tube, which dilates sometimes to an enormous size. Sir Astley Cooper says these tumors sometimes contain several ounces. The following case, is the most remarkable for size on record. The patient was a healthy Irishwoman about thirty years of age, who presented herself at my clinique in January, 1842. She had been nursing her child about nine months. About six weeks before I saw her, she discovered a tumor in the breast, which she could not trace to any cause, as she had received no injury, and had felt no pain. The breast was enormous, and there was evident fluctuation. On being punctured, three quarts *by measure* of apparently good milk were drawn off. She was directed to wean her child, and return the next week. She came as desired : the wound had closed, and two quarts more of milk had accumulated in the breast, which were again drawn off. The milk

---

* Op. cit. p. 48.   † Poillard, Jour. Hébdom. 1829.

seemed sweet and unchanged, and produced on standing, a large amount of cream. After this time I did not see the patient.

These tumors are generally cured with great ease, by puncture and weaning the child. Ed.

Vid. N. Y. Med. Gazette for January 1842.]

M. Velpeau believes, that milk effused in the breast may, like extravasated blood, remain a long while, and be the cause of much pain; or, that it may be decomposed, and lead to the formation of a cyst filled with serum, if the curd is first absorbed, or filled with semi-fluid matter, if the serum is first taken away. In other cases, the effusion of milk may cause inflammation and milk abscess; or, again, in others, being once coagulated in the lactiferous tubes, or interlobular tissues, it may become blended with the fibro-cellular element, concrete, and harden more and more, and thus produce what M. Velpeau terms a *buttery* or *caseous tumor* of the breast. It is less necessary for us to adopt the foregoing theoretical explanation, than to remember the fact, that the breast is liable, to tumors of this nature, which sometimes attain a large size. It is curious to learn also, that, in the case recited by M. Velpeau, tumors of the same kind were developed secondarily, as medullary masses in the axilla, and under the clavicle. The tumor of the breast itself, after being completely removed, was reproduced.* These latter particulars lead me to suppose that, whatever might have been the first state, or cause of the formation of this tumor, it was afterwards of the nature of medulary cancer; a disease, which, in some of its varieties, we know is as liquid as cream or milk; though in others of the encephaloid consistance or even much firmer, as exemplified in Abernethy's mammary sarcoma.† The great size which the swelling of the axillary glands attained, viz., that of a child's head, and its lobulated shape, tend to confirm the view to which I incline. However, caseous matter is described as issuing from ulcerated parts of the tumor; and M. Donné, who, in one instance, examined the substance compared to cheese, or butter somewhat altered, found in it numerous globules, which, in the microscope, resembled those of milk, and, like them, were found also to be soluble in ether, and alcohol, and insoluble in ammonia. They were likewise blended with mucous globules, and the minute granular bodies, characteristic of colostrum.

In the *treatment* of solid milk tumors of the breast in the early stage, and where the milk appears to be diffused in the breast by infiltration, M. Velpeau recommends leeches, or even venesection, and active purgatives, followed by liniments of camphor or ammonia. But, if distinct lobulated prominences present themselves, quite concrete, and the diseases of long standing, he deems the ex-

---

* Velpeau, Op. cit. p. 83.
† See Carswell's Elementary Forms of Disease.

tirpation of the tumor the only chance of saving the patient. I apprehend, however, notwithstanding some particulars calculated to support his view, that my friendly correspondent, M. Velpeau, may have mistaken a variety of medullary cancer for a tumor composed at first of effused, and afterwards of curded, milk.

ACUTE INFLAMMATION AND MILK ABSCESS.

Inflammation and abscesses of the breast admit very well of the division adopted by M. Velpeau, into the *subcutaneous*, the *deep*, or *submammary*, and *those of the mammary gland itself*.

Women, during the period of suckling, are particularly liable to inflammation and suppuration of the breast: hence, the term *milk abscess*. The inflammation is of the phlegmonous kind, exhibiting all its usual characters; but, on account of the sensitive nature of the part, and the envelopment of it in a dense cellular or fascial covering, not readily yielding to inflammatory swelling, the suffering is uncommonly severe. A solid swelling is produced, succeeded by a blush of inflammation on its surface, and at length a prominence and smoothness in one particular situation, where the fluctuation of matter may be felt.

The most frequent cause of *milk abscess* is the great determination of blood to the breast each time the child is about to suck, by nurses called the *draught*, combined with the mechanical iritation, to which the part is continually subjected. The origin of such abscesses is sometimes promoted by the child not being put to the breast soon enough after birth; consequently the breast becomes too full; and this state, influenced by the stimulating diet often pressed upon mothers by nurses, soon ends in acute inflammation.

In the early stage, we may sometimes bring about resolution by employing cold evaporating lotions, leeches, and purgative medicines. All action of the great pectoral muscle should be prevented by keeping the arm in a sling; and the patient, when in bed, should lie on the opposite side. If the breast be very large, some practitioners keep it supported with a bandage; a method, which I do not usually follow. Amongst the causes of this complaint, I have mentioned the mechanical irritation and disturbance of the breast in suckling. Hence, I always advise the mother not to allow the child to suck the inflamed breast; and, if it be necessary to draw the milk from it, recommend the use of a glass tube made for the purpose.

When an abscess cannot be prevented from forming, cold applications are to be discontinued, and emmolient poultices and poppy head fomentations substituted for them.

With respect to the question of opening the abscess, I may observe, that if the collection of matter be superficial, not attended with extreme pain, and quick in its progress to the surface, it is not

of great consequence, whether the abscess be opened, or allowed to burst of itself; but when the abscess is deep, its progress tedious, and the pain severe, and accompanied by fever, the matter should be let out. But, even with regard to the most superficial abscesses, some practitioners prefer opening them at once, so as to obviate all risk of the skin becoming undermined by them. I see no objection to the practice, for otherwise sinuses may form, and the cure be rendered more difficult and tedious. "Abscesses in cellular and fatty texture of the breast," says M. Velpeau, "should be opened, and this very freely as soon as a fluctuation can be plainly felt. I will add, that making a puncture in the centre of such abscesses, even before they are completely mature, appears to me to check their progress, and promote their dispersion." The puncture should be made in a depending situation, and if the skin be extensively thinned, or sinuses exist, incisions should be made at different points.*

Some cases are exceedingly obstinate, in consequence of several abscesses following one another in succession. Here the administration of opium and the sulphate of quinine will be found beneficial; and when a deep-seated abscess, in consequence of not being opened freely or soon enough, leads to the formation of sinuses in various directions, which continue to discharge matter for a long time, if they cannot be healed by pressure, we may follow Sir Astley Cooper's plan, which is, to inject into them a lotion of rose water, with every ounce of which two or three drops of concentrated sulphuric acid are blended, and apply the same lotion to the surface, and sometimes a bandage: Mr. Hey, of Leeds, was an advocate for laying open all sinuses of this kind; and M. Velpeau strongly insists upon the advantages of such practice, with the condition, that it be restricted to cases, where the fistulæ have existed several weeks or months, and ordinary incisions and other means have failed. While M. Velpeau gives his testimony in favor of opening *superficial*, *subcutaneous*, and *submammary* abscesses of the breast early, he recommends not opening those of the mammary gland itself, until a fluctuation is very distinct. In the latter cases, also, he finds, with M. Donné, that the milk secreted contains numerous globules of pus; and hence, he objects to the child being put to the breast in this state.†

Chronic abscesses of the breast occur chiefly in scrofulous constitutions, and are much less frequent than acute or milk abscesses. The matter ought to be let out, and an attempt made to improve the general health, by some of the plans mentioned in the general observations upon scrofula. The state of the uterine functions, in particular, should always be inquired into; for they are often disordered, and then aloëtic and steel medicines are indicated.

---

* Op. cit. p. 26.   † Id. p. 39.

With regard to diseases of the breast, arising from peculiar or specific action, but not malignant, I will first notice

HYPERTROPHY OF THE BREAST,

Especially that, which M. Velpeau names *glandular*, is more frequently met with in the Indies, America, England, and Germany, than France.   The principal cause of hypertrophy of the breast is ascribed by Sir Astley Cooper to celibacy; and, according to his observations, it occurs principally between the ages of thirty and thirty-five.   He mentions a girl, only fifteen years old, whose breast, of a pyriform shape, and extending over the abdomen, was twenty-three inches and a half in circumference.   One case is also recorded, in which the breast descended to the knees, and weighed thirty pounds.   Others deem the age of puberty that in which this hypertrophy is chiefly noticed.   As the swelling is not at first attended with pain, nor with any serious functional disturbance, its commencement does not excite much attention.   The menses, however, are lessened in quantity, or are irregular, or even suppressed.   The voice is also affected, and patients seem hoarse.

As the state of the mammæ is intimately dependent upon that of the womb, M. Velpeau regards marriage and pregnancy as the most likely mode of checking hypertrophy of the breast.   The internal exhibition of iodine is also recommended, with iodine baths, and then rubbing the breast with an ointment, containing either the ioduret of lead, the iodide of potassium, or mercury.   A vegetable diet is preferable to animal food, and a suspensory and compression are not to be neglected.

HYDATED TUMORS

Were so named by Sir Astley Cooper, who has described several forms of them.   Since the expression *hydatid* would lead us to suppose, that the disease always consisted, not of adherent cysts, but of detached globular ones, endued with separate vitality, independent of the texture in which they are formed, many surgeons prefer the term *cysts of the breast*.

The tumor is characterised by a tendency to increase to a considerable size; but it is not prone to malignant change; nor does it occasion any inconvenience, except what proceeds from its bulk. At first, it feels entirely solid, but after a time a fluctuation can be distinguished at certain points.   The tumor is very moveable and pendulous.   Sometimes the cysts ulcerate, discharge a serous fluid, and then heal, or even become obliterated.   No local applications are of any service.   If there be only one large cyst, and it be punctured, sometimes it will not fill again.   The only reason for removal in this kind of disease, when it becomes large, is to relieve the pa-

tient from the annoyance produced by its bulk. All the swollen and indurated parts must be taken away, for if any small cysts remain behind, the disease will recur. The glands in the axilla are either free from disease, or only enlarged from irritation. M. Velpeau doubts whether the extirpation of a serous cyst of the breast is ever indispensably necessary. He would prefer making a puncture with a small trocar, emptying the cyst, and then injecting a lotion consisting of ℥ij. of the tincture of iodine in each ounce of water. He has tried the plan, however, only in one case, but with complete success.*

As for *swellings of the breast consisting of globular hydatids*, an incision should be made in them, and the bag extracted, after which the part will heal. The disease is characterised by a central fluctuation, a solid circumference, and freedom from tenderness on pressure. The disease is of an innocent nature. Dr. Warren describes one case, in which the tumor weighed twelve or thirteen pounds.†

CHRONIC MAMMARY TUMOR.

The substance of the female breast is liable to a slow kind of induration,—a swelling that grows from its surface rather than from its interior, and therefore seems to be superficial, except when it grows from the posterior surface of the breast. It is exceedingly moveable; not buried in the mammary gland, but only connected to its surface; not generally painful, nor tender when touched; its growth is slow; and its weight seldom more than from one to four ounces. It is not malignant, and often remains stationary for years, and then disperses. The disease seldom occurs in persons after the age of thirty.

The tumor, when taken out and examined, is loblulated, and at first view something like the mammary gland itself: it is contained in a cyst. The cause of the chronic mammary tumor is generally sympathy of the breast with the uterus, producing great determination of blood to the part; but blows and the pressure of stays may likewise excite it.

When the digestive functions are deranged, we may try the compound calomel pill at night, with the infusion of calumba and rhubarb and carbonate of soda twice a day. When the uterine functions are disordered, we may prescribe small doses of the blue pill, with extract of colocynth and steel medicines.

Sometimes the tumor yields to the internal and external use of iodine. The emplastrum ammoniaci cum hydrargyro is a common application. The disease does not require to be extirpated, nor, as Sir Astley Cooper observes, is it any impediment to matrimony; for, in fact, pregnancy and suckling rarely fail to make it disappear.

---

* Op. cit. p. 70.   † Warren on Tumours, p. 206.

SCROFULOUS SWELLINGS OF THE BREAST

Are occasionally seen in young women, who have enlarged lymphatic glands under the jaw. In general, there is only one tumor, and it is exceedingly indolent. There is no disposition to malignancy, and, of course, it would be improper to have recourse to extirpation. The treatment is like that of scrofulous diseases in general.

IRRITABLE TUMOR OF THE BREAST.

The breast is sometimes the seat of severe pain, without any distinct or perceptible swelling. Such an affection might be called *neuralgia* of the breast; but occasionally, besides excessive pain in the part, there is also a tumor, composed of a structure unlike that of the gland itself, and which therefore appears to be a specific growth. When the glandular structure is the seat of it, one or more of its lobes become exquisitely tender; and, if handled, the pain will sometimes continue for several hours, extending to the shoulder, axilla, down the arm, and even to the side of the body. When the pain is most severe, which is often the case prior to menstruation, the stomach frequently sympathises, and the patient is troubled with vomiting. The *irritable* tumor is most common between the ages of 16 and 30.

Sometimes a distinct circumscribed tumor is noticed, highly sensitive to the touch, acutely painful at intervals, more especially just before menstruation, very moveable, often not larger than a pea, and rarely exceeding the size of a marble. Although the disease may continue for years, it varies but little in size, hardly ever suppurating, but occasionally disappearing of itself. In the general account of tumors, I have already noticed this disease, under the name of *painful tubercle*, as affecting other parts. The tumor, when taken out and examined, is found to be composed of a solid semi-transparent substance, with fibres interwoven with it; but, according to Sir A. Cooper, no large filaments of a nerve can be traced into it.

Equal parts of soap cerate and extract of belladonna may be applied; or a bread poultice made with a solution of the same extract. Or the part may be protected with a piece of oil-skin or hare-skin. Leeches are proper during the violence of the pain.

As internal remedies, we may try calomel with opium, and hemlock with purgatives. If the menstrual secretion be interrupted, the mistura ferri comp., combined with aloes, may be prescribed.

The breast is also liable to the greater number, if not all the varieties, of *tumors* noticed in our first section.

THE ECCHYMOSE DISCOLORATION OF THE BREAST

Is a morbid change, sometimes occurring in young women at the time of menstruation, preceded by severe pain in the breast and arm. Velpeau notices its occurrence also sometimes in women arrived at the critical age. The extravasation of blood makes its appearance as a large spot, with smaller and less conspicuous ones in other places. In general, it gradually disappears after menstruation. According to Sir Astley Cooper's views, the indications are, 1st, to render the menstrual discharge more regular, by means of steel medicines; and, 2d, to support the strength by means of sulphate of quinine, given with infus. rosæ comp. The best local application is the alig. ammon. acet. with spirit of wine, five ounces of the former to one of the latter. M. Velpeau does not consider any active treatment usually requisite, as the discoloration and pain almost always subside of themselves in a fortnight or month; but, if a contrary case presented itself, he would try one general bleeding, leeches to the breast, a discutient lotion, and purgatives and emmenagogues.

With respect to the *third class of diseases* of the breast, or the *malignant*, it comprises scirrhous and medullary cancer, the nature of which has been treated of in the first section of this work.

WOUNDS OF THE BELLY

Are divided into two principal classes: in one, the solution of continuity is confined to the integuments, muscles, &c. exterior to the peritoneum; in the other, this membrane is penetrated, and frequently some of the viscera. Wounds, which do not extend through the peritoneum, are not materially different from those of ordinary textures, and are to be treated on principles applicable to wounds in general. However, if the injury penetrate more deeply than the integuments, the parietes of the abdomen generally remain weakened at the part; and, firm as the cicatrix may appear, if it be not supported with a bandage, it is liable to become the seat of a hernial protrusion.* Severe contusions of the skin and muscles of the belly are also sometimes followed by such an incapacity of resist-

---

* Richerand, Nosographie Chir. t. iii. p. 322. ed. 2. Schmucker relates a case, which followed puncturing an abscess of the abdomen with a lancet, Vermischte Chirurgische Schriften, band. i. p. 797. See also a case by Wardrop, in Sir A. Cooper's work on Crural and Umbilical Hernia, p. 60.

ance in them, that they yield to the pressure of the contained parts, and a particular kind of hernial tumor is the consequence.

A spent ball, striking the belly, may rupture the rectus muscle and aponeuroses of the abdominal muscles, so as to produce at once a protrusion of the viscera; while the integuments, on account of their greater elasticity, continue unbroken.* In other examples, the ball, in its rotation over the circumference of the abdomen, not coming against any hard projecting part, depresses the parietes of the belly, and produces deeper mischief amongst the viscera, succeeded by inflammation, a copious effusion of bloody serum in the cavity of the peritoneum, and other fatal effects.† In a case that had a favorable issue, a cannon ball carried away the integuments, a piece of the left os ilium, and the attachments of the broad muscles of the belly, exposing a part of the sigmoid flexure of the colon.‡

Sometimes, in consequence of punctured wounds, or violent blows, matter forms in the tendinous sheath of the rectus muscle; and when the abscess bursts, or is opened, several pints of pus are unexpectedly discharged. The nature of this case should be remembered, as there is frequently no change of appearance in the integuments, denoting either the suppuration, or its extent. Such an abscess ought always to be opened early, and in a depending situation. The same practice is advisable, when purulent matter collects between the layers of abdominal muscles, or between these muscles and the fascia transversalis, and the peritoneum.

Except when a wound of the belly is free and direct, attended with protrusion of the bowels, or the escape of feces, chyle, fetid air, bile, &c., the fact of its having penetrated the cavity of the abdomen is generally somewhat obscure. Authors do, indeed, advise us to compare the direction of the stab with the ordinary thickness of the abdominal parietes at the wounded part, and the breadth of the wound with that of the weapon with which the injury has been inflicted. When the instrument has entered perpendicularly at a place where the parietes are thin, and when, notwithstanding the narrowness of the end of the weapon, the division is rather broad, it is inferred that the wound is of the penetrating kind. This mode of judging, however, must generally be fallacious, on account of the frequent impossibility of learning the exact direction of the thrust, or of obtaining a sight of the instrument. Also when a probe will pass perpendicularly into the wound for a certain distance, it is concluded, that the injury extends into the abdominal cavity. But it must not be posi-

* Larrey, Mém. de Chir. Mil. t. iii. p. 332.
† Op. et vol. cit. p. 334.
‡ See in Hennen's Mil. Surgery, p. 452., a case, in which nearly all the anterior parietes of the belly were torn away, leaving the lacerated peritoneum exposed. The injury was not immediately fatal.

tively inferred, that the wound does not penetrate because a probe cannot be thus introduced; for its passage may be stopped by the several layers of muscles not having exactly the same situation with respect to each other which they had at the moment of the injury. In short, unless the wound be straight, a probe can hardly be made to follow its course. The local symptoms, then, of a simple penetrating wound are frequently not to be depended upon, and the employment of probes and injections for ascertaining the point is more likely to do serious harm then real good. Nor can certain information always be deduced from a consideration of what may be called the *general* symptoms; a small, feeble, contracted pulse; pallid countenance; cold extremities; great and sudden debility; hiccough; vomiting; and spasms. Several of these effects frequently take place in irritable, timid, nervous subjects, without any parts being injured in addition to the skin and muscles; and they are frequently absent when the weapon has actually entered the peritoneum. I am far from meaning to say, however, that such indisposition is to be disregarded; on the contrary, it seems to me, that particular attention ought to be paid to the symptoms in question; because, if they do not soon subside, there are then strong grounds for suspecting something more than the effects of a common superficial wound on an irritable, timid subject. But, in the beginning, unless the wound be large, or a protrusion of the viscera, or a discharge of bile, chyle, or feces, take place, there is generally a degree of uncertainty with respect to the depth of the injury. At the same time, it is not to be concluded that the wound does not penetrate because no protrusion nor extravasation happens; for a narrow stab may extend into the abdomen, even amongst the viscera, without giving rise to either of these accidents.

There is in these cases a class of symptoms which Ritchter* and other writers denominate *particular*, from their evincing what bowels are wounded; as, for instance, bloody urine, when the kidneys and urinary bladder are injured; vomiting of blood, when the stomach is pierced; discharge of blood with the feces, when the large intestines are wounded. Symptoms like these must of course throw considerable light on the nature of the accident.

With regard to our not being always able to pronounce whether a wound penetrates the cavity of the belly or not, the want of precise information on this point is of little practical importance; for, if the case be not complicated with any urgent symptoms, the treatment should obviously resemble that of a simple wound.

The principal danger of penetrating wounds of the belly partly arise from internal hæmorrhage, or extravasation of the contents of the viscera; but in a still greater degree, from the strong disposition

---

* Anfangsgr. der Wundarzn. b. v. p. 7.

of the peritoneum to inflammation. With the exception of persons who die instantly or in a few hours, from internal bleeding, &c., nine tenths of those who die from penetrating wounds of the belly, are cut off by peritonitis. They who perish with extravasation of the contents of the bowels, also die in fact from peritonitis, which is generally excited partly by the injury, and partly by the irritation of the effused matter. Many authors represent the danger of a penetrating wound of the belly, as principally arising from the entrance of air into the cavity of the peritoneum. But, according to my ideas, it is the wound itself that excites the peritonitis, by which the patient is destroyed; and the same fatal inflammation would come on with equal frequency, were the wound entirely excluded from the air. The cavity of the belly is always so completely occupied by the viscera, that the whole inner surface of the peritoneum is constantly in close contact with them, and, therefore, the air cannot so easily enter within that membrane as some writers seem disposed to believe.

WOUNDS IN WHICH THE VISCERA PROTRUDE, BUT ARE UNINJURED.

When a portion of intestine or omentum protrudes, the sooner it is returned, the more effectually will the irritation, arising from its exposure and constriction be prevented. Fomenting the protruded bowels, as is sometimes recommended, would be absurd; for what application can be so congenial to them, as the natural warmth and moisture of that cavity into which they ought to be immediately reduced? And is it possible to suppose, that the efficacy of any artificial fomentation will make amends for the harm, resulting from continuance of the bowels in a state of exposure and constriction? In order to promote the reduction, the muscles of the abdomen should be relaxed; but, whether we ought to waste any time in giving clysters to empty the large intestines, previously to attempting to return the parts, is a question, on which I entertain the same sentiments as those delivered on the subject of fomentations. The mesentery is always to be returned before the intestine; and the intestine before the omentum; but the last protruded portion of each of these parts ought to be first reduced. In the reduction, care must be taken that the bowels are completely returned into the abdomen, and are not pressed between the layers of the abdominal muscles, or into the sheath of the rectus muscle.

When the distention of the protruded intestine with air or feces creates a difficulty of reduction, its contents may frequently be gradually pressed into that portion of the intestinal canal which is within the abdomen, and the gut may then be returned. But, if this plan were attended with difficulty, I should prefer dilating the wound to much handling of the bowel.

When the protruded bowel is distended with air, Paré and others recommend making small punctures in it with a needle, so that the air may escape, and the intestine collapse. This proposal is justly rejected from modern surgery, both on the grounds of danger and inefficacy. The small apertures made with a round needle will not discharge the air; for they are closed by the mucous coat*, and the making of larger punctures, as suggested by Desault†, would be far more dangerous than dilating the wound. When it is absolutely necessary to enlarge the wound, the delatation should be made in a direction which will not endanger the epigastric artery; and, if possible, parallel to the muscular fibres.

When the protruded intestine is already inflamed, its immediate reduction is, beyond all dispute, the right practice. Even when the inflammation is severe, the reduction of the part without delay, and the employment of antiphlogistic means, will often prevent gangrene. The dull, brown, dark-red color of the protruded intestine, may induce the practitioner to suppose, either that it is already gangrenous, or that grangrene is inevitable, and, consequently, he may delay returning it into its natural situation. But, notwithstanding this suspicious color of the intestine, its firmness will evince that it is not a state of gangrene, and, therefore, its immediate reduction ought to be put in practice. The recovery of a portion of intestine, so circumstanced, is always a matter of uncertainty; but the propriety of speedily replacing it in its natural situation is a thing most certain. In case it should mortify, after being reduced, all hopes of the preservation of life ought not to be abandoned.

When the omentum protrudes, and is strangulated by the narrowness of the opening, it soon contracts adhesions. Richerand has recommended us to cut off all this membrane which exceeds the level of the integuments, and not to trouble ourselves about the remainder, which, he asserts, will act like a stopper, and hinder a future hernia. If adhesions had already been formed, this practice would, perhaps, be the best, but under other circumstances, if the omentum were sound and free from constriction, it should unquestionably be reduced without delay. In cases where this membrane, besides protruding, is in a gangrenous state, certain writers authorise the excision of the dead part, and the reduction of the rest, each of the bleeding vessels having been first tied with a small silk ligature. It will be found, however, that whenever the omentum has been out so long as to slough, adhesions within the wound have had time to form; an event which would embarrass the operator, and constitute a decided prohibition to the attempt. The reduction having been effected, the patient is to be laid upon his back, with the thighs somewhat raised or bent, and he must strictly avoid mak-

---

* See Travers on Injuries of Intestines, &c. p. 176.
† Trait des Maladies Chirurg. tom. ii. p. 135.

any exertion, lest he bring on another protrusion. The wound is then to be closed with adhesive plaster, the uniting bandage, or a suture. Sewing up wounds of the belly made a long subject, in all the old works on surgery, under the appellation of *gastroraphe*, which was nothing more than a quill-suture, practised by introducing the needle through both lips of the wound from within outwards, in order to avoid all risk of pricking the bowels. In Pibrac's *dissertation on the abuse of sutures, cases are related which satisfactorily prove, that the majority of penetrating wounds of the belly may be healed very well without it; and if we wish for still more decisive proofs of the fact, we may find them in accounts of the Cæsarean operation, the extensive wound of which has frequently been healed by common means. But, though sutures are not necessary for all wounds of the belly, they may be useful under particular circumstances: for instance, were the wound of a certain size, they might be indispensable to prevent the protrusion or exposure of the bowels.

CASES WITH INJURY AND PROTRUSION OF THE VISCERA.

Penetrating wounds, attended with protrusion of the intestines or omentum, are always to be regarded as dangerous cases; but the danger is much more serious, when a portion of the intestine not only protrudes, but is wounded. Under such circumstances, we have the authority of numerous writers on surgery, as a sanction of the practice of sewing together the edges of the wound in the bowel; the true utility of which practice, however, is now a disputed point. Even the advocates of sutures here differ exceedingly, both as to the precise object in view, and the way of making the stitches. Some advise only one stitch to be made (frequently only through the mesentery); and they employ the ligature chiefly with the view of confining the injured bowel near the external wound, so that, in the event of any effusion, the matter may readily find its way outward. Other writers wish to remove the possibility of extravasation by applying numerous stitches, and attach little importance to the plan of using the ligature principally for the purpose of keeping the intestine near the external wound.

When the wound of a bowel is so small, that it is closed by the protrusion of the villous coat, the application of a suture must evidently be needless. Supposing the breach in the intestine, however, to be somewhat larger, so as to be capable of letting the feces escape, what practice ought we to follow?—As Sir Astley Cooper was operating upon a strangulated hernia, an aperture, giving issue

---

* See Mém. de l'Acad. de Chir. tom. iii. 4to. Other cases of similar success may be perused in numerous works; Journal de Médecine, tom. lxxi.; Duncan's Medical Commentaries, vol. x ; Philosophical Transactions, vol. xvi. &c.

to the intestinal contents, was discovered in a portion of sound bowel, just when the part was about to be reduced.   The operator, including the aperture in his forceps, caused a fine silk ligature to be carried beneath the point of the instrument, firmly tied upon the gut, and the ends cut off close to the intestine.   The part was then replaced, and the patient recovered.   Mr. Travers, who has related this fact, approves of the plan of cutting away the extremities of the ligature, instead of leaving them hanging out of the external wound; for the remnant always finds its way into the intestine, and is discharged by stool, without the slightest inconvenience.*

We are next to consider the case, in which the protruded bowel is still more extensively, or even totally, divided.   Here the admirers of the needle have found ample scope for their ingenuity; and since very few of them have met with cases exactly of this description in the human subject, they have made a variety of experiments on animals, in order to determine the right mode of treatment. Some of these reports are favorable to the practice of sewing up the wounded bowel.   Ramdhor is stated to have actually cut off a large part of a mortified intestine in the human subject, and to have joined the sound ends together, by inserting the upper within the lower one, and fixing them in this position with a suture; the ligature being also employed to keep them near the external wound. The patient recovered, and the feces afterwards passed entirely the natural way.†   About a year after the operation the patient died, when the anatomical preparation of the parts was sent to Heister. They were preserved in spirit of wine, and exhibited, according to this last author, a union of the two ends of the bowel and their consolidation with a part of the abdomen.   Now, it has been reasonably questioned, whether the union here spoken of ever really happened. When the upper end of the bowel is introduced into the lower, the external surface of the former is put in contact with the inner one of the latter; a serous membrane is placed in contact with a mucous one.   These heterogeneous structures are not disposed to unite. The mucous membrane, when inflamed, more readily secretes a kind of mucus, which must be an invincible obstacle to adhesion. In the case related by Heister, the invagination was probably maintained by the union of the intestine with the corresponding part of the abdominal parietes.   Several experiments on living animals tend to prove, that the mucous membrane will not unite with the external peritoneal coat.   If this be a fact, it is of course a strong argument against repeating Ramdhor's practice.   Another objection is, that the upper end of the bowel cannot be put into the lower one, unless it be separated from a part of the mesentery, and

---

* Inquiry into the Process of Nature in repairing Injuries of the Intestines, &c. pp. 112, 113.

† Haller, Disput. Anat. vol. vi.; Obs. Med. Miscell. 18.

a division of the mesenteric arteries would cause a dangerous bleeding. In vain did Boyer tie seven or eight of these vessels; his patient died with an extravasation in the abdomen.* The difficulties encountered by Moebius and Dr. Smith in their attempts to repeat this experiment on animals, are related in my Dictionary, and I need not, therefore, expatiate upon them. In short, experience is decidedly adverse to Ramdhor's practice, either in its original form, or modified by the ingenious introduction of cylinders of isinglass, pasteboard, &c. Flajani tried the artifice on several patients under his care in the hospital at Rome, but death was invariably the consequence.† I am of opinion that Mr. Travers deserves the thanks of the profession, for the attention and talent with which he has investigated the subject before us; but, with respect to the question of sutures, I apprehend that he has gone too far, when he declares that, in order to avoid abdominal effusion, the suture employed should be such as will secure the absolute contact of the everted surfaces of the divided intestine.‡

When the intestine has been completely divided with a cutting instrument, Scarpa§ is decidedly of opinion, that Ramdhor's operation cannot be undertaken with any probability of success. But, setting out of the question this bold method, at once so amusing and captivating to the inexperienced student, this eminent professor offers a variety of arguments against sewing the intestines at all, and asserts that *in all cases of penetrating wounds of the abdomen, attended with injury of the intestine, whether the canal be opened longitudinally or transversely, a suture is always not merely useless, but even dangerous and fatal.* In whatever manner it is practised, says he, one cannot avoid the evils which must originate from the punctures, however few, and from the passage of the ligatures through the coats of the intestine; a part endued with exquisite sensibility, and whose external tunic is much disposed to inflame, and rapidly to communicate the inflammation to all the other abdominal viscera. It has (says Scarpa) been unfortunately proved, by the experience of several ages, that, in most of the cases in which the intestine has been stitched in penetrating wounds of the belly, the patients have died in the greatest agony. If a few escaped the dangers of this operation, it was only because in them the stitches soon cut their way out, and were voided with the feces, which continued to escape from the wound until it was entirely healed.

All surgeons of experience, and particularly those of large hospitals, have often seen wounds of the right or left iliac region ac-

---

* Richerand. Nosogr. Chir. t. iii. p. 345. &c., edit. 4.
† Collezione d'Osservazioni, &c. di Chirurgia, tomo iii. p. 60. 8vo. Roma, 1802.
‡ Inquiry into the Process of Nature in repairing Injuries of the Intestines, p. 121.
and p 134.
§ Sull' Ernie Memorie Anatomico-Chirurgiche; mem. iv. fol. Milano, 1809.

companied with injury of the great intestine. They may also have noticed in these examples, that, after the subsidence of the local and general inflammatory symptoms, the wound still continues to discharge feces for a certain time; but that afterwards it contracts, and the excrement resumes its usual course. These wounds almost always heal* completely: first, because the adhesion of the large intestine to the parietes of the abdomen prevents the feces from being extravasated in the cavity of the peritoneum; and, secondly, because the ample capacity of the same bowel always presents a ready passage for the feces, notwithstanding the progressive, and sometimes quick, closure of the external opening.

If, in the instance of a penetrating wound of the belly, attended with injury of the small intestines, it were in the surgeon's power (as indeed it is) to return the bowel into the abdomen, so that the opening in it may exactly correspond to the wound in the abdominal parietes, there could not be a doubt of its quickly acquiring adhesions to the peritoneum, which lines the part around the internal orifice of the external wound. Hence, the feces would readily escape from the outer wound, and at length the artificial anus would close, and the feces resume their natural course, just like what happens in wounds of the large intestines. The narrow diameter of the small intestines would not make an insurmountable obstacle to the passage of the feces, if these were, as they usually are, in this part of the alimentary canal, in a sufficiently fluid state; and besides (as Scarpa observes), is it not proved by experience, that they resume their natural course, after the cure of an artificial anus, even when a considerable noose of the small intestines has been destroyed by gangrene, and when the two ends form by their reunion a very acute angle? Scarpa then feels no hesitation in admitting the possibility of curing wounds of the small intestines, without having recourse to a suture. It would not, he says, be difficult to quote examples of such cures; and one is related, which fell under his own observation. He afterwards describes the incessant pressure made by the abdominal muscles and diaphragm upon all the viscera, as the cause which makes the wounded intestine enter the external wound, and soon adhere to its edges, instead of quitting it. When these adhesions are formed, all danger of extravasation is over. He observes, that one should neglect no remedies, internal as well as external, which may be of use in moderating the patient's sufferings, diminishing the impetus of the circulation, and bringing the inflammation down to the degree suited to the formation of adhesions. He recommends keeping the external wound open, with the same precautions, and according to the same indications, which are to be attended to in the treatment of an artificial anus. The principal object of these precautions is to let the treatment be such, that the

---

* See Larrey's Mém. de Chir. Mil. t. ii. p. 161.

external wound may only diminish in proportion as the evacuation from the lower part of the intestinal canal increases.

The very nature of the process, by which the reparation of wounds or the bowels is effected, is a weighty argument against the employment of a suture. In their cicatrisation, they follow quite a different course from that of simple wound of the skin, muscles, or any other parts of the body. Their edges never become immediately applied to each other, and therefore, strictly speaking, they do not reunite. Their cure is altogether completed through the medium of the surrounding parts; that is say, by the adhesions which the intestines contract with the great sac of the peritoneum lining the cavity of the abdomen, or with the productions of this membrane, which compose the external covering of the greater part of the viscera.*

Even from the description which Mr. Travers has given of the process of reparation, in the cases where sutures are employed, we may conclude, that the stitches can be of little service; for, says he, " the action of the longitudinal fibres being opposed to the artificial connection, *the sections mutually recede as the sutures loosen by the process of ulcerative absorption.*"† Unless, therefore, it be allowable to suppose, not only that the divided portions of bowel can be sewed together so closely and accurately at every point as to remove all possibility of effusions of its contents, but that this can also be done without risk of exciting inflammation of the bowel, thus handled, dragged, and stitched, I must fully agree with Scarpa, respecting the impropriety of thus boldly sewing up wounds of the bowels with as little scruple as a hole in a glove.

In some former editions, I have said, that if a case were to present itself, in which a protruded intestine were extensively cut, or its whole diameter completely divided, I should venture to make a single stitch with a small needle and a piece of fine silk. But subsequent reflection and information make me doubt whether this limited employment of the needle would be necessary; and if not necessary, it would undoubtedly be improper. The following case, which, as well as Ramdhor's memorable experiment, is at variance with another statement, that wounds amounting to a direct division of the canal are irreparable, and therefore invariably fatal‡, furnishes an unequivocal proof, not only that an intestine may be completely cut through, and the injury not always be fatal, but that the cure may be effected without any stitching whatever of the bowel. At the assault of Cairo, in 1799, M. N—— was struck by a ball, which divided the muscular parietes of the abdomen, and a portion of the ileum. The two ends of the bowel protruded, were separated from each other, and very much distended. The upper end

---

* See case recorded by Littre in Acad. Royale des Sciences, an. 1705.
† Inquiry into the process of Nature in repairing Injuries of the Intestines, p. 28.
‡ Op. cit. p. 133.

was everted, its contracted edge strangulating the intestinal tube, as the prepuce does the penis in paraphymosis. The progress of the contents of the bowel being thus obstructed, they accumulated above the constriction. Larrey began with making four small incisions in the constricted part of the intestine; he then passed a ligature through the portion of mesentery corresponding to the two ends of the bowel; reduced them as far as the edge of the opening, which he took care previously to enlarge; and, having dressed the wound, he awaited events. Without detailing the subsequent particulars of the case, suffice it to say, that in a few months it ended in a perfect recovery.*

It is curious that Flajani, who has so decidedly reprobated Ramdhor's practice, and mentioned facts against it from his own experience, should recommend stitching a wounded and protruded bowel in any manner; for, with the exception of his unfortunate trials of inserting one end of the bowel into the other, in the cases which occurred in the hospital at Rome, he records only two instances in which he stitched the intestine, and, in both these, the bowel became gangrenous, and the patients lost their lives.† We may therefore infer, with Mr. John Bell, "that if there be a work of supererogation in surgery, as I believe there are but too many, surely this of sewing an intestine is one."‡

Every reflection, then, which I can make on this subject leads me to adopt Scarpa's sentiments in relation to sutures, and the indications, which should be fulfilled. The chief indication, and that on which the patient's safety mainly depends, consists in keeping the external wound open, in order that the feces may find a ready outlet. The wounded bowel soon contracts adhesions to the inner lips of the wound of the belly, and then we have nothing to fear from an extravasation of intestinal matter in the cavity of the peritoneum. Afterwards, in proportion as the feces resume their natural course, the external wound is to be allowed to diminish, and entirely heal up.§

In every instance of a penetrating wound of the abdomen, attended with injury and protrusion of a portion of the intestinal canal, if the patient be not already in a hopeless or dying state, from internal hemorrhage and other lesions, the displaced part is to be reduced, whatever we may choose to do in respect to the free or limited employment of stitches, or their absolute rejection. The reduction should be performed as speedily as possible, before the bowel has suffered much from exposure, constriction, &c., and also before any adhesions have formed at the inner orifice of the external

---

* Larrey, Mem. de Chir. Militaire, t. ii. pp. 160, 161.

† Collezione d'Osservazioni, &c. di Chirurgia, t, iii. p. 35—41. In one case, the protruded bowel was a po,tion of jejunum; in the other, a piece of colon.

‡ Discourses on the Nature and Cure of Wounds, edit. 3d, p. 320.

§ Scarpa sull' Ernie Memorie Anatomico-Chirurgiche; mem. 4.

wound; adhesions which would make the reduction of the protruded part imracticable. Of course when the wound is so small, that the reduction cannot be effected without handling and bruising the bowel immoderately, it ought to be carefully enlarged with a curved bistoury, guided on a director. Indeed, according to Scarpa's principles, one would suppose that the wound, if not free, should always be dilated, as by this means the ready escape of any extravasated matter would be insured. The rest of the treatment consists in antiphlogistic measures, more especially copious and repeated venesection, with the view of counteracting the danger of peritoneal inflammation. With respect to the dressings, they cannot be too light, simple, and superficial, except when the stoppage of evacuation in the natural way, and the issue of the intestinal contents from the breach in the bowel, are such as to lead us to adopt particular means for hindering a premature closure of the external wound. The tepid water dressing is one of the best.

The pressure of the elastic bowels, and of the diaphragm, and abdominal muscles, not only frequently presents an obstacle to the wide diffusion of extravasated matter, but often propels it towards the external wound.* We can conceive no power capable of overcoming the resistance so produced, to the extensive dispersion of extravasated fluids in the cavity of the abdomen. Numerous cases are on record of persons being stabbed, or shot through the body, without any effusion in the abdomen, or other very serious consequences. In some few of these instances, the bowels, perhaps, might have eluded the ball, or point of the weapon; yet it is highly probable that, in most of them, the bowels were injured, and that an extravasation of the intestinal matter was impeded by the pressure to which I have referred. In many of the cases, the intestines were known to be wounded.†

PENETRATING WOUNDS, ATTENDED WITH INJURY OF THE VISCERA, BUT NO PROTRUSION.

A wound of the intestines is indicated by the discharge of blood with the stools, and sometimes by the escape of fetid air, or of intestinal matter from the external wound. Such an injury, however, when the wounded bowels lie concealed in the belly, does not always admit of being immediately known with certainty. In the majority of examples, there is at first no escape either of air, or of

---

* On this subject, I would particularly recommend the reader to consult two essays by M. Petit le Fils, one entitled " Essai sur les Epanchemens et en particulier sur les Epanchemens de Sang;" the other, " Suite de l'Essai sur les Epanchemens," in Mém. de l'Acad. de Chir. tom. ii. and iv. 12mo.

† Recoveries are recorded in Wiseman's Surgery, p. 371. Œuvres de Par', liv. x. chap. 35.; La Motte, Traité Complete de Chir. Albucasis, lib. ii. cap. 26; Ravaton, Traité des Playes d'Armes-à-Feu, chap. 6., &c. &c.

the contents of the bowels, from the external wound; the quantity of blood voided per anum may be inconsiderable; and however this may be, none at all will generally be discharged downwards, until a certain time after the accident. Wounds of the small intestines, especially of the duodenum and jejunum, are indeed usually followed by great anxiety, paleness of the countenance, syncope, cold perspirations, and a small, intermitting, tremulous pulse; but these symptoms are far from being unequivocal, and they cannot be said to furnish any positive information, because a superficial cut, or unimportant stab, frequently causes similar indisposition in subjects of nervous, irritable, or timid habits. Our inability, however, to say positively in every case, whether the bowels are injured or not, is of no practical importance; because, when the nature of the accident is not clearly manifested by some peculiarity or severity of the symptoms, the case ought to be treated on common antiphlogistic principles; and also, when circumstances leave not the smallest doubt of the intestines being hurt, the same treatment is the only rational plan. Wounds of the small intestines are more dangerous than those of the large, and the nearer the injury is to the pylorus, the greater is the risk. Such cases are also much more frequently than injuries of the large intestines the cause of extravasation. In the latter examples, the symptoms are generally milder, and either the passage of the intestinal contents outward through the wound more easy and certain, on account of the bowel being more fixed than the rest of the intestines; or their passage towards the anus more ready, by reason of the greater capacity of the cœcum, colon, and rectum.

There are several other facts, highly interesting, and absolutely necessary to be remembered in relation to wounds of the bowels: my limits, however, oblige me to pass over the rest of this subject with as much brevity as possible; for which, the fuller account in my dictionary will also afford a just excuse. Were it not for these considerations, I should have felt myself obliged to enter into explanations of the particular appearances presented, as well by punctured wounds, as by transverse and longitudinal cuts in the intestinal canal; and to comment on the circumstance of small punctures being obliterated by the protrusion of the villous coat. I should also have had to point out the results of Mr. Travers's experiments on dogs, proving that, in these animals, a division of the small intestine as far as the mesentery is always fatal; that generally in wounds of the intestinal canal, the retraction, immediately following the injury, is a chief obstacle to its reparation; and that longitudinal wounds of the bowels are more easily repaired than such as are transverse. This tendency of the two portions of a divided bowel to recede from each other, tends to show, that the only mode of spontaneous reparation consists in the formation of an adventitious canal, by the encircling bowels and their appendages.

In the preceding remarks, I have adduced many arguments, casting doubt on the propriety of sewing up a wound in a protruded bowel; but, when the injured intestine lies in the cavity of the belly, the rashest surgeon, the greatest admirer of needles, would never think of ripping open his patient for the sake of performing so cruel and fatal an experiment. In fact, as I have already stated, we rarely know at first that the bowel is injured; for extravasation, as will be presently related, is not the most usual consequence of a wound of an intestine: when it happens, the extravasated matter does not always flow out of the external wound, and indicate the nature of the accident; and, if an extravasation should become manifest in a later stage of the case, it would then be impossible to get at the wound of the bowel, on account of the adhesions, which generally form with suprising rapidity. Even if the wound of the intestine were known to exist directly after the receipt of the injury, and a suture were not objectionable, on grounds already detailed, it could not be applied without enlarging the external wound, searching for the wounded bowel, and drawing it out of the cavity of the abdomen. By these steps, a wound, not at first essentially fatal, might be so altered for the worse, as to leave no possibility of recovery. When an intestine is first found to be wounded, from the occurrence of extravasation, a day or two after the injury, a suture is entirely out of the question, as by this time the part is entirely fixed in its situation by the adhesive inflammation, — that salutary process, which also circumscribes the effusion, and throws out an effectual partition between the extravasated fluid and the general cavity of the peritoneum.

When the wound of the intestinal canal is situated in the abdomen, closely behind the external wound, a suture is also unnecessary, because, if care be taken to keep that opening from closing too soon, the contents of the gut will be discharged outwardly, and there will be no reason to fear their diffusion among the viscera. Nor is the wounded bowel at all likely to slip away from the outer wound, if the patient be kept duly quiet for a few hours, after which the adhesions render a change in the situation of the bowel quite impossible.

In a penetrating wound of the abdomen, caused either by gunshot or a pointed instrument, if no protrusion of intestine take place, the lancet, abstinence, and quietude, should be our chief dependence. In short, as the main danger is inflammation of the peritoneum and bowels, the rigorous adoption of antiphlogistic treatment is indispensable. Pain and tension must be relieved by leeches, fomentations, and the warm bath; and if any purgative medicine be given (which, however, I think should never be done before time has been afforded for the formation of adhesions), it should be of the mildest description possible. Castor oil is perhaps the safest which can be employed. In these cases, indeed,

clysters are generally to be preferred to any other means of empty-ing the bowels. By the simple observance of an antiphlogistic plan, wounds, in which several folds of the bowels were hurt, have been happily cured. Authors abound with instances of this kind. One related by Littre, I have already referred to in this chapter. Garengeot and La Motte record others; and Dr. Hennen has seen several: one was the recovery of a soldier, who had been shot through the abdomen with a ramrod at the siege of Badajos, in 1812. The instrument entered the front of the abdomen, and ac-tually stuck in the vertebræ, from which it could not be disengaged without force.*

Patients, who have recovered from wounds of the bowels, should afterwards be extremely temperate in their diet, and, above all things, avoid taking any kind of flatulent, stimulating, indigestible food. They must also be very careful to keep their bowels regular.

In all cases of penetrating wounds of the belly, the dressings should be light, simple, and superficial. If excrementitious matter be discharged from the opening, the utmost attention must be paid to cleanliness. We should also recollect the precept inculcated by Scarpa, viz. that the external wound should only be allowed to close, in proportion as the feces resume their natural course, with ease and regularity.

Sometimes the intestinal matter continues to be discharged for a considerable time from the wound, and even during the rest of the patient's life, either through a fistula, or an artificial anus. In general, however, this affliction gradually ceases. In almost every collection of cases, we may find examples fully proving, not only that simple stabs of the bowels in the end get well, without leaving a permanent annoyance of this kind, but that large portions of the bowels may even be destroyed by gangrene, and yet the con-tinuity of the intestinal tube be completely re-established. From the facts quoted in this chapter, it would also appear, that a com-plete division of a bowel is neither certainly fatal, nor necessarily followed by an irremediable artificial anus.

Balls, shot into the abdomen, are occasionally discharged with the stools.

EXTRAVASATION.

An occasional consequence of a penetrating wound of the abdo-men is an extravasation in the cavity of the peritonneum. The ex-travasated matter may be undigested food, chyle, the succus pan-creaticus, feces, bile, urine, blood, &c., according to the nature of the injured parts. Fortunately, this kind of accident is far less fre-quent than an inexperienced surgeon would apprehend, or than our

---

* Obs. on Military Surgery, p. 436, 437.

hearing so much of the *cavity* of the abdomen would lead us to expect. Strictly speaking, no empty space exists within the animal body; and all the parts, contained in the abdomen, are in close contact with one another, and with the inner surface of the peritoneum. Hence, except under particular circumstances, though the bowels may be wounded, extravasation is generally prevented altogether; or when it does happen, the effused matter may all lie in one mass, and become circumscribed by the adhesive inflammation.

If, immediately after a wound of the belly, and of its contents, it be the compact state of the contained and containing parts, which at first hinders extravasation, it is that salutary process, the adhesive inflammation, which afterwards renders the occurrence quite impossible; or bounds or circumscribes the effusion, if it should have already taken place. In fact, all the surfaces in contact with each other, and surrounding the track of the wound, become generally so intimately connected together, by the adhesive inflammation, that the wound forms a sort of canal, entirely destitute of all communication with the cavity of the peritoneum; and the rapidity with which such adhesions occur is very great.

According to the investigations of Mr. Travers, the following are the only circumstances, in which an effusion of the intestinal contents can happen. If the gut be full, and the wound extensive, the surrounding pressure is overcome by the natural action of the bowel tending to the expulsion of its contents. But, in defect of either of these states, effusion cannot follow. When, however, air has escaped from the bowel, or blood has been extravasated in quantity within the abdomen, at the time of the injury, the resistance made to effusion will be less effectual, although the pressure of the sides of the abdomen is the same, as such fluids will yield more readily than the solids naturally in contact with each other. Effusions more generally follow ruptures of the bowels by blows or falls upon the belly, than ordinary penetrating wounds.*

When an extravasation is perceived, in the first instance, a part of the wound is to be left open, and the posture of the patient is to be so regulated, that the wound may be as depending as possible, and the effused fluid readily escape. If the extravasation should not be perceived till after the wound has been dressed, we are directed to remove the means employed to close a part of it, and to place the patient in a proper posture, with a bandage applied round his body. When internal hemorrhage is suspected, and the state of the pulse will admit of it, venesection is proper.

When symptoms of irritation exist, attended with local inflammation, pain, and a fluctuating tumor, denoting the seat of the extravasation, the effused fluid is to be let out by a puncture.† In

---

* See an Inquiry into the Process of Nature in repairing Injuries of the Intestines, &c., p, 25—36.

† Richter's Anfansgr. der Wundarzneykunst, band. v. p. 38.

the Memoirs of the Academy of Surgery may be found observations, recorded by Petit and Le Vacher, illustrating the advantages of such treatment.

When there are no symptoms denoting the exoct seat of the extravasation, the treatment should be restricted to the prevention, or diminution, of inflammation. Venesection is to be resorted to, or not, according to the state of the pulse; the belly fomented two or three times a day; and only liquid aliment allowed, sometimes merely barley water. In some cases, a bandage is applied round the body, as a means of promoting that compact state of all the parts in the abdomen by which the ill consequences of extravasations are so materially diminished.

Musket balls may pierce and lodge in the bladder, in which circumstances a surgical operation, resembling lithotomy, will become necessary, as soon as the dangers of the first injury are past.* In wounds of the bladder, a great deal of difference in the degree of danger will depend upon whether this organ happens to be full of urine at the time of the accident, and whether the injured part of it is one over which the peritoneum is reflected. In all cases, however, the principal danger depends upon the chance of the urine becoming effused, and exciting inflammation and gangrene of the peritoneum, bowels, cellular tissue, and, in short, of every part with which it comes into contact. The obvious indications are to make a free and depending outlet for any urine already effused; to prevent a further extravasation by the continual use of an elastic gum catheter; to keep down and diminish inflammation by copious bleeding and low diet; and to avoid every sort of dressing at all likely to irritate or obstruct the wound itself. The best applications, indeed, are light, simple pledgets, or lint kept soft with tepid water, the strictest attention to cleanliness being paid. The cases are now numerous, in which considerable wounds of the bladder terminated favorably under such treatment.†
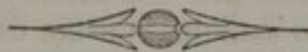
THE PSOAS, OR LUMBAR ABSCESS,

Is a collection of matter, formed in the cellular tissue of the loins, behind the peritoneum, and mostly descending in the course of the

---

* See Larrey's Mém. de Chir. Mil. t. iv., and Hennen's Mil. Surgery.
† Such facts are abundant in Larrey's excellent work, especially the 4th vol. Flajani relates another case, in which the means were restricted to antiphlogistic remedies. Collez. d'Osservazioni, t. iii. p. 39. Thomson saw fourteen examples of wounded bladder recovering. See Obs. in the Military Hospitals in Belgium, p. 108, &c.

psoas muscle, until it produces a swelling below or above Poupart's ligament, or glides under the fascia of the thigh. In a few cases, it descends into the pelvis, whence it passes through the sacro-ischiatic foramen, and forms a swelling near the the anus. Some-times it passes backwards on the outer edge of the quadratus lum-borum, and sacro-lumbalis muscles, so as to cause a swelling on one side of the loins; and, in some rare cases, it takes the course of the spermatic chord, and forms a tumor projecting through the abdominal ring, such as superficial observers might easily mistake for a hernia. The disease furnishes one of the best illustrations of the nature of large chronic abscesses, and especially of those usually regarded as scrofulous. It begins with slight un-easiness in the loins, and a weakness in walking; but no acute pain may have been experienced, though the matter be already copious enough to produce an external swelling. By degrees, however, the quantity of matter becomes considerable, producing a sense of tension and weight about the loins, pains shooting down the lower extremity, and some degree of hectic disturbance of the system. As the disease advances, the lower extremity of the same side be-comes more and more weakened, and the thigh inclines forwards. In a girl, who was under my care in University College Hospital, with a double lumbar abscess, both thighs were drawn up close to the abdomen.

Lumbar abscess may or may not be combined with caries of the vertebræ; and the disease of the bone may be either the cause or the accidental accompaniment of the collection of matter. At the same time I ought to mention, that my friend Sir Benjamin Brodie is led by his experience to believe, that lumbar abscess is rarely the primary disease, but commonly originates from caries of the verte-bræ. When a psoas abscess is joined with disease of the lumbar vertebræ, there is no paralysis, a peculiarity referred by Sir Benja-min Brodie to the greater magnitude of the bodies of the lumbar as compared with those of the cervical or dorsal vertebræ, in conse-quence of which the former are not destroyed by the same degree of caries which would be sufficient for the destruction of the latter. In the lower part of the spine, the disease seldom reaches the the-ca vertebralis. It is the disposition of lumbar and other chronic abscesses to begin very slowly and insidiously, and to increase in the same way, until, from containing a few ounces of matter, they include at last several quarts. The matter, of a lumbar abscess frequently presents flakes of a curdy substance, like those seen in other scrofulous abscesses; and the whole cavity, in which it col-lects, is lined by a membrane called *the cyst of the abscess*, which has somewhat the appearance of a mucous membrane, and is the organ by which, after the disease is established, the matter contin-ues to be incessantly undergoing secretion and absorption. The extent of the surface of such a cyst may well be conceived, when

it is recollected that a lumbar abscess sometimes contains a gallon of matter. Until the quantity of matter is enough to produce an external swelling and fluctuation, we rarely have any positive knowledge of the existence of the disease, which is often mistaken for rheumatism.

I have seen several lumbar abscesses, the swelling of which in the bend of the groin more or less resembled that of a hernia, and was attended with impulse when the patient coughed. One case was brought to my house: there was a small soft prominent tumor, with impulse, near the groin, but rather more towards the ilium than the place of a hernia, and accompanied by a larger swelling,—evidently an abscess behind the os innomiatum. I recommended the tumor behind to be opened, when, if it had a communication with that in the thigh, the latter would subside, and indicate, at all events, the nature of the case. Another surgeon of great experience advised the introduction of a needle into the femoral tumor, in order to learn the quality of its contents.

Attempts have been made to disperse lumbar abscesses by exciting the action of the absorbents, by emetics, blistering the surface of the swelling, and the employment of purgatives. The plan has been attended with little success. Now as it is the nature of lumbar and all chronic abscesses to become larger and larger, and sometimes to attain vast magnitude before they burst, it is, I think, a good general rule to open them as soon as a fluctuation can be plainly distinguished. It is found, however, that the plan of opening a considerable lumbar abscess is frequently followed by a violent and even fatal attack of *irritative fever;* and hence, some caution is requisite if the tumor be large. In fact, when we puncture the abscess, discharge its contents, and leave the opening unclosed, the cyst often inflames over its whole extent, and the patient now suffers that violent derangement of the system, excited by any fresh irritation operating upon a hectical constitution, which is well known by the name of *irritative fever.*

The knowledge of this fact made surgeons fearful of following this practice, when the cyst was of considerable size. Hence arose the method of introducing a seton across the tumor, and letting the matter escape gradually ; and Mr. Abernethy's more successful way of letting out the matter by a puncture, and then closing it with adhesive plaster, and healing it by the first intention. The skin is to be drawn to one side, the lancet introduced, and the matter having been discharged, the skin is allowed to resume its natural place again. Thus the openings in the skin and the fascia and cyst do not afterwards correspond, and the admission of air is more likely to be excluded. The cyst remains for some time undistended—it has an opportunity of contracting—and, as soon as a certain quantity of matter accumulates again, the same proceedings a re repeated.

With such treatment should be combined the administration of tonic and alterative medicines, and especially bark, preparations of steel, the iodide of potassium, and such as are found to be the best for scrofulous constitutions in a state of hectic.   After the abscess has been considerably lessened, blistering the skin, or rubbing the skin freely with ung. iodidi comp. will sometimes promote the dispersion of the remains of it.   If the vertebræ be diseased, counter-irritation will be advisable; especially an issue or blister kept open.   The fact established by Sir Benjamin Brodie, that a psoas abscess is almost constantly attended with caries of the vertebræ, must have a very unfavorable influence on the prognosis, on account of the greater difficulty of curing any abscess combined with disease of the spine, than an abscess free from so serious a complication.   The double lumbar abscess in University College, above referred to, was opened, and terminated in the girl's recovery.

SCROFULOUS CARIES OF THE SPINE.

Perhaps I may not be altogether justified in calling this affection a caries of the vertebræ, because it is alleged that one variety of it begins, not with a morbid alteration of the cancellous structure of any of those bones, but with ulceration of the intervertebral substance.   But as the disease, in whatever texture it begins, generally leads to caries of the spine, I think the name sufficiently appropriate.   By adding the epithet *scrofulous*, we also distinguish this caries from other forms of it, as well as from necrosis, and simple absorption of parts of the vertebral column, the effect of aneurism, or other tumors, not usually productive of any paralytic affection of the lower extremities.

In whatever manner the disease commences, if it be not checked in its progress, it occasions a destruction of the bodies of the vertebræ and intervertebral substance, leaving, as Sir Benjamin Brodie correctly says, the posterior parts of the vertebræ unaffected by it; the necessary consequence of which is an incurvation of the spine forward, and a projection of the spinous processes posteriorly. The same pathologist adverts also to the frequent and early complication of the disease with chronic inflammation of the membranes of the spinal cord, and even of the latter organ itself, which in consequence of the curvature, and, as I have reason to believe, still oftener in consequence of the disease around the spine, quite independently of the mechanical effect of the curvature itself, becomes disqualified for the performance of its highly important function.   This observation is founded on the fact of many cases being upon record, in which the most surprising degrees of curvature,

from destruction of the bodies of the vertebræ, were not accompanied by paralysis. In the museum of University College is a preparation, illustrating the earliest change perceptible in the most common form of the disease,—that which begins in the bones. In the cancellous structure of the cervical vertebræ, small cells are seen, which are produced by the removal of a portion of the natural texture.

Frequently in caries of the spine, and especially in scrofulous cases beginning in the bones, suppuration occurs at a very early period of the disease, and, in other examples, not until a late stage of it.

I have explained, in the first section of this treatise, the changes in the shape of the spine produced by rickets; where the curvature is lateral, and the spine twisted, not from any carious affection of the vertebræ, but from their being only imperfectly developed, and not calculated to resist the preponderating influence of the muscles and the weight of the parts, which the column has to sustain. However great such rickety curvature and deformity may be, no paralysis is induced. I have also made some remarks upon that kind of absorption of the bones, which arises from the pressure of aneurism and other tumors upon them, and which has peculiarities marking it very completely as a different affection from what is denominated caries; for in no situation, does it lead to the formation of abscesses; and, in the spine, it is particularly remarked by all pathologists that it does not give rise to paralysis. Not, however, that the thing is absolutely impossible; for, in the museum of University College, is a specimen of aortic aneurism, which had occasioned such an absorption of the lateral part of the spine, that the medulla spinalis was exposed; though even in that case, I believe, there was no paralytic affection of the lower limbs. It is conceivable, however, that the mischief might have gone on, till palsy bad been excited by its effects upon the medulla spinalis; and I have certainly read of a case or two, in which the pressure of an aneurismal tumor in the abdomen was the cause of paralysis. Such an occurrence, however, is at all events rare.

The greater number of individuals, afflicted with scrofulous caries of the spine, are infants or children; yet many adults also suffer from it, especially after having been weakened by fever, or a long mercurial course. It is very uncommon for it to begin after the age of forty-five.

It may be asked, how are we to distinguish scrofulous cases, commencing in the bodies of the vertebræ, from others, which begin in the intervertebral substance? Now, the only information that I can deliver, in reply to this question, is a remark made by Sir Benjamin Brodie, that where the disease is of a scrofulous origin, affecting the cancellous structure, he suspects, that it is more immediately followed by suppuration, than where it commences in

the intervertebral cartilages; and that, in the latter cases, the pain and tenderness in the carious part of the spine are more considerable than in scrofulous examples.

With regard to the general symptoms of caries of the spine, I may remark, that, in the early stage, the patient has pain and tenderness in that portion of the spine which is the seat of disease; and, as I have stated, perhaps these symptoms will be most strongly manifested in those cases in which the disease begins in the intervertebral substance. If the patient be old enough to describe his complaints, he will tell us, that he is annoyed with a feeling of tightness of the chest, uneasy sensations at the pit of the stomach, a torpid sluggish state of the intestinal canal, perhaps some disturbance in the functions of the urinary bladder, and weakness, aching, numbness and cramps in the muscles of the lower extremities. Now, it is scarcely necessary for me to say, that very similar symptoms may proceed from other causes ; and even some of the information respecting the symptoms now enumerated, as appertaining to the early stage, cannot always be obtained, because the patient may be an infant. Hence, until some inequality or projection becomes perceptible on the spine itself, and until the want of control over the muscles of the lower limbs and the paralysis are more established, the diagnosis is generally obscure. The muscles and parts affected with paralysis must, of course, be those, which derive their nerves from the portion of the medulla spinalis below the seat of the disease. Generally there is impairment of motion and sensibility together; but sometimes one limb will retain more or less sensibility, yet be deprived of the faculty of motion.

In different cases, the symptoms differ considerably. Sometimes there is great pain in the part affected; sometimes none. In many instances, the paralysis comes on early, and often even before there is any material curvature forwards; but, in some cases, we see the spinous processes making a considerable angle posteriorly, in consequence of the bend of the spine forwards, and the destruction of the bodies of the diseased vertebræ, yet without any paralysis having taken place. The true cause of most of the symptoms is a morbid state of the spine and parts connected with it, attended with irritation and disease, and perhaps sometimes with compression of the medulla spinalis itself. The morbid state of the spine always precedes the deformity observable in the vertebral column itself. Indeed, the curvature forward, in such a degree as to produce the angular projection of the spinous processes posteriorly, cannot happen until the bodies of the diseased vertebræ have been seriously injured by caries. The deformity is of a peculiar kind, and such as nothing can produce, except the destruction of one or more of the corpora vertebrarum, the spine being bent forwards, as I have already explained, so as to form an angle backwards. The dy of one, and sometimes the bodies of several vertebræ may be

completely absorbed, permitting those below and above the deficiency to join, and be united by anchylosis. The spinous processes may also be soldered together; and the sides of the thorax pressed downwards and backwards, so as to lessen, in a very serious manner, the dimensions of the hypochondriac region. In this disease, the bones are large and well developed, which is very different from what is noticed in rickets. In curvatures from other causes, there is not an angular projection of the spinous processes; but the bend forms the segment of a circle, generally affecting a great extent of the spine, and often assuming the lateral inclination or spiral figure, with a very conspicuous leaning above, towards the right side.

In most cases of scrofulous spine, paralysis of the lower extremities, and even a more extensive paralysis, will come on sooner or later; but, in rickets, where the spine may be said to be deformed, rather from an imperfect development of the bones, than from disease of them, palsy of the legs is not produced, however great the lateral or spiral curvature of the back. Professor Cruveilhier, in the 4th Livraison of his Anatomie Pathologique, gives us the particulars of a case, which proves how very far even scrofulous disease of the vertebræ will sometimes advance, without causing paralysis, though this is a deviation from what is most common. In Cruveilhier's case, no paraplegia existed, though not less than five of the bodies of the dorsal vertebræ had been totally annihilated; and the alteration in the shape of the vertebral column was such, that the upper half formed with the lower an extremely acute angle, which would have been still more acute, if it had not been prevented by the eleventh and fifth actually touching one another. The intervertebral foramina were all preserved, though more or less deformed, contracted, or displaced backwards. In those which were most diminished, the corresponding intercostal nerves must have been compressed, and consequently the action of the intercostal muscles impaired, explaining partly the cause of the asthmatic disorder, with which the patient was troubled. The engraving in the above work shows how nature contrived to maintain the integrity of the vertebral canal, and to keep the spinal cord from being compressed, in the midst of such a surprising deviation of the vertebral column from its natural configuration. Although the bodies of five vertebræ were demolished, anchylosis took place, and the medulla suffered no pressure or irritation adequate to paralyse the lower extremities. A beautiful specimen, illustrative, I think, of an equally extensive destruction of the bodies of the vertebræ, and of as sudden a bend of the spine, will attract the attention of every pathologist who visits the museum of University College. Cruveilhier also gives the particulars of a child, ten years old, brought to the dissecting room, in which only a few vestiges of the bodies of the third, fourth, fifth, sixth, seventh, eighth, ninth,

15*

tenth, and eleventh dorsal vertebræ were left. According to this pathologist, diseases of the vertebral column, like those of every other part of the osseous system, are seated, not in the osseous tissue itself, but in the cellular or medullary tissue occupying its interstices. When this cellular tissue inflames, sometimes it pours out pus in abundance, constituting an abscess, but sometimes in a more scanty quantity so as to admit of absorption. The cells of the osseous tissue, being distended by the development of the cellular tissue, and deprived of the materials of nutrition, may be entirely absorbed; and thus Cruveilhier accounts for the total disappearance of the texture of bone, without a vestige of it being left. In fact, his doctrine is, that all disease is seated in the cellular tissue of organs, the other tissues being, according to his views, only liable to simple atrophy or hypertrophy.

The view, now taken of this subject, must render it manifest, that the removal of the deformity of the spine, even when we succeed in curing the disease, must be altogether impracticable. There must always remain an angular projection backward, which will be greater or less, according to the part of the spine affected, and the extent of the destruction of the bodies of the vertebræ.

Nevertheless, we are not to conclude, that every bend of the spine forward is from scrofulous disease. We have the authority of Sir Benjamin Brodie for the observation, that a curvature of the spine in this direction may arise from other causes, as a weak condition of the muscles, or a ricketty affection of the bones. Generally, he says, in such cases, the curvature occupies the whole spine, which assumes the form of a segment of a circle. Occasionally, however, the bend occupies only a portion of the spine, usually that composed of the superior lumbar and inferior dorsal vertebræ, the curvature being always gradual, not angular, a circumstance in which it particularly differs from the curvature resulting from caries.

One common effect of scrofulous caries of the spine is the production of an abscess around the diseased bone. Yet, it frequently happens, that the caries will go on to a vast extent, and even so as to demolish the bodies of several vertebræ, without any abscess being produced. Disease of the spine may continue for years without suppuration; but abscesses sometimes lie upon the diseased bone, and are not detected till after death, when the body is examined.

With respect to scrofulous disease of the upper cervical vertebræ, and of the articulations between the atlas and the condyles of the os occipitis, I may remind the reader of an observation made by Sir Benjamin Brodie, which is, that the pain is greater in such cases, than in others, where the disease is in the dorsal or lumbar vertebræ. When abscesses form from disease of the cervical vertebræ, the matter generally collects amongst the muscles of the neck, or behind the pharynx, into which it may pass. As the dis-

ease advances, the arms become paralytic: and this while the muscles, which derive their influence from the spinal cord below the neck, remain under the control of the will. Afterwards, however, the paralysis extends to the muscles of the trunk and lower extremities. In the case of a girl, eight years old, with disease of the spino-occipital articulation, as recorded by Mr. T. R. Blackley, "the countenance was peculiarly expressive of caution, and was florid and full, if not bloated; the chin was advanced preternaturally beyond the chest; the mouth slightly opened; and she kept the arms parted from the side, as if to poise herself. On looking laterally, she strained her eyes in the direction of the object, and, failing in this, turned her entire body for the purpose. The effect produced, when she attempted to observe any thing placed near her feet, was yet more remarkable; for this purpose, she generally put her hand to her forehead, as if fearful of undue weight in the head, and bent her body, thus avoiding the least motion between the first and second vertebræ. In getting up from bed also, or in lying down, she invariably supported the head with the hand." During the last four days of her life, the right arm was powerless.* The *post mortem* appearances, which are interesting, my limits compel me to omit.

The most approved plan of treating scrofulous caries of the spine consists in employing, in the early stage, cupping or leeches over the part, followed by the application of blisters, caustic issues, a seton, or the moxa. With the local abstraction of blood, are of course to be joined other mild antiphlogistic remedies, especially aperient medicines, composed of rhubarb, and the carbonate of soda, castor oil, or the sulphate of magnesia. After beginning with these means, counter-irritation, or issues, setons, a perpetual blister, or the moxa, may be tried; and these remedies may be assisted with the medicines and regimen usually recommended for other scrofulous diseases, particularly bark, chalybeates, and iodine, with the benefit of a light nutritious diet, and pure country air, if it can be conveniently had. One thing is quite essential, namely, the diseased spine should be kept as quiet as possible, and therefore the patient ought to remain very much in the recumbent position. When the disease has existed a considerable time, and a conspicuous angular curvature is formed, I think Sir B. Brodie's advice should be followed, which is, to let the patient recline on his side, instead of on his back; or if this posture be disagreeable, he should not lie on an absolutely flat surface, but be supported with pillows, so that his position may have no tendency to restore the spine to its original figure, which would only have the pernicious effect of disturbing the completion of the anchylosis, by which alone the cure can be accomplished.

---

* See Dublin Journ. of Med. Science, vol. xii. p. 62.

Of late years, issues and blisters, from having been employed in these cases for immoderate periods of time, and without discrimination, have become objects of abuse by certain practitioners. Yet, that they frequently produce great benefit, I am convinced by repeated experience. We often find paralysis suddenly cease, or diminish, on the application of a blister. At the same time, I am of opinion with Sir B. Brodie, that issues are chiefly useful in the early stage of the disease, with the view of preventing suppuration, and that they are of no service after an abscess has actually formed. He likewise suspects, that issues are of little or no service where scrofulous disease of the cancellous texture precedes ulceration of the cartilages. If this be true, we see, then, the reason why so many cases are not benefited by this plan; but it is a point for further investigation, and one on which I cannot say, that my experience agrees with what has now been suggested.

I may next observe, that the medulla and its coverings are liable to chronic inflammation and its effects, as a consequence of external violence. Cases are likewise sometimes met with, where scrofulous tubercles form in the medulla itself. Any of these changes may of course impair the functions of this important organ, and bring on paralytic affections. The treatment must be regulated by principles applicable to diseases of joints, and comprise very much the same means which have been advised for scrofulous disease of the bodies of the vertebræ; local bleeding, counter-irritation, quietude in the recumbent position, and medicines and regimen for the improvement of the health in general.

SPINA BIFIDA, HYDRO-RACHITIS, OR THE CLOVEN SPINE,

Is a congenital malformation, consisting in a deficiency of one or more of the spinous processes and arches of the vertebræ, which, indeed, are sometimes deficient throughout the whole extent of the vertebral column. In consequence of the deficiency of the back part of the spinal canal, the theca vertebralis protrudes, and forms a kind of pouch filled with a limpid fluid. The swelling is of different sizes in different cases, according to the extent of the malformation in the bones, and the age of the individual. The most common situation of it is on the lumbar vertebræ; but it may take place on the dorsal or cervical ones, and even the sacrum. In some cases, an aperture is left in the bodies of the vertebræ, in addition to the absence of the spinous processes. All the processes are occasionally deficient, and the vertebræ small, and not properly developed. The swelling is soft, and attended with fluctuation, and sometimes a degree of transparency. It generally subsides when compressed, but returns as soon as the pressure is removed. The skin retains its natural color, and there is no pain in the part, unless it be compressed.

Children born with spina bifida seldom live more than a year. They are generally weakly and emaciated; and very often afflicted with paralysis of the lower limbs, and of the sphincters of the bladder and rectum. However, I have seen children with spina bifida, who had a healthy appearance and suffered no paralytic complaints. Sometimes, also, instead of dying in infancy, they live to the adult age, as was the case with a young woman, whom I saw many years ago under the care of Mr. Copland Hutchinson. The urine and feces passed involuntarily. The tumor was of such enormous size, that it measured in the vertical diameter thirty inches.

With very few exceptions, spina bifida proves fatal; and this, in the greater number of instances, within the first year from the period of birth. Some children thrive for a few years, and appear to suffer little or no inconvenience; but no sooner does the tumor burst, or is it punctured, than convulsions usually come on, and the little patient suddenly dies. This was the final result of a case, in which I saw a little boy, about two years old, that was in perfect good health, and with the free use of his legs, though he had a spina bifida on the sacrum nearly as large as his head.

Gentle pressure on the tumor was suggested as worthy of trial by the late Mr. Abernethy, with the view of producing an absorption of the fluid; and, if that object could not be accomplished, he deemed the experiment of letting out the fluid by a small puncture, and then closing the opening with sticking plaster, quite warranted by the commonly fatal course of the disease. This was done in one example, the puncture being repeated every fourth day for six weeks, and regularly healed; but, at length, one of the punctures failed to unite, the sac inflamed, pus was formed, and the result was fatal.

Sir Astley Cooper tried the effect of puncturing spinæ bifidæ with a fine needle. In one case, the fluid was discharged, and the cavity obliterated by the adhesive inflammation, so as to produce a radical cure. This gentleman, however, besides the radical treatment, if it can be so called, as it is only supported by one or two instances of success, has a palliative method, which consists in treating the protrusion on the principle of a hernia, and applying a compress and bandage to it.*

Spina bifida, when joined with hydrocephalus, paralysis of the lower extremities, and involuntary discharge of the urine and feces, is entirely a hopeless case. The same observation applies to examples in which the spinal cord itself is deficient.

In many children, the bodies of the vertebræ are not perfectly developed, the ossification of the cranium is not complete, and the

---

* Two patients treated in their infancy on these plans, and now grown up to be strong men, I have lately examined by the favor of Sir Astley Cooper, under whose care they were about twenty years ago, or more.

disease is associated with other deformities, such as club feet. All these circumstances were illustrated in a case, from which a preparation in the museum of University College was taken. The child lived only three days.

[Hydro-rachitis or spina bifida, is a disease of the brain and its membranes, which is followed by an effusion of serum; and the bifurcated condition of the arches of the vertebræ, is caused by the outward pressure of the membranes of the medulla spinalis, in consequence of their containing water. The tumor is most often situated in the lumbar region, still it does occur at all points of the vertebral canal. Sometimes there is but one of the arches wanting, and at other times they are all wanting, from the head to the coccyx. When there is but one arch wanting, the tumor is pendulous, and the coverings consist of the common integuments of the body, and the meninges of the medulla; but when there is a deficiency of several of the arches, the base of the sac is large, and its walls, especially the posterior portion, are diaphonous, and their structure fibrous instead of tegumentary.

The *prognosis* in these cases is unfavorable, the patients usually die soon after birth. Dr. John T. Lewis, of Eatontown, N. Y., has reported to me the case of a man, who, with one of these tumors, measuring thirteen inches in circumference at the base, and *twenty* inches in its largest transverse diameter, lived to the age of thirty years.

In addition to the *treatment* mentioned by Mr. Cooper, I have seen two cases cured by *ligation*, as suggested by Mr. Benjamin Bell. In both of these, the sac was covered by the common integuments and the base of the tumor was small. The last of these two cases was treated at the Clinique of the College of Physicians and Surgeons, in New York, June 5th, 1844, by Dr. L. A. Sayre, *Prosector* of Surgery. The patient was two years old, and enjoyed good health. The tumor was situated at the lower part of the cervical region. A needle armed with a double ligature, was carried through the base of the tumor, and then firmly tied; after which it was excised outside the ligature, and is now in my museum at the college. The ligature came away on the twenty-third day, the wound being then entirely healed; and the patient completely recovered.—Ed.]
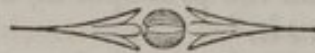
HERNIA.

The term *hernia* is applied to a protrusion of parts from any of the greater cavities of the body: thus there may be herniæ of the brain, lungs, or abdominal viscera. The expression *rupture*, employed synonymously with *hernia*, signifies, however, only the abdominal form of the disease, and came into use from an erroneous notion, that the parts, through which the protrusion happened, were

constantly burst or torn. When any of the viscera of the abdomen protrude, they almost always push out, along with them, a portion of the peritoneum, which forms a kind of pouch in which they are contained, and is called the *hernial sac*. Of this the narrow part is termed the *neck*, and the more expanded part the *body*.

But hernia is attended with infinite variety, so that it will not always admit of being defined to be a protrusion of the viscera, included in a peritoneal sac; for the parts may not protrude at all; the displaced or entangled bowels may form no external swelling; they may be entangled in some unusual aperture in the mesentery, or be compressed by adhesions formed within the abdomen; or, if they do protrude, they may not be entirely covered by a peritoneal sac. The total or partial absence of a sac, however, is the peculiarity of but few cases, as when a hernia follows the cicatrisation of a penetrating wound of the abdomen, or when the sac is rendered imperfect by ulceration or absorption, or is torn by accidental violence directly applied to the tumor. The bladder and cœcum are not contained in the peritoneum, and hence, when they form herniæ, they have not a complete hernial sac; they do not push out the peritoneum before them, but draw after them the portion of that membrane with which they are naturally connected. Thus a kind of sac may follow them, without covering them, and into such sac other bowels may fall.

The most common situations for herniæ are the abdominal ring, the navel, and a limited point below Poupart's ligament, just at the inner side of the femoral vein. They are also met with at every point of the linea alba, and, in less common instances, at the foramen ovale, at the ischiatic notch, in the perinæum, or the vagina. Hernial protrusions are also possible through the diaphragm into the chest, sometimes through a lacerated opening in that muscle, sometimes through a natural aperture in it, or one from congenital malformation. The *contents* of a hernia are mostly either intestine or omentum, or both together. The small intestine, being more moveable than the large, is more frequently protruded, especially that portion of it named the ileum, which lies very near the ring and the space below Poupart's ligament. Sometimes the protrusion will comprise merely a part of the diameter of the intestine; and sometimes several inches or feet of it may be contained in the sac. In rarer forms of hernia, other parts are met with, as portions of the stomach, or liver, the spleen, uterus, ovaries, or bladder.

From the two circumstances of *situation* and *contents*, are derived nearly all the various names of herniæ. Thus, when the tumor contains intestine alone, it is called *enterocele*; when *omentum* alone, *epiplocele*; and, when its contents consist of both parts, *enteroepiplocele*. We hear also of *herniæ of the stomach, bladder*, &c. With respect to names derived from situation, when the protrusion is at the abdominal ring, or even merely within the inguinal canal,

the case is termed a *bubonocele* or an *inguinal hernia;* but if the parts come out of the same aperture, and descend further, so as to get into the *scrotum*, such form of the disease is termed *oscheocele*, or a *scrotal hernia*. The protrusion below Poupart's ligament, just on the inner side of the femoral vein, receives the name of *crural* or *femoral hernia*. A protrusion at the naval is termed an *exomphalos*, or an *umbilical hernia;* and, at any other point of the front of the abdomen not yet specified, a *ventral hernia*. Protrusions by the side of the vagina, at the foramen ovale, in the perinæum, through the diaphragm, or the ischiatic notch, are named accordingly, *herniæ of the vigina, foramen ovale*, &c. One kind of hernia, named from the circumstance of children being born with it, or having it very soon after birth, is called *congenital*, which is likewise singular in another respect, viz., that of having the tunica vaginalis for the hernial sac.

When the protruded viscera create no disturbance, and readily admit of being put back into the abdomen, the hernia is said to be *reducible;* but when they cannot be put back, owing to adhesions, or their large size in relation to the opening, through which they would have to return, the hernia is called *irreducible*, or *incarcerated*. If the parts be not only difficult of reduction, but subjected to such pressure, or constriction, as impedes or deranges their functions, stopping the passage of the intestinal matter towards the anus, causing frequent sickness, with inflammation or worse consequences in the constricted parts, the case is well known among surgeons as a *strangulated hernia*

The *causes of hernia* are divisible into the *predisposing* and *exciting*. With respect to the first, I may remark, that a natural deficiency of resistance in any part of the boundaries of the abdomen, and a loose, very moveable state of certain viscera, must be regarded as the common predisposing causes. According to the observations of Sir Astley Cooper, debility predisposes to hernia by occasioning a relaxation of fibre, and a dilatation of the aperture through which the spermatic vessels pass. If a person, debilitated by fever, return to habits of violent exertion before his strength is fully re-established, a hernial swelling will frequently take place. It is on the principle of general relaxation, that the same distinguished surgeon explains the remarkable frequency of the disease in old persons, especially those who work hard. Hot climates, by producing relaxation, and all circumstances, which tend to bring on a sudden absorption of fat, are well known to give a tendency to the formation of hernial swellings. Many facts also support the doctrine, that herniæ are sometimes particularly prevalent in certain families, so as to be called hereditary, and no doubt this depends upon a weaker conformation of the parts where the tumors form, than is exemplified in the generality of individuals.

The *exciting causes* may all be referred to the powerful action of

the abdominal muscles and diaphragm on the viscera; and this is the reason of the great frequency of the disease in the laboring classes, in dancers, in the inhabitants of mountainous countries, in the cavalry, in persons who ride hard, &c.; persons who lift heavy weights, who suffer from asthma, or from long-continued cough, or who habitually exert their lungs in any kind of manner, are principally subject to hernia. Costiveness likewise creates a risk of hernia, which usually comes on when the person is straining at stool. Strictures of the urethra also promote the formation of hernia, the abdominal muscles being required to act with unusual force in order to empty the bladder. Cases are recorded, in which several hernial tumors were thus occasioned in the same individual. The same causes, which first produced the complaint, are constantly tending to promote its increase. The tumor becomes larger, in proportion as the pressure against the hernial sac is stronger and more frequent. Hence the great size which it often attains in persons following laborious occupations. Its increase will also be in proportion to the less considerable resistance of the parts in which it is situated; hence the magnitude of scrotal ruptures, and the generally small size of a femoral hernia. Sir Astley Cooper adverts to one condition conducive to hernia, through an altered state of the viscera, the abdominal muscles being nearly passive; this is when the viscera become, as it were, too large for the belly, from extreme obesity, the fat accumulating in extraordinary quantities in the omentum and mesentery. The enlargement of the uterus in pregnancy, as every surgeon knows, gives a great tendency to the occurrence of umbilical and ventral herniæ, by over-distension of the abdominal parietes.

At the first moment of the occurrence of a *suddenly formed* hernia, the protruded peritoneum must be unconnected with the parts amongst which it lies; but, in a very short time, it becomes firmly bound to them by the adhesive inflammation, which then prevents the return of the sac into the abdomen on the viscera being reduced.

The great apparent increase in the thickness of the sac is mostly owing, not to such change in the peritoneal sac itself, but to that of the more external coverings of the tumor, as the fasciæ, cremaster, and cellular tissue. However, there are exceptions, in which the hernial sac is really much thicker than the rest of the peritoneum; especially when the tumor, after having been long reduced, protrudes again, and is not kept up; when it has been repeatedly affected with inflammation; or there are extensive adhesions between the sac and its contents.

REDUCIBLE HERNIA.

The *general symptoms of a reducible hernia* are an indolent tu-

mor, situated at one of the points of the abdomen, already specified as the places for hernia; sometimes originating gradually, sometimes suddenly, and subject to change of size, being smaller when the patient lies down on his back, and larger when he stands up or holds his breath. Frequently it diminishes when compressed, and grows large again when the pressure is removed. Its size and tension often increase after a meal, or when the patient is flatulent. In many cases, colic, constipation, and vomiting occasionally take place, seemingly from the bowels being out of their natural situation, and less capable of their usual action on their contents; but, in others, the functions of the bowels go on quietly and regularly.

When the sac contains only a piece of intestine, forming what is termed an *enterocele*, the tumor is characterised by elasticity and uniform smoothness. No pain attends the handling of it; and, on the patient's coughing, while the surgeon's hand is applied to the part, a forcible impulse is felt, as if air were blown into the swelling. The bowel generally returns into the abdomen with great facility, a guggling noise being frequently heard at the moment.

If the sac contain only omentum, constituting *epiplocele*, the tumor has a more flabby and unequal feel; is more inclined to be oblong than round; and if the quantity of protruded omentum be considerable, the disease is in some degree indicated by its weight, which is greater than that of an enterocele. Here, also, an impulse is felt in the tumor when the patient coughs. In very young subjects, the contents of a hernia are generally intestine, and seldom omentum.

With respect to the signs of an *entero-epiplocele*, or hernial tumor, containing both omentum and intestine, if a part of the contents slip up suddenly and with a guggling noise, leaving behind something which is less easily reduced, the disease is an entero-epiplocele.

The *general treatment of a reducible hernia* is perfectly obvious. The protruded viscera are to be returned into the cavity of the belly, and a truss applied for the purpose of preventing their descent again. The manual proceedings, by which the contents of a hernia are reduced, without the use of the knife, are termed the *taxis*, the manner of performing which varies according to the situation of the tumor.

If no means be employed for reducing the parts, and keeping them reduced, there will be a constant risk of the hernia becoming strangulated by an additional protrusion of more bowel or omentum into the sac. But, besides this danger, and the loss of all chances of a radical cure, when a reducible hernia is neglected, other considerations should be pressed upon the patient, to make him understand the necessity of regularly keeping up the parts with a truss. It should be represented to him, that, if he neglect this precaution, the hernia will increase in size, so as not only to pr?

vent all active exertion, but, if a bubonocele, to impair the genital function by involving the integuments of the penis, and sometimes also, by the pressure, causing a wasting of the testicle. In particular, as the early period of life is that in which the opening has the greatest disposition to close, infants and children should never be suffered to be without a proper truss; and it is now perfectly ascertained, that they can wear trusses with steel springs just as well as adult subjects.

Though such are the doctrines which I have to offer in relation to the general treatment of reducible hernia, cases sometimes present themselves in which the contents of the hernia are so bulky that, though reducible, they cause, after their return into the belly, so much pain and indisposition, that it becomes necessary to let them continue in the sac, which should then be supported with a suspensory bandage.

IRREDUCIBLE HERNIÆ FREE FROM INFLAMMATION, AND TROUBLESOME OR DANGEROUS SYMPTOMS.

The usual causes, preventive of reduction in such cases, are, first, the bulk of the protruded parts, in relation to the opening through which they would have to return; secondly, alterations in their form and texture; thirdly, adhesions to one another, or to the inside of the sac; fourthly, transverse membranous bands within the sac, or the neck of it; fifthly, some herniæ are rendered irreducible, because the viscera are bound down by their natural cellular connections, though in a state of displacement. The bladder is generally incapable of being completely returned; and the hernial sac, where the cœcum protrudes, is deficient behind and at the outer side of the tumor, where the bowel has only its usual cellular attachment.

The course of the intestinal matter is always more or less obstructed in that portion of the bowels which is included in the hernia; and hence, patients with irreducible enterocele are frequently subject to complaints of the digestive organs, colic pains, or even a total stoppage of evacuations per anum; not the result of any constriction of the protruded bowel, but of the difficulty with which its contents pass through it.

Persons with irreducible ruptures should avoid rough exercise, support the tumor with a bandage, and keep it out of the way of all harm from pressure or bruises. They should also be careful to avoid costiveness, and irregularity of diet.

An irreducible omental hernia, free from constriction and inflammation, may not be the cause of much present inconvenience; but, when affected with inflammation from any accidental cause, or when a portion of bowel slips into the sac with it, severe and fatal consequences may ensue.

GENERAL SYMPTOMS OF A STRANGULATED HERNIA.

The first symptoms are a tumor in the situation of the hernial protrusion, attended with pain, not only in the part, but about the diaphragm, followed by eructation, sickness, inclination to vomit, suppression of stools, and acceleration of the pulse. The suppression of stools is often as complete and as irremoveable by purgative medicines, when only a small portion of the diameter of the bowel is strangulated, as when an entire fold of it is pinched. The action of a clyster on the bowels below the stricture often produces a stool after strangulation has taken place; but when they have once been emptied, the most irritating clysters have no effect. If the reduction be delayed, the bowels are distended with air; the belly is tense and swollen from this cause; the vomiting and eructations become more frequent,—all the contents of the stomach, and afterwards those of the bowels down to the stricture, being rejected. Afterwards, the pulse, which was previously about 90, and, perhaps, strong and hard, becomes much quicker and weaker, and the belly is very sore on pressure. Peritonitis has now come on. There is great anxiety and restlessness, with a small, quick, hard pulse, and generally cold extremities. After a time, hiccough occurs, the pulse sinks, and the whole body becomes covered with a cold clammy perspiration. Mortification next takes place, beginning in the the protruded viscera and extending to the containing and neighboring parts. The patient may now experience a sudden feeling of relief, but this is only temporary. The tumor becomes emphysematous, a sure sign of the gangrenous mischief within it. In this state, the gut either goes up spontaneously or is returned with the smallest degree of pressure; but, the hiccough and cold sweats continuing, the pulse becomes more and more rapid and irregular, and death soon follows.

When the body is examined, the whole surface of the peritoneum is found inflamed, the intestines participating in the disorder, particularly those above the stricture, which are considerably distended with air. From the strangulated part downwards, the intestine is generally smaller than usual, and sometimes not inflamed. The convolutions are also frequently connected together by recently formed adhesions; a turbid puriform fluid is effused in the abdomen; and, not unfrequently, spots of gangrene are seen on the intestines.

The symptoms of a strangulated epiplocele are less severe and rapid, and stools may generally be procured by purgatives and clysters; but this is sometimes attended with great difficulty, and the sickness and vomiting are, for the most part truly distressing. In the museum of University College is a preparation, exhibiting the production of a permanent stricture of the inner coat of a por-

tion of bowel that had suffered strangulation: an exceedingly rare occurrence.

General Treatment of a Strangulated Hernia.—Surgeons should always remember the necessity of not losing too much time in the trial of means not to be depended upon for procuring the reduction of the parts for the rapidity with which gangrenous mischief sometimes takes place in the hernia, attended by a dangerous and fatal degree of inflammation within the abdomen, is very remarkable. The greater number of patients, who die after operations for strangulated herniæ, do not die of those operations abstractedly considered, but rather of the effects of the disease; and if the knife were used more promptly, life would more frequently be saved. I fully coincide in the opinion entertained by many surgeons, that we should save many more lives by operating on strangulated hernia much sooner than is generally done. I would recommend a fair and prompt trial of those means which are the most likely to promote the reduction of the hernia; and if they failed, and the symptoms were urgent, it seems to me that time ought not to be wasted in the useless repetition of them, or the employment of others known to be less efficient.

The *taxis*, or an attempt to reduce the parts with the hand, is, of course, the first proceeding for adoption. For this purpose the abdominal muscles and femoral fascia should be relaxed by inclining the chest forwards, and bending the thigh and rotating it inwards. In the external inguinal hernia, the pressure should be directed upwards and outwards, along the course of the spermatic cord; but, as the femoral hernia passes first downwards and then forwards and upwards, the pressure in this case must be directed first downwards and then backwards. In umbilical and ventral herniæ, it is to be made directly backwards. No violence ought to be used, as it can be of no service, and must increase the inflammation of the bowels. The intestine may even be burst by too much force, or the sac forced into the abdomen, with the viscera strangulated by its neck. While the tumor is grasped with one hand, and moderate pressure on it steadily kept up, the fingers of the other hand are to be employed in the endeavor to get up any portion of the contents of the hernial sac, and to keep it reduced, until followed by another portion. If air be felt to return, this will be encouraging. Dr. O'Beirne's plan of lessening the contents of the abdomen, and thereby some of the resistance to the reduction, by discharging the air from the the large intestines with an elastic gum tube, appears to me to deserve greater attention than it has yet received from the profession. If the first trial of the taxis should fail, we may put the patient into a warm bath, if it can be prepared without too much loss of time; and while he is in it, take blood from his arm. If the warm bath should require much time for its preparation, I would advise it to be dispensed with, and blood taken from the arm.

16*

The object of the warm bath and bleeding is to render the patient weak and faint, to bring on a kind of general collapse, during which the taxis may often be practised with success. If the patient should fall into this state, therefore, the opportunity of trying the taxis again is to be taken.

Supposing, however, we were not yet able to succeed, what ought to be done? If the patient were not a very old or debilitated subject, I should next try the united effect of cold or ice applications to the swelling, and of an infusion of tobacco thrown up the rectum: ʒj. of tobacco is to be infused for ten minutes in a pint of boiling water poured upon it; the liquor is then to be strained, and one-half of it injected first; and if in about a quarter of an hour, this produce not too violent effects, the other half is to be thrown up. When the patient is under the influence of the tobacco, and the tumor has been subjected to the cold applications some little time, the hernia will sometimes return of itself, or with the slightest assistance. If it should not, the taxis is to be tried for the last time; and, if it now fail, and the symptoms be urgent, and peritonitis present, the operation ought to be performed without further delay. Although I would not generally employ the tobacco enema in old weak subjects, one exception deserves notice; and this is, when such an individual absolutely refuses to submit to an operation. One, or two cases of this kind have been attended by me in University College Hospital, and the practice was so successful, that, as soon as the patients came under the influence of the tobacco, the contents of the hernial sac returned into the abdomen, almost without the aid of any manual proceedings.

I have little faith in purgatives and opium, except in cases of strangulated epiplocele, or where there is reason to believe that a part of the contents of the tumor has been reduced. We are sometimes called to cases in which so much time has been lost, that we only just have an opportunity of trying the effect of tobacco and cold, or even not of them.

ANATOMY OF INGUINAL HERNIA, OR BUBONOCELE.

It will be impossible to understand the subject of inguinal hernia, unless we are acquainted with the anatomy of the passage through which the spermatic cord naturally proceeds, in order to reach the scrotum, and through which the most common form of inguinal hernia takes place. We must also understand the coverings of the spermatic cord, because they are also the coverings of inguinal hernia; and, in addition to these matters, we should have a clear idea of the situation of this hernia, in relation both to the spermatic vessels and the epigastric artery.

The *abdominal ring*, or triangular opening in the tendon of the external oblique muscle, the base of which corresponds to the crista

of the os pubis, is the external termination or outlet of the canal through which the spermatic cord passes. The upper, inner, and weaker pillar of this opening is inserted into the symphysis of the os pubis, and its lower, outer, and stronger pillar into the angle and crista of that bone. In the living subject, it is not an unclosed aperture; for, besides being occupied by the cord, it has the *intercolumnar fascia* extended over it. The inner opening or commencement of the passage, designed for the spermatic cord,—the very place, in fact, where the viscera first protrude in the most common kind of inguinal hernia,—is not situated directly behind the *abdominal ring*, but about an inch and a half from it, in the direction towards the anterior superior spinous process of the ilium. Or, I may say, that the *inguinal canal*, as it is generally named, is about an inch and a half in length; the *internal ring* being situated very nearly midway between the symphysis of the pubes and the anterior superior spinous process of the ilium.

From this description, it is manifest, that the direction of the inguinal canal must be oblique, extending downwards, inwards, and forwards.

But the student will naturally ask, what parts form the inguinal canal? In order to understand this part of the subject, it should be remembered, that a thin fascia, termed the *fascia transversalis*, first accurately described by Sir Astley Cooper, is extended from the inner margin of Poupart's ligament, over the posterior surface of the transverse muscle, thus forming a kind of partition between the abdominal ring and the peritoneum, and also forming, with a portion of the united fibres of the transverse and internal oblique muscles near the crista of the os pubis, the posterior boundary of the inguinal canal, the anterior side of which is formed, to the extent of its first third from the inner ring, by the transversalis and internal oblique muscles, and, in the remainder of its continuation, by the aponeurosis of the external oblique.

The precise point, at which the most common forms of inguinal hernia begin, corresponds, in the adult, to the passage of the spermatic cord under the edge of the transverse muscle. In the sound state, this part of the peritoneum has a small funnel-shaped depression in it; and it is this small digital kind of pouch, whose progressive enlargement constitutes the hernial sac, the hernia in its course always following the direction of the spermatic cord, in front of the vessels of which it is situated.

In point of fact, the opening which constitutes the internal ring or commencement of the inguinal canal, is the aperture in the fascia transversalis, designed for the passage of the spermatic cord into that canal. Now the cord, in passing through this opening, carries along with it a covering derived from the margin of such aperture in the fascia transversalis, which covering is termed the *funnel-shaped process* of the fascia transversalis. It is the least im-

portant of the investments of the hernia; for, after it has descended a little way, it is lost in the cellular tissue, between the peritoneal hernial sac and the cremaster.

The spermatic cord, invested by the *funnel-shaped process*, then passes under the lower edge of the transverse and internal oblique muscles, and here it receives its second covering from the *cremaster muscle*.

The abdominal ring is closed by the *intercolumnar fascia*, and from this the cord also derives a third investment, termed the *spermatic* or *intercolumnar fascia*; and, in addition to these several coverings, namely,—the *funnel-shaped process* of the fascia transversalis, the *expansion of the cremaster*, and the *spermatic* or *intercolumnar fascia*,—the cord is also covered by the *superficial fascia*, placed immediately under the integuments.

These investments of the cord are also the coverings of the common bubonocele, or oblique inguinal hernia, which descends through the inguinal canal. The hernial sac has between its external surface and the inner surface of the cremaster the *funnel-shaped process*, or investment derived from the margin of the aperture in the fascia transversalis, and named in some schools the *internal spermatic fascia*. On the outside of the cremaster, the sac has the covering derived from the intercolumnar; and, external to this, the *fascia superficialis*, which is immediately under the common integuments.

Sir Astley Cooper believes the inguinal canal to be endowed with muscular contraction, which, under the action of the abdominal muscles, serves to close it, and lessen the propensity to hernia. He observes, that the lower edge of the transverse muscle begins to be attached to Poupart's ligament almost immediately below the commencement of the internal ring, and that it continues to be inserted behind the spermatic cord into Poupart's ligament as far as the attachment of the rectus. Sometimes, he has found a portion of muscle descending from the tendon of the transversalis, in the course of the linea semilunaris, to be inserted into the fascia transversalis, behind the cord, and into Poupart's ligament, and a preparation exhibiting this conformation he was so obliging as to show me some time ago. Sir Astley believes, that this encircling of the internal ring and upper part of the inguinal canal by muscular fibres, may be a cause of strangulation in the external bubonocele. However, the anatomical facts, on which this doctrine is founded, are sometimes considered to be only deviations from what may be regarded as the normal, or most usual, conformation of the parts. Although we may not be disposed to explain the supposed spasmodic nature of some kinds of strangulation by the cause referred to by Sir Astley Cooper, we ought to feel obliged to him for his original explanation of the internal ring being occasionally surrounded by muscular fibres derived from the transversalis. His greatest

discoveries on the subject of this hernia, however, appear to me to be those relating to the first correct description of the internal ring, and of the fascia transversalis.

OF THE SITUATION AND COURSE OF THE SPERMATIC VESSELS AND EPIGASTRIC ARTERY, IN RELATION TO INGUINAL HER-NIA.

As the epigastric artery naturally runs first behind the spermatic cord, and then about a quarter of an inch from the pubic margin of the internal ring, and as the viscera protrude through this aperture, and follow the course of the cord, they must be situated on the outer side of that artery, which passes first behind the neck of the sac, and then at its inner side, in its way to the inner surface of the rectus muscle. Hence, the inner margin of the neck of the sac is encircled, as it were, by the track of the vessel.

In recent bubonoceles, the internal and external opening of the ring are at some distance from each other, the first being situated obliquely upwards and outwards in relation to the former; but the pressure of the protruded viscera gradually forces the internal opening more towards the pubes, and nearer to the abdominal ring, so as to render the posterior side of the neck of the hernial sac and of the inguinal canal very short. Thus, in an oblique inguinal hernia of long standing, the opening into the abdomen is almost direct, and the epigastric artery becomes situated nearer the pubes than in the natural state.

But, though in the most frequent form of bubonocele the protrusion begins at the point which I have described, and follows the course of the spermatic cord, passing all through the inguinal canal, and having the epigastric artery behind and at the inner margin of the neck of the sac, circumstances are very different in another less common variety of bubonocele, where the viscera instead of beginning to protrude at the internal and upper opening of the inguinal canal, and descending through that canal by following the course of the spermatic cord, are thrust out at the point directly behind the abdominal ring, together with the portion of the fascia transversalis, forming, with the conjoined fibres of the internal oblique and transverse muscles, the posterior boundary of the inguinal canal, immediately behind the abdominal ring, out of which the viscera then protrude in a direct manner. Here the hernial sac, instead of passing over the spermatic cord, as in the most frequent form of bubonocele, lies on its inner or pubic side; and the epigastric artery now pursues its course in front of the neck of the sac, at the usual distance from the upper and outer angle of the abdominal ring.

As in the most common inguinal hernia, the protrusion is on the outside of the epigastric artery, which winds under and round the inner

margin of the neck of the sac, the case is sometimes termed the *external bubonocele*; while the less frequent one, in which the protrusion takes place immediately behind the abdominal ring, out of which the viscera pass without having descended through the rest of the inguinal canal, is named the *internal bubonocele*; a case most particularly claiming recollection, as the protrusion *is at the inner or pubic side of the epigastric artery.* One case is also called the *oblique* inguinal hernia; and the other the *direct* or *ventro-inguinal.*

In this internal direct inguinal hernia, the sac pushes out with it the fascia transversalis, situated immediately behind the ring, and must either lacerate or displace the united fibres of the internal oblique and transverse muscles at this point. As the hernia does not follow the spermatic cord through the inguinal canal, in general the cremaster only covers it near the abdominal ring. With this exception, the coverings of the hernia are the same as in the external bubonocele.

The explanation of the very different situation of the epigastric artery, in relation to the neck of the sac of an internal bubonocele, from what prevails in the external one, immediately shows how important it is to distinguish one case from the other in practice. In fact, if we were to divide the stricture in the same way in each case, we should often wound the epigastric artery. The discrimination of one case from the other is also important, with reference to the manner of performing the taxis, and the kind of truss that should be selected.

In scrotal herniæ of large size, the spermatic vessels, instead of forming a cord, may be disjoined by the pressure of the swelling, the vas deferens being situated on one side of the sac, and the spermatic artery and veins on the other. In general, towards the upper part and neck of the sac, the cord is not much unravelled: but, as its component vessels proceed downwards, they diverge more and more, and spread themselves over the sides, or even over the front of the sac.

The close adhesions, which a hernial sac soon contracts to the cellular substance on the outside of it, makes its reduction a rare occurrence. Such an event, however, sometimes happens, especially in the femoral and internal bubonocele; for, in the external one, the prompt and intimate manner in which the sac becomes connected to the spermatic cord, makes it much less likely to take place.

Bubonoceles are most common in the male sex; but are occasionally met with in women, and then the round ligament of the uterus bears the same relation to the tumor as the spermatic cord does in males. Of course, in such a case, the hernia has not the covering which, in the male subject, it derives from the cremaster. There are also rare examples in which the direct bubonocele occurs in women. I operated upon a Mrs. Smith for a strangulated

hernia of this description, a tailor's wife, in Cumberland Street, Middlesex Hospital.   As she had no stools for three or four days when I went to her, and the symptoms were urgent, I performed the operation at once, without trying any previous means but the taxis, and, in about a week, she was perfectly well.

DIFFERENCE IN THE SYMPTOMS OF OBLIQUE, AND DIRECT INGUINAL HERNIÆ.

In the oblique inguinal hernia, there is an *oblong swelling*, extending obliquely inwards and downwards; in the direct hernia, the parts pass from behind straight forwards, and form, on the outside of the abdominal ring, a circular globular swelling, in general suddenly occasioned by some violent effort.   If any obliquity occur in the direct inguinal hernia, it is in a course towards the linea alba, and not towards the anterior superior spinous process of the ilium. Then, in the oblique inguinal hernia, the spermatic cord is situated behind or under the sac; but, in the direct bubonocele, it lies to the outer side, or upon the external half of the front of the neck of the hernial sac.   In the direct inguinal hernia, where the sac adheres to the cord, the testicle is not situated exactly under the fundus of the sac, as in the oblique inguinal hernia, but either at the forepart, or on the outer side of it.

In the direct bubonocele, the epigastric artery ascends obliquely inwards at the outer side of the neck of the hernial sac, though Hesselbach found an exception to this in one rare case, where that artery proceeded from the obutratrix.   This hernia occurs where the tendon of the transversalis is unnaturally weak, or from malformation does not exist at all, or from violence has been broken. Sometimes the fascia transversalis protrudes before the peritoneum, and there may be between the two membranes a stratum of fat. In certain instances, the hernia neither distends nor lacerates the conjoined tendon, but the protrusion takes place under the edge of the transversalis, and then through the lower opening of the inguinal canal.   Sometimes this hernia consists of two protrusions, divided from each other by strong tendinous fibres.

In other instances, the fascia transversalis is lacerated, not dilated.   In general the sac is not covered by the cremaster; but all the best authorities concur in the statement, that this investment is not unfrequently met with.   A direct inguinal hernia is now and then accompanied by an oblique one.

From the previous description it is sufficiently clear, why, in the oblique hernia, the pad of a truss should always press, not merely upon the abdominal ring, but upon the track of the inguinal canal; and why, in the direct hernia, the pad should only act upon the abdominal ring.   In the taxis, the direction of the pressure should be different; for, in the oblique bubonocele, the viscera should be

pushed upwards, backwards, and outwards; in the internal, upwards and backwards. Then, in the operation on strangulated cases, a still more important thing to be remembered is the different directions which should be given to the incision for the division of the stricture: in the oblique case, we may cut upwards and outwards, with perfect safety to the epigastric artery, but not inwards or towards the linea alba; whereas, in the direct hernia, the cut must not be made outwards, but inwards, the epigastric not being displaced from its natural situation. In order to avoid doing mischief by mistaking one sort of hernia for another, Sir Astley Cooper recommends the incision always to be made directly upwards.

OPERATION FOR OBLIQUE INGUINAL HERNIA.

The hair having been removed from the parts which will be in the track of the knife, and the bladder emptied, the first incision should commence an inch above the external angle of the abdominal ring, and extend obliquely downwards, and inwards over the middle of the tumor to its lower part except when the hernia is very large. This incision divides the skin and the superficial fascia, and sometimes the upper branch of the external pudic artery, as it crosses the tumor near the abdominal ring. By directing the incision obliquely downwards and inwards we lessen the chance of injuring the spermatic vessels, should they happen to be situated towards the front of the sac. The division of the integuments, subcutaneous fat, and the facia superficialis, exposes the fascia derived from the intercolumnar, at the abdominal ring, and generally forming one of the thickest coverings of the hernia. We should then make a small opening through this covering derived from the intercolumnar fascia, which may be safely done by taking hold of a small portion of it with a pair of forceps, and then dividing it cautiously close to the point of the forceps, with the edge of the knife turned horizontally. Having made an opening, we introduce a director, and, with a probe-pointed curved bistoury, divide the fascia upwards and downwards as far as the external incision reaches. Thus the next covering of the hernial sac is brought into view, namely, the expansion formed by the cremaster, which must be opened and divided in the same manner as the fascia. Having done this, we come to the funnel-shaped process, or the continuation of the fascia transversalis between the upper portion of the cremaster and the hernial sac, but which is so thin and so soon lost in the cellular tissue between the sac and the cremaster, that it is not recognised by some of the best writers on hernia. Now the cellular tissue on the outside of the sac will be brought into view; and, after having carefully divided it, we arrive at the hernial sac itself; a little piece of the anterior and lower portion of which is to be lifted up between the thumb and fore-finger, and carefully examined to learn whether the

fold thus raised includes any portion of bowel. If it does not, we take hold of it with a pair of forceps, and cautiously open it with the edge of the knife directly horizontally. Surgeons choose to open the hernial sac at its anterior and lower part, because if there be any fluid in it, it will gravitate to this part, and be a kind of protection to the intestine from the edge of the knife. Sometimes much perplexity is evinced in distinguishing the sac itself from the intestine. However, the circular arrangement of the vessels of a piece of intestine, and its smooth polished surface, sufficiently characterise it from the hernial sac, which has a rough cellular surface, bloodvessels pursuing an arborescent course, and is closely connected to the surrounding parts. Having made an opening into the hernial sac, we are to introduce a director, and, with a probe-pointed bistoury, lay it open to the extent of the other incisions.

The next thing is to divide the stricture, which may be situated either at the abdominal ring, and be formed by the margins of this opening; or else, what is more frequent, within the inguinal canal, where it is produced by the lower edge of the internal oblique and transverse muscles; or, lastly, at the internal ring itself, about an inch and a half from the external ring, in the direction towards the anterior superior spinous process of the ilium.

If the case require it, we may now introduce a director, or the end of the left fore-finger, into the neck of the sac, within the abdominal ring, and, with a probe-pointed bistoury, cut the stricture *upwards and outwards* or if it be preferred *directly upwards*; the recommendation of which last plan, suggested as a general one by Sir Astley Cooper, is, that we shall not endanger the epigastric artery by it, whether the case be an external or an internal bubonocele. Were we completely sure, however, that the case were a *direct* bubonocele, we might safely divide the stricture upwards and inwards, the epigastric artery lying on the outer side of the neck of the sac, the reverse of what happens in the *oblique*, or most common form of bubonocele.

When the stricture is at the upper opening of the inguinal canal, the abdominal ring itself should not be cut, unless it prevent the operator from reaching the more deeply-seated strangulation.

The next business is to return the protruded parts, if sound, and free from adhesions; and this will be considerably facilitated by bending the thigh, and rotating the limb inwards. Sometimes, it is true, there is a good deal of difficulty in separating adhesions, which may even be such as to prevent the reduction of the protruded parts altogether; but this is unusual. In such a dilemma, by dividing the stricture, we render as much service as surgery can accomplish; and the patient will not always be lost, though we may be obliged to leave some of the bowels protruding. The intestine, if possible, should always be reduced, unless it be found in a state of actual mortification. The appearance of dark-brown chocolate

discolorations is no objection; and they should be discriminated from the *black* or *purple spots* which indicate mortification.

With respect to *adhesions*, the intestines are not often firmly adherent to one another. In general, the strongest adhesions are those between the omentum and the inside of the sac. Slight adhesions of the intestine to the inside of the sac may be gently broken with the fingers. If such connection should require the use of the knife, the safest plan is not to cut too near the bowel, but to remove the adherent parts of the sac, and return them with the intestine into the abdomen. But, if the adhesions should be within the neck of the sac, the inguinal canal should be more freely laid open, so as to bring them into view.

One important rule, after the reduction, is, to introduce the finger tenderly, and ascertain that the parts are all fairly and freely returned, and not suffering any degree of constriction, either from the margin of the internal oblique and transverse muscles, or the inner opening of the inguinal canal, or other causes, and not confined by any adhesive bands, formed across the mouth of the hernial sac.

Treatment of omentum.—In entero-epiplocele, the omentum, if healthy, is to be reduced after the intestine. If much enlarged and indurated, or gangrenous, diseased, or mortified, the unsound portion is to be cut off, and the arteries taken up with a tenaculum, and secured with fine thread or silk. One half of each thread is to be cut off close to the knot. I do not return the portion of omentum, that lies in the upper part of the sac; by which means all risk of bleeding into the abdomen is avoided.

Treatment of Mortified Intestine.—In many cases, when the intestine mortifies in a hernial sac, the latter part, its coverings, and the integuments, also become gangrenous. If the patient continue to live, the intestine bursts, and the feces at length find an outlet, either through the wound made by the surgeon, or an opening formed by the separation of the sloughs. Of course, before the bowel mortifies, the neighboring inflamed part of it becomes adherent to the neck of the sac. After this the final result may be of three kinds: either the death of the patient; his recovery, with the loathsome annoyance of an artificial anus; or the gradual diversion of the feces from the wound to their natural course again, the cicatrisation of the part, and a complete cure.

The principal thing, on which the re-establishment of the continuous state of the intestinal canal depends, is the adhesion which the living portion of bowel, adjoining the mortified part, contracts with the peritoneum all round. In this manner, the escape of the contents of the bowel into the cavity of the abdomen is in general completely prevented. The two ends of the sound portion, after the sloughs have been thrown off, become connected together through the medium of a membranous cavity, which previously constituted a portion of the peritoneal sac. The gradual contraction

of the wound closes the membranous cavity externally, and thus
the continuity of the canal is restored.   The two ends, however,
are not joined, so as to form an uninterrupted cylindrical tube, like
that of the natural gut; but they are united at an angle more or less
acute; and the matter, which goes from one to the other, describes
a half circle in the membranous cavity, while the two ends of the
bowel always lie in a more or less parallel manner by the side of
each other; the upper with its orifice directed towards the external
wound by the feces, so long as they take that direction.   The low-
er is less capacious than the upper.

This account renders it plain, that there must be a considerable
projection, or jutting angle, between the orifices of the bowel, di-
rectly opposite the communication between the cavity of the intes-
tine and that of the *semicircular funnel-shaped membrane*, as it is
termed by Scarpa.   Now, it is this projecting ridge, or angle, that
forms a material obstacle to the direct passage of the feces from the
upper into the lower portion of the intestinal tube.   It constitutes
one of the chief hinderances to the cure of an *artificial anus*; and
it is destroying it with the pressure of a pair of forceps constructed
for the purpose, that Baron Dupuytren's plan often succeeds in cur-
ing this loathsome affliction.   One of the blades of the instrument,
which is blunt, being one line in breadth, is received into a groove
in the other, so that the jutting angle, or l'épéron, as it is termed by
the French surgeons, is crushed, not suddenly divided, which would
afford no opportunity for the adhesive inflammation.   The first blade
is passed into the upper part of the bowel, the second into the low-
er, and the instrument is then firmly shut by means of a screw,
which connects the handles, and by which the degree of pressure
can be regulated.   The adjoining portions of the peritoneum unite
by the adhesive inflammation; the jutting angle included between
the blades sloughs; the cavity of the peritoneum is saved from an
effusion of intestinal matter into it; and the canal of the bowel re-
mains free and perfect.   Much of the danger of an *artificial anus*
will depend upon its degree of nearness to the stomach.   Thus, if
the opening be in the jejunum, there will be so small an extent of
surface for the absorption of chyle, that the patient will die of in-
anition.

If mortification of the bowel be first detected on opening the sac,
and there should be only one or two spots, we are to divide the
stricture; and, if the gut be not adherent, it is to be reduced.

When the chief part, or the whole diameter, of the bowel is mor-
tified, the indication is to make an outlet for the intestinal matter, by
a free incision through the sloughs, and by cutting the stricture if it
should still exist.   Here, of course, all idea of reduction of the
parts is out of the question.

In *operating upon very large hernia* of long standing, the proper
plan is to divide the stricture, if possible, without laying open the

hernial sac. The plan will answer, if the stricture be at the abdominal ring. When the sac must be opened, it should be so only towards the latter opening, and not more extensively than circumstances demand. The free exposure of the cavity of a bulky hernia is itself a frequent source of fatal mischief.

In operating upon *hernia within the inguinal canal*, but not protruding through the ring, we should make the incision in the direction of that canal. In such a case, the stricture will be found at the internal ring.

After the operation, the wound is to be closed with a suture or two, and lightly dressed. Evacuations from the bowels are to be promoted by means of small doses of sulphate of magnesia, dissolved in peppermint water, or by clysters. The patient must not, however, be allowed to sit upon the night-stool, as doing so would be likely to bring on a protrusion of the bowels again. It is safer to put a bed-pan under him. If tenderness and tension of the belly, with costiveness and febrile symptoms, come on again, in the course of a day or two, we must have recourse to local and general bleeding, poppy-head fomentations, and castor oil. If the stomach be much disturbed after the operation, the sulphate of magnesia may be given in the effervescing saline draught, with or without a few minims of the tincture of opium or hyoscyamus.

Before the patient leaves his bed, a truss is to be applied.

When the bowel has been much discolored, it will sometimes give way two or three days after the patient has appeared to be going on well; and the patient is destroyed by peritonitis, resulting from effusion of the contents of the bowels into the cavity of the peritoneum.

OPERATION FOR DIRECT INGUINAL HERNIA.

In this case, the coverings of the sac are the skin and superficial fascia, the intercolumnar fascia, the fascia transversalis, and sometimes the tendinous fibres of the internal oblique and transverse muscles, if not torn or burst. It is only in the vicinity of the abdominal ring, that this hernia commonly has any fibres of the cremaster spread over it. The several investments, here specified, are to be divided much in the same way as those of the oblique bubonocele, and the stricture cut, either upwards and inwards, or directly upwards, as preferred by Sir Astley Cooper, for a reason already explained.

THE FEMORAL OR CRURAL HERNIA

Is so called, when the hernial sac and its contents protrude under Poupart's ligament at the inner side of the femoral vein, so as to be situated in the bend of the groin, upon the pectinalis muscle,

between the gracilis and sartorius. The protrusion takes place, in fact, through the *crural* or *femoral* ring into that compartment of the crural sheath which is destined for the passage of the absorbent vessels of the lower extremity. When once the sac has descended as low as the saphenous opening in the fascia lata, the hernia has more room to extend itself forwards, and to each side, and the integuments now become raised into an oval swelling, the greatest diameter of which is nearly transverse.

The femoral hernia is frequent in women* who have had children; but rare in young girls. In men, a hernia more readily forms through the inguinal canal, by following the course of the spermatic vessels, than under Poupart's ligament; but the latter case is far from being so uncommon in them as sometimes represented.

The tumor, produced by a femoral hernia, may be mistaken for an enlarged gland. A gland can only become enlarged by the gradual effects of inflammation; the swelling of a femoral hernia comes on suddenly, and, when strangulated, occasions the train of symptoms already described, which an enlarged gland could never occasion. As my friend, Mr. Morton, also correctly observes, in consequence of the extensible and yielding nature of the deep lamella of the superficial femoral fascia, glandular swellings are readily moved upon their basis by lateral pressure, and even allow the tips of the fingers to be pressed underneath them, so as to lift them up, as it were, from the fascia of the thigh. On the other hand, the neck of the tumor, formed by a femoral hernia, is deeper and more fixed.

When the expanded part of a femoral hernia lies over Poupart's ligament, it may be mistaken for a bubonocele; but, the true nature of the case may always be made out by observing, that the neck of a femoral hernia has Poupart's ligament above it. In the bubonocele, the spine of the pubes is below and behind the neck of the sac; but in the femoral hernia, it is on the same horizontal level, and a little on the inside of it.

When a femoral hernia expands in the bend of the thigh, its shape is oval, and its greatest diameter is placed transversely; but, whatever may be the size of an oblique inguinal hernia, it has an oblong pyramidal shape, with its fundus not inclined towards the ilium, but in the direction of the spermatic cord towards the scrotum.

Besides the symptoms, common to all hernial swellings, the femoral hernia, when of a certain size, has some which are peculiar to it, as stupor, and sense of weight in the thigh, and sometimes œdema of the leg and foot: circumstances, accounted for by the

---

* A large proportion of the patients, on whom I have operated, were old women. One, on whom I operated towards the end of October, 1839, in University College Hospital, was eighty-seven, and is at this date (Nov. 2. 1839) nearly well. I remember no instance where the operation was performed on a subject of this very advanced age.

pressure of the hernia on the bloodvessels, lymphatics, and nerves, which pass out of the pelvis in its vicinity.

SURGICAL ANATOMY OF FEMORAL HERNIA.*

The *crural arch* is a term applied to the lower margin of Poupart's ligament, the space intervening between which and the ilium and os pubis is, in a great measure, closed on the side towards the abdominal cavity by the union of the *iliac* and *transverse fasciæ* at Poupart's ligament, which fasciæ, in fact, shut up all that space which is between the anterior superior spinous process of the ilium and the femoral vessels. Hence, a hernial protrusion scarcely ever happens in the space below the crural arch to the outside of the femoral artery and vein. The occurrence is prevented not only by the junction of the iliac and transverse fasciæ within, but also by the *fascia lata* without, which, in this situation, is strong and closely attached to the subjacent parts. The femoral hernia takes place through the *crural ring*, a small oval aperture, which is situated under the crural arch, more towards the pubes; in fact, between the thin posterior border of the *crural arch*, termed *Gimbernat's ligament*, and the septum at the inner side of the femoral vein.

As the protrusion does not take place through a simple aperture, but follows a course of some trivial length, the expression *crural canal* is employed by Scarpa and Cloquet. It is at all events the superior or posterior aperture of the *crural canal* which is implied by the *crural ring*, the canal itself extending obliquely downwards and forwards for a half or three quarters of an inch, and terminating below at the oval depression for the vena saphena major; or, in the words of Mr. Morton, the *crural canal*, is the short passage which extends between the *saphenous opening* of the fascia lata and the *crural ring*. It is formed by the innermost of the compartments into which the funnel-shaped sheath of the femoral vessels is subdivided.

The viscera descend at first nearly in a perpendicular direction, and come into the hollow in front of the pectinalis, but the hernia then turns forwards, and directs itself rather towards the ilium, the fundus of the sac sometimes inclining over the crural arch.

As the protrusion descends over the pectineal line, or close attachment of the pectinalis muscle to the pubes, it must be situated over the pubic portion of the fascia lata. *Gimbernat's ligament*, which is a part of so much importance in the anatomy of femoral

---

* An excellent description of this subject, which I recommend to all students, is contained in " Morton's Surgical Anatomy of the Groin, the Femoral and Popliteal Regions." 8vo. Lond. 1839. The lithographic plates and wood engravings are superiorly executed from original drawings; and the book is replete with valuable surgical remarks.

hernia, I think, will be best understood by considering it as a pro-
longation or extension of Poupart's ligament, which, when it ap-
proaches the os pubis, becomes suddenly broader, and is attached
by this broad portion to the angle and crista of that bone, and ileo-
pectineal line.   The posterior edge of Gimbernat's ligament is
concave, thin, and sharp, the ligament itself about three quarters of
an inch in breadth, but broader in the male than the female subject.
In the erect position of the body, it is nearly horizontal.

The *crural ring*, through which the absorbents of the thigh as-
cend to the lymphatic glands situated upon the inner border of the
psoas muscle, is formed by this posterior edge, or, as it is some-
times termed, the base of Gimbernat's ligament, directed towards
the crural vein; externally by the femoral vein, or rather by a pro-
duction of fascia, or a kind of septum placed between that vessel
and the compartment of the femoral sheath, through which ascend
the great lymphatics of the thigh; anteriorly by the thin posterior
edge of the crural arch, or Poupart's ligament; and posteriorly by
the horizontal branch of the os pubis.   But into the crural ring
productions both of the fascia transversalis and fascia iliaca always
descend, so as to form at once a part of the *tubular or funnel-shap-
ed sheath for the femoral vessels*, and a lining for the crural canal,
the front half being formed by the fascia transversalis—the back
by the fascia iliaca; and, as Sir Astley Cooper has clearly explain-
ed, it is through the inner side of the sheath, next to the pubes,
that the femoral absorbent vessels pass into the abdomen, the open-
ings for which give a cribriform appearance to this portion of the
tubular sheath.   The femoral sheath is wider above than below: its
external side, which is straight, being closely applied to the femoral
artery; while its inner margin extends downwards and outwards
from Gimbernat's ligament to the femoral vein, just on the inner
side of which vessel is an oval aperture, frequently occupied by a
lymphatic gland, and some absorbents and loose cellular tissue (the
septum crurale of J. Cloquet), through which opening the hernia,
in its descent, passes towards the point of the fascia lata, at which
the vena saphena major gets to the femoral vein, which point is in-
cluded within what is called the *falciform process*.   It should then
be clearly understood, that the *tubular* or *funnel-shaped sheath* of
the femoral vessels is subdivided into three distinct compartments
•by the membranous septa, which are situated on each side of the
femoral vein, and connect the anterior and posterior parietes of the
sheath more firmly together.   The most external of these subdivis-
ions contains the common femoral artery, the second, or middle,
the great femoral vein, while the third, or that which is nearest the
tuberosity of the os pubis, corresponds with the crural ring, and is
closed in the natural condition of the parts by some loose cellular
tissue, and lymphatic vessels, an absorbent gland also occasionally

lying within it.* Into this last compartment, the viscera protrude in a femoral hernia.

The very lucid and original explanations of the anatomy of femoral hernia by Sir Astley Cooper reflect the highest honor on himself, on his profession, and, I would also say, on his country. We knew little about various points in the minute anatomy of femoral hernia until he demonstrated them, and published a clear description of them. If we turn to this source of information, or, what is better, if we dissect and open the tubular sheath, we find that it contains two membranous partitions, or septa, one passing between the artery and vein, and another between the vein and the absorbents. The artery and vein completely fill up the spaces in the sheath allotted to them; but the absorbents, being but loosely connected by cellular tissue, do not always afford sufficient resistance to prevent the descent of the viscera in this situation, and the formation of a crural hernia. It is this opening, then, in the inner part of the sheath, which is really the aperture by which the bowels descend, and which is situated, as already stated, between the thin crescentic edge of the base of Gimbernat's ligament and the femoral vein, or rather the septum. Or I may say, that the hernia protrudes into the division of the tubular sheath, designed for the transmission of the principal trunks of the absorbents from the lower extremity, scrotum, and superficial parts of the hypogastriac region into the pelvis.

The *falsiform process* is easily comprehended when we remember, that the fascia lata has two origins, one from the lower border of Poupart's ligament, all the way from the anterior superior spinous process of the ilium, to the tuberosity of the os pubis. This, which is the thickest and strongest, is called the *iliac portion*, and it covers the psoas, iliacus, sartorius, and rectus muscles, the femoral artery and vein, and the anterior crural nerve, its breadth in the adult subject being from four to five inches. The *inner* or *pubic portion* of the fascia lata arises from the pubes in front of the origin of the pectinalis muscle, which muscle it covers, together with the adductor longus, and the gracilis, and afterwards unites with the iliac portion of the fascia lata, under the great saphena vein. Of course, it lies behind or under the femoral vessels, while the iliac portion is in front of them; and above, it is continuous with the iliac fascia. From this description, it is manifest that, where the pubic portion of the fascia lata joins the iliac portion under the vena saphena major, there must be an aperture left for the passage of that vessel. This opening is termed the *saphenous opening*, the concave

---

* See Th. Morton, Op cit. p. 90.

external margin of which consists of part of the *falciform process*, first correctly described by Mr. Allan Burns.*

Scarpa represents the iliac portion of the fascia lata as connected with Gimbernat's ligament; and Mr. Lawrence describes the upper end of the fascia falciform process, not merely as passing in front of the femoral vessels, just as they emerge from behind the crural arch, but as bending under Poupart's ligament, so as to unite with the thin border of the arch called Gimbernat's ligament.

The great saphænal vein passes over the inferior sharp edge or horn of the falciform process, and there joins the femoral vein. Then, between the parts just described and the skin, is the *fascia superficialis*, quite distinct from the fascia lata, and consisting of two layers, between which lie some adipose matter and the superficial inguinal glands. Where it covers the saphenous opening, it has several apertures in it, and this portion of it, or rather of the deep layer of it, is sometimes termed the *cribriform fascia.†*

The anterior wall of the crural canal is formed by the fascia transversalis, covered by the falciform process of the iliac portion of the fascia lata. The posterior wall is formed by the fascia iliaca, supported on the pubic portion of the fascia lata, which here covers the pectineus. The external wall is formed by the septum at the inner side of the femoral vein, and the internal by the transverse and iliac fasciæ, where they unite to complete the inner side of the funnel-shaped sheath.

In femoral hernia, the viscera descend through the crural ring, pushing before them the peritoneum. They then pass into the internal compartment of the tubular sheath of the femoral vessels, that designed for the transmission of the lymphatics, and afterwards turn forwards, and even upwards, through the saphenous opening in the fascia lata, so as to lie over the iliac portion of the fascia lata.‡

The coverings of the femoral hernia are the *integuments*, the *fascia superficialis*, and the *fascia propria*, or tubular sheath of the femoral vessels, besides the peritoneal hernial sac. The epigastric artery passes obliquely upwards and inwards, about half an inch from the external side of the neck of the sac. When the obtura-

---

* "It is in a great measure owing to the connection existing between the margin of the saphenous opening and the sheath of the vessels, that the fundus of the sac of a complete femoral hernia is usually prevented from descending any further downwards, but is rather turned, or tilted forwards and upwards, so as to rest upon the falciform process under the lower part of the aponeurosis of the external oblique muscle." Morton, Op. cit. p. 110.

† "The fascia cribriformis adheres pretty closely to the margins of the saphenous aperture of the fascia lata; it is covered externally by the cutaneous vessels and superficial absorbent glands; while its internal surface is in apposition with the anterior part of the funnel-shaped sheath of the vessels, where it is formed by the fascia transversalis." Morton, Op. cit. p. 103.

‡ In a few instances, where the septum on the inner side of the femoral vein is defective, the hernia, instead of protruding at the saphenous opening, descends further into the sheath of the femoral vessel, and then, of course, it lies under the fascia lata.

trix artery arises from the epigastric, it may go either near the outer or inner side of the neck of the sac to the obturator foramen. When the common trunk of these vessels, so originating, is long, and the place where the obturatrix goes off from it is high up, the latter vessel may descend near the upper and inner border of the crural ring. But, when it arises from the epigastric lower down, it will then pursue its course downwards near the external margin of the neck of the sac. On this point, Mr. Morton makes the following remark:—" When the obturator artery is given off from the epigastric (a variety that occurs about once in three subjects), it most frequently descends upon the pubal side of the external iliac vein to reach the thyroid foramen; and, when it does so, will always be placed upon the iliac, or external side of the crural ring, and therefore altogether removed from the edge of the knife, as commonly directed in the operation for femoral hernia." Sometimes, however, it runs, for a short distance, along the superior margin of the crural ring, and then descends behind the lunated border of Gimbernat's ligament, in its way to the thyroid foramen. When this latter arrangement prevails, the neck of the hernial sac is surrounded for at least three fourths of its circumference, by large and important vessels. The spermatic cord, or, in women, the round ligament, as it lies within the inguinal canal, passes directly over the superior part of the hernia; or, in other terms, is situated close above the anterior margin of the crural ring. All these are essential things to be considered in operating on a femoral hernia.

The peritoneum, as it descends before the hernial protrusion, pushes before it the subserous cellular tissue, and the septum crurale. So long as the hernia is lodged within the crural canal, and does not project through the lower opening of it, the case is termed an *incomplete femoral hernia*. On account of the tumor being small, and bowed down by the falciform process, its detection, as Mr. Morton justly observes, requires much attention, especially in corpulent subjects.

When the fundus of the sac protrudes through the saphenous opening, the case is a *complete femoral hernia*.

OPERATION FOR STRANGULATED FEMORAL HERNIA.

The bladder should first be emptied; for, a wound of it has been known to occur in the operation. This is not always performed in one way, different surgeons having different modes of proceeding, according to their view of the parts chiefly concerned in forming the stricture, and of the safest place for the incision, with reference to the epigastric artery and spermatic vessels; for the round ligament in the female ought not to have much influence on the question, a wound of it being of little importance. At St. Bartholomew's, the

school where I was brought up, the surgeons usually began the operation by making an incision, which commenced about an inch above the crural ring, or pubic portion of Poupart's ligament, and extended obliquely downwards and outwards over the centre of the swelling. This plan answered very well where the intention was to divide Gimbernat's ligament near the pubes, in order to free the protruded parts from strangulation in the crural ring itself, and to be able to reduce them. Sir A. Cooper and Baron Dupuytren make two incisions through the integuments, in the form of the letter T reversed. The transverse cut, extending over the middle of the tumor, is safely made by pinching the skin into a fold in the direction of the femoral vessels, and then cutting it across. The second incision is then to descend from a little above Poupart's ligament to the central part of the transverse incision, after which the angles or flaps are to be carefully dissected up. The first transverse cut is likely to wound the superficial epigastric artery: but this is a matter of no importance. The division of the integuments exposes the superficial fascia, which is here generally thicker than what lies over an inguinal hernia, though, in thin persons and recent cases, it may be so delicate as to escape notice. It also includes between its layers the superficial absorbent glands. Sometimes, when we have made the incision through the skin, we find the hernia concealed by dense fat and enlarged absorbent glands; but we are not to be perplexed by the circumstance, provided we are clear and certain respecting the existence of hernia. I remember being sent for to a poor woman in St. Giles's, one twelfth-night, for a strangulated femoral hernia, when, as the symptoms were urgent, and I had not much time to spare on account of a private engagement, I proceeded to the operation directly after the taxis had failed. Now, on making the incision through the integuments, I came to such a mass of diseased fat and glands, that I was a little staggered, and led to consider for a minute or two whether I might not have been in too great a hurry to operate, and mistaken a case of enlarged glands for a hernia. But a little reflection convinced me, that the patient's symptoms could not depend upon the latter cause; and, on dissecting more deeply, I came to the fascia propria of a small hernial tumor. The patient recovered, as, I think, most patient's do, in whose cases the operation is not deferred till too much inflammation and other mischief have had time to take place. After the division of the superficial fascia, we come to the tubular sheath of the femoral vessels, or *fascia propria*. Our next object is to lay open the fascia propria, first lifting up a piece of it with the forceps, and then making a small opening in it with the edge of the knife directed horizontally. A director is then to be introduced into the aperture so made, and the fascia propria divided upwards and downwards to the neck and fundus of the sac. After having laid open the fascia propria, we may meet with a quantity of fat,

which, in consequence of the long pressure of trusses, sometimes presents a thickened dense feel, and assumes very much the appearance of indurated omentum, so as to cause an erroneous suspicion of the hernial sac having been already divided, followed by pernicious efforts to push back the parts into the abdomen. This is a subject, on which excellent practical information is contained in Key's edition of Sir Astley Cooper's work on Hernia, who has given a plate exhibiting an unopened sac pushed back into the abdomen, with the strangulated bowel in it. In University College Hospital, I operated last winter (1838-39) on a woman of sixty, for a strangulated femoral hernia of long standing. On opening the fascia propria, a portion of a cyst, imbedded in fat, and filled with fluid, presented itself, looking very much like a fold of intestine. On dissecting more deeply, another cyst of the same kind was met with, before the hernial sac was exposed.* Circumstances of this kind, if the surgeon be not aware of their possibility, create much embarrassment in the operation. The hernial sac having been exposed, is now to be cautiously opened, in which step of the operation we are to nip up a small portion of the fundus of the sac, and feel that no portion of the contents of the hernia is directly within it. Then we are to take hold of it with the forceps, and make a small opening in it with the edge of the knife directed horizontally, and kept close to the extremity of the forceps. On this being done, a certain quantity of clear or turbid serum mostly gushes out, but not invariably. The director is now to be introduced, and the sac laid open upwards and downwards to the crural sheath and fundus of the sac itself.

Having proceeded thus far, we may sometimes easily return the contents of the hernia without the further use of the knife; but, unless this be practicable without any squeezing and bruising of the parts, the stricture ought to be cut. In this important stage of the operation, I have generally divided Gimbernat's ligament, and with it the neck of the hernial sac, and the contiguous part of the fascia transversalis. A director is introduced along the inner side of the protruded viscera into the crural ring, with the groove turned towards the pubes. Then with a narrow probe-pointed bistoury, or with Sir Astley Cooper's hernial bistoury, which has but a limited cutting edge, and none at all towards the handle, in order to occasion less risk of wounding the bowel, we are to cut the base or deep-expanded part of Gimbernat's ligament in the direction inwards, or inwards and upwards. In this part of the operation, the bowel is continually exposed to injury, on account of the small space in which we have to act; and I recommend all surgeons,

---

* See Clinical Lecture in Lond. Med. Gaz. for March, 1839. Cysts of this description I find noticed in the last edition of Lawrence's Treatise on Hernia; also by Sir Charles Bell, in his Illustrations of the Great Operations of Surgery, p. 41.

therefore, not only to use the kind of bistoury suggested by Sir Astley Cooper for the division of the stricture, but to be particular in keeping the intestine out of the way of the instrument with the left fore-finger, or with the hand of an assistant. Of late, I have sometimes cut the posterior edge of Poupart's ligament upwards and inward either with a common probe-pointed bistoury, or Sir Astley's knife, passed along the nail of the fore-finger of the left hand, which is sometimes safer than a director. "The tip of the finger nail (as Mr Morton observes) should be insinuated underneath the band which forms the stricture, and the blunt extremity of the probe-pointed bistoury (placed flat upon the finger) guided just within the sharp margin of the stricture; after which the edge of the knife is to be turned upwards and the handle being raised, the tendinous band, which resists the return of the bowel, will be easily divided." The stricture having been divided, the thigh should be fixed, and rotated inwards, in order to relax still further the crural ring, and facilitate the reduction.

When the bowel has been strangulated beyond a certain time, it becomes dark-colored; and, though not actually gangrenous at the period of the operation, it will sometimes give way afterwards. This happened in a case, where I operated rather too late on the sister of the celebrated harlequin, Bologna. She was a dancer, a pro-fession particularly exposed to the risk of hernia. After the opera-tion, her sufferings ceased, she had several motions, and her pulse came down to 80; but, all on a sudden, forty-eight hours after the operation, she was seized with excruciating agony in the abdomen, faintings, quick faltering pulse, and cold sweats, with which symp-toms she soon died; and, on opening her, it was found that a small point of the ileum had given way, that the contents of the bowel had become effused, and that a rapidly fatal inflammation of the perito-neum had been the consequence.

It would not be safe to cut the crural ring upwards in a male sub-ject; because we should wound the spermatic cord. In a female, how-ever, in whom we find that this hernia is most common, I do not know, that the round ligament ought to deter us from cutting in this direc-tion, if we had any reason for selecting it. We could not cut up-wards and outwards, because we should injure the epigastric artery; and we could not turn the edge of the knife precisely outwards, or in the direction away from the pubes, because we should wound the femoral vein. The safest plan, therefore, seems to be generally that of making the requisite division of the crural ring by cutting inwards and a little upwards.

The only case, in which the division of the deeper part of the stricture, in the direction inwards, would be attended with danger, is that in which the obturatrix artery arises from the epigastric, high up, and, in its way into the pelvis, descends round the inner margin of the crural ring, This position of the obturatrix artery, however, in relation to the neck of the sac and the crural ring, is computed

not to occur more frequently than once in about eighty cases of
femoral hernia. The division of Gimbernat's ligament inwards
has not the sanction of some surgeons, for whom I entertain the
highest respect; and though it is the method which I have frequent-
ly adopted, and found answer, let not the reader suppose that I do
not see reason for sometimes following other plans. Sir Astley
Cooper cuts the anterior part of the crural canal, by carrying the
knife as far as the front margin of the crural arch, in the direction,
upwards and inwards. When this is not sufficient, he next cuts the
thin posterior border of Poupart's ligament in the same direction.
there ought, indeed, to be some variety in the method of operating,
according to the circumstances of each individual case: and the
valuable investigations of that eminent surgeon tend to prove, that
the seat of strangulation in femoral hernia is not always in the
same place, but may be either in the crural sheath, where the stric-
ture is occasioned by the semilunar edge of the fascia lata, or the
saphenous opening, or at the posterior edge of the crural arch; or,
lastly, at the mouth of the hernial sac, in the fascia which sur-
rounds it.*

Having laid open the hernial sac, Sir Astley Cooper introduces
his probe-pointed bistoury, which does not cut near the point, into the
crural sheath, at the anterior part of the sac, and divides with it the
sheath as far as the front edge of the crural arch. This cut, which
does not exceed half an inch, is sufficient for the reduction of small
hernia. But if the bowel cannot now be returned by gentle pressure,
he passes in his finger about half an inch higher, and divides the
posterior edge of the crural arch and fascia transversalis immediately
next to it. As these two incisions are made from within the sac,
they will of course remove any stricture formed by the sac itself.
The direction of an incision for the division of the stricture, which
he deems most eligible, is upwards, with a slight obliquity towards
the umbilicus.

Baron Dupuytren, in operating on femoral hernia, used to divide
the same parts as Sir Astley Cooper; but employed a curved probe-
pointed bistoury, which cuts on its convexity; it is introduced into
the hernial sac flat on the left fore-finger, and its edge is then turn-
ed upwards and outwards, and the upper extremity of the falciform
process divided as far as the front margin of the crural arch. Hes-
selbach also regards an incision through the front side of the crural
canal safer than one through Gimbernat's ligament. Although Du-
puytren directed the knife towards the spermatic cord, he did no

---

* On this interesting part of the subject, the following is Mr. Morton's statement.
"In by far the greater number of instances, the constriction is relieved by the division
upwards and inwards of the falciform process of the fascia lata, and the lunated edge
of Gimbernat's ligament, where they join with each other. In some instances, it
will be the fibres of the deep crescentic arch ; in others again the neck of the sac it-
self," within the circumference of the crural ring.

injury to it; because he took care not to cut far enough to endanger it. He also avoided the epigastric artery by making a very limited cut.

CONGENITAL INGUINAL HERNIA.

The great peculiarity of this case is, that the protruded viscera lie in the tunica vaginalis, which serves as the hernial sac. The bowel, or omentum, is therefore in contact with the testicle.

The congenital inguinal hernia, arises in the following manner: In the fœtus, the testes are situated immediately below the kidneys, on the forepart of the psoas muscles, with their anterior and lateral surfaces covered by reflected peritoneum, and their posterior surfaces connected to the psoas muscles by means of cellular tissue. About a month or six weeks before birth, but sometimes subsequently to this event, the testes descend through the abdominal ring into the scrotum, where there is a production of the peritoneum already formed for their reception, and afterwards constituting the tunica vaginalis. The testes in their descent do not fall loose into the tunica vaginalis, but carry with them the peritoneum immediately adherent to them. Soon after the testes have got into the scrotum, the upper part of the tunica vaginalis is closed, by which change all communication between the cavity of that membrane and the belly is shut. Sometimes, however, this closure is delayed, and then, if any of the bowels insinuate themselves into the passage, they become of course, so long as they continue unreduced, an impediment to its further obliteration; and the case is a congenital inguinal hernia, which differs from all common hernia in having no hernial sac produced by a protrusion of the peritoneum with the bowels themselves.

No doubt, one of the most frequent predisposing causes of congenital hernia is the occasional delay in the descent of the testicle, which circumstance has the effect of retarding the closure of the passage between the belly and the scrotum. The disease is not generally produced by the insinuation of the bowel into the tunica vaginalis at the same time as the testicle itself. Before birth, the small intestines are but little distended; and, in the absence of respiration, they can suffer no compression from the diaphragm and abdominal muscles. Hence, notwithstanding the expression *congenital*, the disease is hardly ever noticed in infants directly they are born, but makes its first appearance afterwards. One accidental circumstance, however, may really make the hernia strictly congenital, namely,—the intestine or omentum may become adherent to the testicle previously to its leaving the abdomen, and consequently descend with it into the scrotum before birth.

The formation of such adhesions between the bowels and testicle

before birth may also sometimes prevent, or retard, the descent of the latter organ.

Surgeons are frequently consulted for congenital hernia, where the testicle has not yet descended through the ring.

The congenital inguinal hernia must always necessarily be external, or oblique; because the neck of the tunica vaginalis invariably corresponds to the point, at which the spermatic cord passes under the border of the transversalis muscle. Also, as the tunica vaginalis enters the inguinal canal beyond the point at which the spermatic cord crosses the epigastric artery, it must have this artery on the internal side of the inner ring.

In young children, the congenital hernia more frequently contains intestine than omentum, because in them the latter part is very short.

The impossibility of feeling the testicle, while the bowels are down, is the most important criterion between this hernia and a common bubonocele, where we can always feel the testicle at the lower and back part of the swelling. Then a suspicion of the nature of the case may be entertained, if the hernia has existed from early childhood; not that infants may not be occasionally the subjects of common bubonoceles.

The viscera, included in a congenital hernia, but more especially the omentum, are frequently adherent to the testicle; a complication attended with serious inconvenience, unless removed, as it prohibits the reduction of the protruded parts, and the use of a truss. The bowel and omentum may also adhere to the sac, and sometimes to the sac and testis at the same time.

A congenital inguinal hernia is to be treated on the same general principles which apply to other herniæ. If the bowels admit of reduction, the patient be young, and a proper truss constantly worn, the communication between the abdomen and scrotum will frequently become obliterated, and a radical cure be the result. The chances of this desirable event diminish, however, as the individual grows older, and, after the adult age, a truss can hardly ever be safely dispensed with. Unfortunately, we cannot always apply a truss, as when a piece of intestine or omentum is in the sac, while the testicle is in the groin, or even within the abdomen; for, in the first case it would press upon and inflame the testicle, and, in the second, prevent its descent. However, if the patient should be beyond the age, when any chance of the descent of the testicle exists, I would recommend the hernia to be reduced, and a truss applied.

In young subjects, in whom no congenital hernia exists, but one or both testicles have not yet passed the ring, their descent should be watched, and, as soon as they are low enough, a truss should be worn, constructed so as not to make any hurtful pressure on them.

A congenital hernia is remarkable for the thinness of its sac; a

fact dictating caution in the first steps of the operation. The sac is, indeed, frequently not thicker than the natural peritoneum. This hernia is also well known to be particularly often strangulated at the inner opening of the ring, or by a contraction of the neck of the sac within the inguinal canal. It has also another peculiarity, which is, that it sometimes becomes strangulated by constrictions in the body of the sac itself.

As the epigastric artery is always on the inner side of the neck of the sac, the division of the stricture may be safely made upwards and outwards.

Great care should be taken not to handle, wound, or, in any manner injure the testicle in the operation.

A peculiar case is sometimes met with, consisting of a protrusion of the viscera, together with a peritoneal hernial sac, into the cavity of the tunica vaginalis. It is formed after the recent obliteration of the communication between the abdomen and the tunica vaginalis. Were we not aware of the possibility of such a case, we might be considerably perplexed on meeting with it. In the museum of University College is a preparation of a double kind of hernia: first, a congenital one, with omentum in it; and, secondly, another hernial sac pushed down into the tunica vaginalis.

HERNIA OF THE CŒCUM AND COLON.

Scrotal herniæ of the right side, formed by the cœcum, the appendix vermiformis, and commencement of the colon, draw after them into the scrotum that portion of the great bag of the peritoneum by which those viscera are naturally fixed in the right ileo-lumbar region; and, on opening the sac, we find the cœcum and colon connected to this part of the peritoneum, just as they were in the abdomen previously to the displacement. The same kind of natural adhesion of the large intestines to the hernial sac may also take place in a scrotal hernia of the left side, when the protrusion consists of that part of the colon which is naturally fixed in the left ileo-lumbar region by duplicatures of the peritoneum.

Another peculiarity of these herniæ arises from the cœcum and beginning of the colon being partly situated out of the peritoneum: hence they can only be partially surrounded by a hernial sac, a portion of their external side being in immediate contact with the adjacent cellular tissue. In such a case, were the surgeon to cut too much towards the outside of the tumor, he would find the cœcum and colon immediately under the cremaster and infundibular process of the fascia transversalis.

From what has been stated, we discern the cause of another peculiarity of herniæ of the cœcum and fixed portion of the colon, namely, the impossibility of their reduction. The appendix ver-

miformis may be returned, but the cœcum itself cannot be reduced, unless the sac itself admit of being replaced.

These circumstances render it a matter of importance to discriminate a hernia of the cœcum and beginning of the colon from others. Now, *such a case can only form gradually;* the displacement of the cœcum and colon, fixed as they are in their natural situation, must be a slow process. Herniæ of sudden formation, therefore, cannot be of this kind. The tumor will also generally be of large size, of long standing, and of an irregular knobby shape.

In this species of hernia, as well as in all others of large size, the symptoms of strangulation are seldom violent, on account of the width of the opening through which the protrusion takes place. We should in such cases be cautious not to mistake the colic irritation, to which the viscera in the tumor are liable, for the symptoms of strangulation. When a large old scrotal hernia is really strangulated, the evacuations from the bowels are soon totally suppressed, the swelling is painful, and the patient is affected with vomiting, eructations, and fever. On the contrary, in the colic from irritation, resembling strangulation, the discharge of air and feces from the rectum is never entirely suppressed; and the evacuations are increased when mild purgatives and clysters are given. If nausea and tendency to vomiting occur, it is at long intervals; there is not much fever; and the swelling, though tense and bulky, is not painful on being handled. Under such circumstances, mild saline purgatives, clysters, and cold applications, may frequently be employed with success, and we should not be in haste to perform an operation.

But, if a large hernia of the cœcum were to be truly strangulated, we should remember, that the bowels will not admit of being completely returned, on account of their particular and natural adhesions to the sac; and in this, as well as in all scrotal herniæ of large size, the neck of the hernial sac is not the seat of strangulation. Here, perhaps, the best plan would be merely to expose the abdominal ring, and make a division of it, upwards and outwards, without opening the hernial sac at all, and then to try to reduce the viscera as far as practicable.

THE EXOMPHALOS, OR UMBILICALHERNIA,

Is a protrusion of the viscera through the naval, or in the neighboring part of the linea alba. The first case, whether met with in the infant or adult, has a *circular neck*, at the circumference of which the tendinous margin of the umbilical ring can be felt. Whatever may be the size of the tumor, its body always retains nearly a spherical shape; nor can any wrinkle of the skin, nor any thing at all resembling the cicatrix of the naval, be seen upon the convexity

or the sides of the swelling. On the contrary, in a hernia of the linea alba, the *neck of the swelling* is of *an oval shape*, like the fissure through which the protrusion has taken place; and, if the hernia be very near the naval, the *umbilical cicatrix may be seen on one of the sides of the swelling*—a sure proof that the viscera do not protrude through the umbilicus itself.

In a true exomphalos, the tumor in a thin person is free and pendulous; in a fat subject, round at its base, less prominent, and hence spherical. The protruded parts will naturally tend downwards, so that the opening into the abdomen is from the upper part and not from the middle of the swelling.

The umbilical hernia is not only furnished with a true peritoneal sac, but with a superficial investment of condensed cellular substance. The coverings of this hernia, however, are frequently very thin, and, in old cases, portions of the sac are sometimes absorbed. Nay, the viscera may be adherent to the integuments, and strangulated by the opening in the sac, through which they have protruded, and which has been occasioned by its partial absorption.

An umbilical rupture in an adult rarely contains intestine unaccompanied by omentum. The disease happens with much greater frequency in women than men; a fact explicable by the consideration that pregnancy has more influence than any other cause in bringing on the complaint. Dropsical and corpulent subjects, however, of both sexes are particularly liable to it.

HERNIÆ IN THE LINEA ALBA OR VENTRAL HERNIÆ,

Are much slower in their progress than a true exomphalos. On account of their small size, they are frequently unobserved, especially in corpulent subjects, or when situated on one side of the ensiform cartilage. However, they bring on complaints of the stomach and habitual colics, and are more liable to simple obstruction, than strangulation with inflammation and tendency to gangrene. But when this state unfortunately does occur, the symptoms are more intense, and the accession of mortification more rapid, than in any other species of hernia. Even when merely the omentum is strangulated, the symptoms are particularly violent, a circumstance ascribed to the proximity of the stomach.

When practicable, the exomphalos and ventral herniæ should be reduced, and a truss worn. In Hey's Surgery is a description of an excellent truss for umbilical hernia. In young subjects, the pressure of a truss will often radically cure the disease; and the plan is much more commendable, than that of reducing the viscera, and then extirpating the integuments and sac with a ligature.

When, in adult subjects, an operation is unavoidable, the sac

should be laid open with the greatest caution, and the umbilical ring divided either directly upwards or downwards. When the hernia is very large, but not attended with gangrene, we should be content with cutting the umbilicus, without opening the sac at all, or as little of it as possible.

The division of the stricture in ventral hernia may also be made upwards or downwards, due regard being paid to the epigastric artery which crosses the linea semilunaris.

CYSTOCELE, OR HERNIA OF THE BLADDER.

The protrusion is most frequently through the abdominal ring; and generally in male subjects who have been repeatedly afflicted with retention of urine. Cystocele has been noticed, however, in children, from the irritation of stone, and even in women from the effects of dropsy and pregnancy.

Only the fundus and a part of the posterior surface of the bladder, down to the insertions of the ureters, are covered by peritoneum. Now, as it is usually the anterior and lateral part of the bladder which first passes through the ring into the scrotum, the peritoneum will not protrude at the same time, and the displaced part of the bladder will not be covered by a hernial sac; but, as more of it descends, its fundus at length passes into the scrotum, drawing after it the peritoneum naturally attached to it. Thus the bladder first protrudes, and a hernial sac follows, into which a portion of the omentum or intestine may glide. Here the bladder is invariably excluded from the other hernia, and situated at its posterior and inner side. Sometimes the case is reversed, and the cystocele is the consequence of an ordinary hernia.

The symptoms of cystocele are a fluctuation in the tumor, the swelling becomes large and tense when the patient holds his water, and diminishes when the urine is discharged. If the scrotum be compressed, an inclination to make water is experienced. Sometimes, the muscular coat of the bladder being paralytic, the patient cannot expel the urine from the swelling, unless he raise and compress the scrotum; indeed, as the bladder is always drawn to one side, the patient invariably has more or less difficulty in making water, and is sometimes afflicted with a total retention.

The disease has been mistaken for hydrocele, though the marks of difference are great. Thus, the tumor produced by the bladder always extends into the ring, the testicle is plainly perceptible below the swelling, and the tumor diminishes when the patient voids his urine.

Cystocele may occur also under the crural arch, in the perinæum, or the vagina.

The reduction of a cystocele is soon rendered totally impossible by adhesions; and all that can be done is to apply a suspensory

bandage.   If a total retention of urine were to attend it, caused by the displaced condition of the organ, and not to admit of a catheter being passed, the swelling should be punctured.   If a calculus were to form in the protruded bladder, an incision might be practised for its extraction.

This is all the information which I can offer on the subject of hernia in this treatise.   Some forms of the disease, like herniæ at the foramen ovale, or ischiatic notch, in the vagina, or perinæum, or through the diaphragm, are rare; though I would advise all surgeons to remember them, and be prepared for them.   They will be still more likely, I think, to meet with cases, in which the bowels within the abdomen become strangulated by accidental displacements, bands of adhesion, or various other causes.

[*A new mode of treatment*, for the radical cure of hernia, has been introduced within the last three years in this country.   It is still a matter of dispute, as to whom the credit of its introduction belongs. the operation consists in making an opening in the integuments, and then in introducing, by means of a small syringe, some stimulating fluid, like the oil of cloves, upon the neck of the sac, near the ring or opening in the abdominal wall.   This excites inflammation, which is designed to produce adhesion between the walls of the sac and at its neck.   The patient must be watched for a few days; and if the excitement be too great, it must be moderated by the appropriate means; if it be not sufficient, it may be increased by repeating the operation, or by the firm application of a truss, so as to effect the desired occlusion.

My experience in this mode of treatment has been limited, yet I have seen enough of it to form rather a favorable opinion of it, and to regard it rather as a method of management which deserves trial. —Ed.]
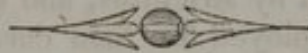
DISEASES OF THE GENITAL ORGANS.

The testicle is particularly often the seat of inflammation and disease, owing, perhaps, to circumstances adverted to by Sir Astley Cooper, namely, the slow manner in which the blood returns from it against its own gravity; the occasional immoderate distension of the seminiferous tubes; its exposure to injury from blows or pressure; its sympathy with morbid conditions of the urethra and prostate gland; and the changes, which it almost naturally undergoes in old subjects.

The classification of the diseases of the testicle, adopted by this able pathologist, is, first, into those which are the result of *common inflammation, acute* or *chronic*; secondly, into those which are of

a *specific nature*, but *not malignant;* and thirdly, others, which are both *specific* and *malignant.*

The first division comprises *acute* and *chronic inflammation*, and *atrophy of the testicle.* The second, embracing diseases, attended with specific, but not malignant action, comprehends what Sir Astley Cooper names the *hydatid* or *encysted disease of the testicle;* the *irritable testicle*, or *neuralgia testis; the swelling of this organ* frequently *occurring in* the disorder of the system termed *mumps; ossific changes in the part; solid tumors of the epidydimis*, or *the testis; scrofulous testicle;* and what has been occasionally denominated the *venereal sarcocele.* The third division of the classification, including specific and malignant affections, comprises *medullary cancer*, or *fungus hæmatodes*, and *scirrhus.* But, besides the numerous varieties of disease now referred to, there are several diseases of the coats of the testicle and spermatic cord, for which the advice of a surgeon is often requested. Now, if attention be not paid to the subject, the ignorant practitioner will be likely to get into serious scrapes, by confounding one disease with another; mistaking diseases of the body of the testicle either for hernial swellings or hydroceles; or these again for enlargements of the testicle itself; and varicous swellings of the spermatic veins for herniæ or herniæ for varicoceles. I am continually meeting with patients who either have herniæ, and, not being aware of the nature of their cases, do not wear trusses, or who are wearing trusses on the supposition of their having herniæ, when, in truth, they have no such complaint.

ACUTE INFLAMMATION OF THE TESTICLE,

When it arises from gonorrhœa, or some other kind of irritation in the urethra, is frequently, though absurdly, termed *hernia humoralis.* It is often excited by strictures, and still more commonly by the means ordinarily employed for their cure, namely, bougies, the irritation of which becomes the cause of the affection of the testicle. When inflammation of the latter organ is thus excited by disease in the urethra, it is preceded by soreness or irritation about the membranous and prostatic portions of that canal; the spermatic cord becomes swollen and tender; and in particular the vas deferens, which seems much thickened, and on being touched, is extremely painful. When the case is still further advanced, the swelling extends to the whole of the testicle, the hardest part of it being the epidydimis. In general, so considerable is the enlargement of the organ in every severe case, that the scrotum is exceedingly distended, and its rugæ being effaced, its surface is completely smooth. Painful as the inflamed testicle is itself, a still greater degree of suffering is often experienced in the lumbar and inguinal regions, with great uneasiness about the hip and thigh. Sometimes the agony in the part affected seems to have paroxysms of increased severity, which are

alleged to depend upon spasmodic contractions of the fibres of the cremaster. The scrotum, besides losing its naturally corrugated appearance, is also reddened. These symptoms are accompanied by an acceleration of the pulse, constipation, restlessness, thirst, heat, and dryness of the skin, and other symptoms of inflammatory fever. The blood taken away from the patient is also found to be buffy. Sometimes the stomach is disordered sympathetically, and nausea, and even repeated vomiting may occur. I once attended a man for an acute inflammation of the testicle, who labored under so obstinate a suppression of the stools, and such a repetition of vomiting, that a suspicion of strangulated hernia was created for a short time, but quickly abandoned on a careful examination of the swelling. In fact, a general enlargement of the testicle, like that from acute inflammation of the organ, is not at all likely to be mistaken for any kind of hernia, excepting the congenital; because in bubonocele the testis may always be felt at some point or another below the hernial tumor.

Inflammation of the testicle may be the consequence of external violence; and it is often purposely produced by various surgical proceedings, employed for the radical cure of *hydrocele*. Sometimes it is brought on by the pressure of badly constructed trusses; sometimes as one of the effects of the disorder of the system, well known by the appellation of mumps.

When the testicle inflames and swells in gonorrhœa, the pain in making water and the discharge of matter are almost always suddenly diminished, or even suspended; a circumstance ascribed by some pathologists to metastasis; and by others to sympathy between the urethra and the testicle. All that I can say upon this point is, that we seem to know little more than the fact itself, which is exemplified, I think, with remarkable frequency in patients, who, while they have a clap, take rough exercise, indulge in wine, and live altogether too freely. One thing here merits attention, and it is perhaps what would not have been expected, namely, the swelling of the testicle does not always come on exactly at the period when the inflammation in the urethra is worst, but frequently when it is on the decline, or even nearly cured. Occasionally, also, the inflammation of the testicle is not followed by any diminution or stoppage of the discharge; a fact clearly overturning the doctrine of metastasis. A suspicion is entertained, that the inflammation is sometimes propagated to the testicle from the mouth of the vas deferens. Mr. Hunter did not, however, adopt this view, because he found a swelling of the testicle to be as frequent in gonorrhœa, where the inflammation did not extend further than an inch or so from the orifice of the urethra, as where it reached to the neck of the bladder. Another idea is, that a swelling of the testicle is particularly disposed to come on when gonorrhœa is suddenly checked by the employment of copaiba, cubebs, or astringent injections;

but, the correctness of this opinion may be doubted; for, many experienced surgeons believe, that they have seen an inflammation of the testicle arise as frequently under other modes of treatment as that now alluded to.   At the same time, I feel it right to mention, that Sir Astley Cooper inclines to the belief, that injections really have a tendency to bring on hernia humoralis, especially when they are made to pass far into the urethra.   Notwithstanding Mr. Hunter's view, I am disposed to think, that inflammation may sometimes extend to the testicle from the urethra, by the course of the vas deferens; and Sir Astley Cooper describes certain appearances, noticed in the dissection of the urethra of a criminal, who had been executed, which confirm the possibility of this occurrence. The man had a gonorrhœa at the time of his death; and when his urethra was cut open, although the inflammation was greatest in the first three inches of the canal, yet it extended also to the membranous portion of it, and even blood had been extravasated under the mucous membrane.   Under such circumstances, the verumontanum, and the terminations of the common ducts of the vesiculæ seminales and vasa deferentia in the urethra, participate in the inflammation, which may then be propagated along the vas deferens to the cord, epidydimis, and testicle.

One fact, relative to this subject, is certain; which is, that inflammation of the testicle rarely or never comes on in the early stage of gonorrhœa, but usually between the tenth day and the end of the third week.   When the pain and swelling begin to abate, the discharge from the urethra very commonly returns.   Within the tunica vaginalis there is generally a quantity of serum effused, which, after the inflammation has subsided, is absorbed again.   We find likewise that fibrine is thrown out within the same membrane, and in the interstices of the glandular part of the testicle, occasioning considerable hardness, the remains of which will often continue a long time.

The treatment of acute inflammation of the testicle must, of course, be antiphlogistic, comprehending quietude, and even the horizontal posture in bed, if the case be severe.   When the patient is young and robust, the swelling considerable, and the pain in the lumbar region violent, we should have recourse to venesection, and this pretty freely; and in all cases, leeches, saline purgatives, and low diet, are absolutely necessary.   If leeches cannot be procured, the veins of the scrotum may be punctured, whereby a copious and beneficial discharge of blood may generally be obtained.   With respect to local applications, we may employ cold evaporating lotions; or, if the patient seem to derive great relief from emollient poultices and fomentations, these may be used.   Perhaps, in very severe cases, the latter ought always to be preferred.   But, nothing will lessen the patient's sufferings more effectually, than the plan of taking off the weight of the testicle from the spermatic cord with a

bag-truss or suspensory bandage; it has, indeed, the greatest effect in diminishing the pain experienced in the back and inguinal region, particularly when assisted by bleeding, saline purgative medicines, and the occasional exhibition of eight or ten grains of the compound powder of ipecacuanha. When the disease has arisen from the irritation of bougies, their employment must, of course, be suspended. One plan that has sometimes proved expeditious in stopping the inflammation, and bringing down the swelling, is that of prescribing tartarised antimony, so as to keep up a degree of the nausea; but the practice is not commonly adopted, because patients more readily submit to other means of relief.

In general, a considerable hardness of the testicle, and especially of the epidydimis, remains after the inflammation has been completely removed: sometimes during the rest of the patient's life. Mr. Hunter even suspected that, in some cases of this description, the canal of the epidydimis was impervious, and the function of the testicle annihilated. However, this suspicion does not coincide with the examinations instituted by Sir Astley Cooper, who says, that, when the swelling is at the lower part of the epidydimis, it is seated in the cellular tissue of the vas deferens, where it forms its first convolutions, and is not an effusion within the cavity of the duct. The induration, according to his researches, frequently affects merely the tunics; and when situated in the upper part of the globus major, it arises either from fibrine effused in the cellular substance between the coni vasculosi, or else from a sac filled with a viscid fluid.

For promoting the dispersion of the chronic induration, remaining after all acute inflammation is over, we may employ camphorated mercurial ointment, with or without two scruples or a drachm of the hydriodate of potash in each ounce of it. Or we may try poultices of vinegar and oatmeal, or the hydrochlorate of ammonia lotion, where friction cannot be borne. In some cases, good seems to be produced by internal alterative medicines, as the compound calomel pill, and sarsaparilla, or the tincture of iodine.

Acute inflammation of the testicle, when a consequence of gonorrhœa, or irritation in the urethra, rarely suppurates; but when produced by external violence, the chance of an abscess is greater.

ATROPHY OF THE TESTICLE,

Or a more or less complete wasting away or absorption of this organ, may follow the subsidence of acute inflammation of it; but it more frequently takes place when such inflammation has been brought on by external violence, than when it originates as a consequence of gonorrhœa. No doubt, under these circumstances, the structure of the testicle has been irreparably damaged by the inflammatory process; and probably in some instances, the atrophy may depend up-

on an obliteration of the vas deferens; for, in the museum of St. Thomas's Hospital, there used to be a testicle in this condition, the vas deferens of which could only be filled with quicksilver for about half an inch of its extent from the abdominal ring towards the testicle itself. This fact is reported in Sir Astley Cooper's work. An atrophy of the testicle sometimes takes place without any previous inflammation of it: the pressure of a truss on the spermatic cord will produce it; and many curious cases are recorded by Larrey, where sabre wounds about the occiput and nape of the neck were followed by it.

CHRONIC ENLARGEMENT, OR CHRONIC INFLAMMATION OF THE TESTICLE,

Usually commences with hardness and swelling of the epidydimis, at first attended with but moderate uneasiness, scarcely amounting to pain; at length the glandular part of the organ becomes involved, and the testicle seems rather larger and more tender than that of the other side. If the disease arise from a blow, then it may begin in the body of the testicle, which may present a globular, instead of its naturally oval form, and sometimes, though enlarged and altered in shape, it has no inequalities upon its surface. In other instances, however, it is at first unequal, so that knobs can be felt upon it; and this, according to Sir Benjamin Brodie, is usually the case in the beginning; a general uniform enlargement, without any knobs, being the more advanced state of the disease.

The case is rarely so painful as to compel the patient to keep himself quiet, and refrain altogether from labor and exercise. In some cases, a clear transparent serum is effused in the tunica vaginalis, constituting one of the forms of disease, to which the term *hydro sarocele* is vaguely applied. In ordinary cases, the spermatic cord is not hardened, but its veins are somewhat enlarged; and when the disease has existed some considerable time, and has attained magnitude, the patient complains of pain and a sense of weight in the loins and thigh.

This chronic inflammation of the testicle, the *sarcocele tuberculeux* of Cruveilhier, which has been well described by Sir Benjamin Brodie, leads to the production of a yellow tubercular substance in the texture of that organ; an unorganised yellow matter, collected at first in small masses, but afterwards in larger ones at certain parts of the testicle; while, in other places, the glandular structure is quite healthy. In a later stage, the yellow matter, which is secreted within the tubuli testis and epidydimis, assumes a harder consistence, and is generally laminated. This disease is met with in various unhealthy states of the constitution, whether connected with rheumatism, syphilis, or other causes. It often presents itself in persons who have been scrofulous in their youth, or whose constitu-

tions have been broken by the long use of mercury. What has been termed the *venereal sarcocele* is only a variety of it. In this latter case, according to Cruveilhier, the tubercular deposit always takes place first in the epidydimis. He describes one remarkable instance, in which the tubercular substance was deposited not only in the epidydimis and body of the testicle, but in the vas deferens, the vesiculæ seminales, seminal ducts, and the prostate gland*.

According to Sir Astley Cooper, when a solid effusion has taken place in the seminiferous tubes, or even in the substance of the testicle, or epidydimis, the disease may be cured by the strict observance of the recumbent posture, and the exhibition of three grains of calomel and one of opium, night and morning, so as to keep the gums affected for a month at least. A black dose and fifteen or twenty minims of the liquor antim. tart. are to be given every fourth morning. The topical treatment should consist of leeches twice a week, and a lotion composed of the liq. ammon. acet. ℥v. and one ounce of spirit of wine. Cruveilhier supports the same view, observing that a deposit of tubercular matter in the epidydimis, or even the body of the testicle, is not an adequate reason for castration.

GRANULAR PROTRUSIONS, OR FUNGOUS GROWTHS FROM THE TESTICLE,

May follow the formation and bursting of an abscess in the part; or they may occur in the advanced stages of chronic inflammation of it. At one point, the testicle adheres to the skin, inflames, and ulcerates; and then, through the ulcerated opening, a fungus of mall size at first projects, but, gradually acquiring greater bulk, makes its way through openings, not only in the tunica vaginalis, but in all the investments of the scrotum. Now, according to Sir Benjamin Brodie's investigations, we may trace on the surface of this fungus the same kind of yellow matter, found in the glandular portion of the testicle, which glandular texture itself likewise protrudes, until no part of the testicle is left within the scrotum, and the spermatic cord can be distinctly traced into the centre of the fungus. In a still more wasted condition of the glandular structure, the cord terminates in a small tubercular mass, the only remains of the organ. The height to which the *fungous* or *granular* protrusion rises, prevents the skin from healing over it; but it may generally be reduced by the pressure of a dossil of lint, fixed on it with adhesive plaster, or it may be got rid of with escharotic applications. However, the surest mode of cure is that of cutting away the protruding mass on a level with the inner reflexion of the tunica vaginalis, making two semicircular incisions, and afterwards bringing

---

* Cruveilhier Anat. Pathol. liv. ix. p. 2.

their edges together. The plan is not, however, approved of by Sir Benjamin Brodie, because in doing it we actually slice away the tubuli testis; and hence, he prefers sprinkling the fungus with red precipitate, and giving mercury. Then, as soon as healthy granulations form, he dresses the sore with a solution of the sulphate of copper in camphor mixture. I believe it to be a very good practice, when abscesses of the testicle leave deep and fistulous openings, to prescribe calomel and opium in the manner directed by Sir Astley Cooper, and to inject into the fistulæ a lotion of the sulphate of copper, or bichloride of mercury.

THE IRRITABLE TESTICLE, OR NEURALGIA TESTIS,

Is a case analogous to tic douloureux, or neuralgia in other parts. It is a highly sensitive and painful state of the organ, often without any very obvious cause, the suffering produced by it being frequently of the most excruciating kind, and of long duration, though subject to occasional remissions. The part is but little, if at all, swollen; and, on dissection, no change of structure can be detected. One example, however, of this affection in a medical student, in which I was lately consulted, and in which Sir Astley Cooper was also kind enough to give his advice, had been attended with repeated swelling of the testis, though it mostly remained with scarcely any perceptible change of size. The most successful treatment consists in giving large doses of the sulphate of quinine or carbonate of iron; or, when the disease assumes an intermittent type, the liquor arsenicalis. Opium, the acetate or hydrochlorate of morphia, the extract of conium, hyosciamus, and other narcotics, with calomel, may also be given. If the secretions of the skin and liver be defective, calomel, opium, and antimony may be tried in combination.

As local applications, I may recommend leeches, ice, or a plaster composed of one third of the extract of belladonna and two thirds of soup cerate. This is a disease, in which the ointment of veratria may deserve trial. In one instance, Professor Gibson dissected down to the spermatic nerves, and divided them; a difficult operation, but alleged to have answered.*

No doubt, neuralgia testis frequently depends upon some disorder of the system at large, the removal of which is an essential thing in the cure. That severe pain in the testicle may arise from sympathy between this organ and other parts, without any alteration of its structure, is illustrated in cases, where great agony in the testis is experienced on the descent of a calculus from the kidney into the

---

* Gibson's Institutes, &c. of Surgery, vol. ii. p. 179., ed. 5. Philadelphia, 8 vo. 1838.

ureter. In particular instances, however, a degree of swelling of the part, a varicose fulness of the spermatic veins, or even some hardness or prominence about the epidydimis, may be observed.

OF THE SCROFULOUS TESTICLE.

The secreting glands are rarely affected with scrofula; but this organ forms an exception. Even in young children, it may become enlarged and hardened, without pain, and remain in this indolent state for many weeks, months, or years; and then, as the health improves, gets well. More frequently, the disease occurs towards puberty, preceded or accompanied by some other marks of scrofula, and sometimes it affects both testicles. Scrofulous disease of the testicle is remarkable for its indolent character, and the little pain attending it; we perceive a trivial swelling of some part of the organ, mostly the epidydimis; and, afterwards a small superficial lump at another point. These little tumors increase, and by degrees create greater uneasiness in the part. The skin becomes adherent to them; they suppurate; the abscesses burst, but discharge only a scanty quantity of matter; and the openings, having little tendency to heal, remain fistulous. At length, the testis sometimes diminishes and wastes away, until but a small portion of it is left; but, more commonly, the organ is not wholly destroyed, and a considerable part of the glandular structure remains.

The treatment is to be conducted on the same principles as are applicable to other forms of scrofulous disease. We may prescribe rhubarb and carbonate of soda in equal proportions (ten grains of each) to be taken once or twice a day; liquor potassæ; preparations of iodine, or tonics of various kinds, according to the circumstances of the case, and the effects which are produced by such means on the part and the whole system. With respect to iodine, I prefer the way in which it is prescribed by Lugol, to the less diversified mode in which we employ it.

CYSTIC SARCOMA—HYDATID DISEASE OF THE TESTICLE.

This latter term is objected to, as conveying the erroneous notion, that hydatids exist in the part. The morbid mass, into which the organ is converted, is partly composed of a solid structure, and partly of cysts, varying in size from that of a large pin's head to that of a small marble; some of them containing a thin, transparent, yellow serum, and others a more turbid fluid. The disease occurs chiefly between the ages of thirty and thirty-five, and is sometimes mistaken for hydrocele; though the shape of the tumor ought to serve as a criterion, since it is oval, not pyriform, like that occasioned by a collection of fluid in the tunica vaginalis. The particular character, however, of enlargement of the testicle with cysts cannot always be

known with certainty previously to the examination of the part after its removal by operation. It is not malignant, for it never extends to other parts: it may however be conjoined with medullary cancer, which is itself malignant. No treatment is of any use, because the disease is truly an organic one, accompanied by a total disorganisation of the testicle, and changes of structure, leaving no possibility of a return of the part to its healthy state again. The pain, caused by the weight of the tumor on the spermatic cord, and the annoyance of its bulk, frequently compel the patient to submit to castration.

What we call cystic sarcoma of the testicle, is termed by Cruveilhier, *Cancer Alvéolaire*, of which he has given an excellent representation in pl. 1. liv. 5. of his Anatomie Pathologique. In the dissection of the specimen from which the engraving was taken, he ascertained, that the proper substance of the testicle did not participate in the morbid change, but was pressed by the new formation towards the surface of the tumor, where it formed a thinnish stratum of a grey semi-transparent appearance. "The further," says he, "we advance in the study of morbid alterations, the more we shall be convinced of the truth (which, I believe, was first announced by me,) that our textures are unalterable, and that what are called morbid lesions, are new productions, endued with an independent life of their own, and that our tissues are only susceptible of hypertrophy and atrophy. Here the atrophy is admirably explained by the compression which the substance of the testicle had undergone."

MEDULLARY CANCER OF THE TESTICLE

Is a malignant disease, that has received a variety of names; by some it is called the *pulpy testicle;* by some it is denominated *medullary sarcoma;* by others *fungus hæmatodes;* a term that is only warranted in an advanced stage of the disease, when a mass, which, from its look, is mistaken for a fungus, occasionally, though not often, protrudes through the scrotum. It is the *soft cancer* of the testicle, as it is denominated by some writers, on account of its malignancy; that is to say, its having a tendency to extend itself in the course of the absorbents; its disposition to attack other textures; its incurable nature; its general character to show itself again in the same, or other parts, after removal by operation; and its connection with some undefined, but highly unfavorable condition of the system. By Cruveilhier it is named *sarcocèle aréolaire encéphaloide.* The disease begins in the body of the testicle, which it enlarges, the swelling extending to the whole of this part of the organ in the course of three or four months. Afterwards the epidydimis becomes involved. While confined to the body of the testicle, the swelling is of an oval figure; one circumstance, by which the case may be known not to be a hydrocele: but as soon as the epidydimis

is diseased, the tumor may assume a somewhat pyramidal shape, and be not unlikely to be mistaken for a hydrocele, more especially as the disease is attended with a softness and elasticity, which often lead the practitioner to think, that he feels a fluctuation in the part. Indeed, there is sometimes a small quantity of fluid in the tunica vaginalis. I should say, however, that, with due attention, a medullary tumor of the testicle may almost always be descriminated from hydrocele, by the tumor presenting a more decidedly oval form than the latter disease; by its greater weight; its having no transparency; its being harder in some parts than others; its not being, after a time, so uniformly smooth as a hydrocele; and its being accompanied by a sallow, unhealthy look, such as is usually indicative of a malignant organic disease of an important part. At first, the swelling is not attended with pain; but, after a little while, the patient begins to experience shooting, darting sensations from the testicle, up the spermatic cord to the lumbar region and the groin; and the part will not bear much handling, without a great deal of tenderness being produced in it. The period of life in which medullary sarcoma of the testicle is most frequent, is that between puberty and the age of 35 or 36; but Mr. Earle has recorded a rare instance of its occurrence in a very young child. These circumstances deserve attention; because, though medullary disease of the testicle is seldom met with in children, the same disease of the eye is chiefly confined to them.

The swelling consists of a mass of medullary very albuminous matter, or of a pulpy substance, firmer than the medullary matter of the brain, included in the interstices of a thin, delicate, transparent membranous texture. It would not be correct to say, that the organ is always converted into this kind of substance; for, in many cases, the medullary substance is not a molecular deposit, after the manner of nutrition, but an adventitious formation, an additional growth, which by its pressure seems to cause the removal of the original tissues. Sometimes the glandular portion of the testicle remains unaltered, while a medullary tumor lies beneath the tunica albuginea, or grows from the superficial part of the testicle, and fills the cavity of the tunica vaginalis, of which Sir Benjamin Brodie relates one instance, and Cruveilhier another. At last, however, the substance of the testicle always suffers atrophy from the compression of the new and extraneous substance, whether this be first formed within the testicle, or on its surface.

In the latter stage of the disease, the tumor becomes adherent to the scrotum; the spermatic cord becomes knotty and unequal; at length ulceration of the scrotum may take place, and a large mass of the medullary substance protrude, from which copious hemorrhage every now and then occurs. The protrusion of such a mass, however, I believe, is much less frequent in medullary disease of the testicle than in the same disease of the breast, eye, and limbs.

Sometimes, when the scrotum is implicated, the inguinal glands become affected; but it is the lumbar, which are so liable to be involved in the disease.

This malignant disease of the testicle has a tendency to extend itself in the course of the absorbents, and to attack many different parts and tissues in the same person. As the absorbents of the testicle pass to the lumbar glands, these are frequently involved, and sometimes are transformed into an immense mass, equal in size to a child's head, readily perceptible when the abdominal muscles are relaxed, and causing, by their pressure on neighboring organs, various functional disturbance. Such may be the case, even when the spermatic cord itself is sound. Too frequently, indeed, the testicle is only one of numerous parts which are implicated; and soon after this organ has been removed, the patient may die, and on his being opened, we may trace various other medullary tumors in the organs or membranes of the cranium, chest, or abdomen. Cruveilhier gives the particulars of one case, in which the ascending vena cava was filled with medullary matter. In another, in University College Hospital, after I had removed the testicle, the medullary growth of one of the lumbar glands made its way into the pelvis of the kidney. Even the beginning of the thoracic duct has been obliterated by the pressure of the diseased mass. Some surgeons of great experience, who have removed many testicles, affected with medullary cancer, have not known one instance of a permanent cure being effected by such operations. This fact, at all events, is a lesson to us in delivering a prognosis; we should candidly explain the chances of a return of the disease, and let it not be said, that we have persuaded the patient to submit to the operation as a certain means of cure. In the museum of University College is a fine specimen of a medullary cancer of the testicle, one of considerable size, which I removed from a young man about thirty years of age, who had a remarkably sallow unhealthy look. The case illustrates several interesting circumstances. The patient came from Oxford, where a surgeon had introduced a trocar into the swelling, on the supposition, no doubt, that the case might be a hydrocele. Another practitioner had been led to do the same thing. The punctures, however, healed up very well, without any subsequent inflammation, or any protrusion of the morbid substance; a circumstance, which I had an opportunity of noticing; for, not being aware of these fruitless operations, and fancying one morning that a fluctuation was perceptible, I also passed in a tocar, but no material harm resulted from the experiment, only a very slight degree of pain, the wound healing up completely in two or three days. I showed the case to Sir Astley Cooper, who advised castration, which I performed, and then sent the diseased testicle to him, which he injected and carefully dissected. One section of it, with the spermatic vessels, he retains himself; the other he was so ob-

liging as to send to me as a present. In the examination of the cord, minute extraneous substances, some of them less than pins' heads, were noticed in the cellular tissue, which were suspected by Sir Astley Cooper to be of a medullary character. This was a very discouraging circumstance, one that fully prepared me to expect a return of the disease; yet contrary to my expectation, the wound, caused by the operation, healed up favorably, the man's health improved, and he continued well more than three years from the period when the testicle was removed. We learn from this case, that the introduction of a trocar into the swelling is not attended with any serious consequences; and that even when the patient has a very unhealthy, sallow look, and the cord is not entirely sound, there may not be a return of the disease. We must not, however, anticipate success as a common occurrence under these unfavorable circumstances, and we should always be guarded in our prognosis, though the case may present much less discouragement than the one which I have mentioned. Here, also, the best chance of benefiting the patient permanently can only be obtained before the disease has extended itself to other parts; and, if they are already involved when we are first consulted, it will be too late for us to recommend an operation; for the case is of a hopeless description. But, operate when we will, we shall find that, in a large majority of cases, the disease will show itself again in some part of the body or another, and bring on fatal consequences. Thus, in one case, where Mr. Cline had removed the testicle for medullary disease, another tumor of a similar nature formed in the lumbar region*, and by its pressure destroyed the bodies of the vertebræ near it, so as to injure the medulla spinalis, occasioning paralysis and fatal consequences. This case is recorded by Sir Benjamin Brodie. As, however, we have no medicines, nor applications that have the power of stopping this malignant form of disease, the knife is the only means that can be resorted to, with any prospect of success, and this, as I have explained, is very uncertain. In some cases, medullary disease and cystic sarcoma, appear to be blended together in the testicle, as well as in the absorbent glands, which happen to become affected. This modification of the disease is as bad, and difficult to control, as where no cysts are present, and the morbid mass is simply a medullary substance.

The rule of operating early, if an operation is to be performed at all for medullary disease of the testicle, is inculcated by every surgeon, whose judgment is worth having. It is only at this period, that there is any hope of other parts of the system not participating in the disease. Possibly, in some few instances, the disorder may be at first strictly local, and afterwards become a constitutional one, by reason of the absorption of the medullary matter into the system.

---

* See also Cruveilhier, Anat. Pathol. liv. v. p. 4.

In a former part of this work, however, I have described the common characters of this terrible disease, and mentioned the situation and organs in which the medullary matter is found. Sometimes the absorbent vessels, leading from the disease, have been found full of a cerebriform substance; a fact, which Sir Benjamin Brodie regards as giving some probability to the hypothesis, that the disease may thus, from being at first local, become more widely diffused, and extend from one to several organs in the body. We may therefore operate early, though we are sure that the case is a medullary tumor. But if we have doubts, we should first try the plans that were recommended for the cure of chronic inflammation, or enlargement of the organ,—in particular, the free use of mercury, iodine, and other alteratives. If these fail, and we are certain that it is not a hydrocele which we are dealing with, we may conclude that the testicle is disorganised, and that, in all probability, the disease is medullary. If there be any suspicion of fluid in the tunica vaginalis, we should introduce a trocar before we resort to castration; for the puncture will do no harm to the testicle, if it be already disorganised by medullary disease; and if the case be a hydrocele, with a thick tunica vaginalis, the light thrown on the nature of the complaint will save the patient from a dreadful mutilation.

SCIRRHUS OF THE TESTICLE,

Exhibiting precisely the same morbid structure as in the breast, is accounted by some of the best pathologists a very rare disease, if it exist at all. Sir Astler Cooper doubts whether a hard swelling of the testicle, intersected by a net-work of strong fibres or bands, has any existence. However, we meet with solid, heavy, particularly indurated, almost cartilaginous enlargements of the testicle, with a tuberculated feel, severe pains in the part, the cord, and the lumbar region; some fluid in the tunica vaginalis; and, at length, followed by anasarca of the lower extremities. The patient's countenance is sallow, he becomes surprisingly emaciated, and at length he sinks under impaired digestion, constant suffering, diarrhœa, and loss of rest. This is the kind of disease, which the late Dr. Baillie described as scirrhus of the testicle. Certainly, though, in texture, the part affected may not correspond to other examples of scirrhus, it does so in malignancy and incurableness. Here, the early extirpation of the diseased organ is as strongly indicated as in fungus hæmatodes. If the case should be too far advanced for an operation, and the part be ulcerated, all we can usefully do, is to palliate the patient's misery with opium, hyoscyamus, morphia, and other narcotics, at the same time applying the nitric acid lotion, the liquor opii sedativus, the chloride of soda wash, or the carrot or fermenting poultice; or one made with bread and water, with a proportion of the extract of hemlock, or henbane mixed with it.

HYDROCELE.

The common hydrocele is a collection of serous fluid in the tunica vaginalis, producing a pyriform, fluctuating, and, generally, a more or less transparent swelling in the scrotum. I have seen it in persons of all ages, but less frequently in boys than in adult subjects. The swelling commences opposite the lower part of the testicle, unattended with pain; at all events, the cases in which pain is felt at the beginning of the complaint, are not the most common. At first, the tumor is soft, and readily allows the testicle to be felt through the fluid; but, by degrees, it becomes tense, and then the testicle can no longer be perceived. The largest part of this pyriform swelling is below, its diameter lessening gradually as it approaches the abdominal ring. It is only after it has attained a certain magnitude, that its weight and tension cause uneasy sensations in the lower part of the back.

In a dark room, if a lighted wax taper be held close behind one side of the scrotum, and the swelling be viewed from the opposite side, while the surgeon's hand is placed over the external portion of the tumor, the transparency will generally be very manifest. It will always be so if the fluid be clear, and the tunica vaginalis, cremaster, and other coverings, be not too much thickened. This thickening is found to prevail chiefly in large hydroceles; but, as Sir Benjamin Brodie has noticed, sometimes it occurs where the tumor is but of diminutive size; and then, if we have an opportunity of examining the parts after death, we find the inner surface of the tunica vaginalis exhibiting a slightly honeycomb appearance, which is suspected by the latter gentleman to denote, that the hydrocele began with inflammation.

Another symptom of hydrocele is the fluctuation, which on the surgeon grasping the scrotum, and propelling the fluid forwards, may be very plainly distinguished, except when the tunica vaginalis is of considerable thickness. When the tumor is of some size, the testicle is commonly placed about two thirds of the way down the posterior part of the cavity, a circumstance deserving recollection when we are about to introduce a trocar for the discharge of the fluid.

Sometimes hydroceles take place on both sides of the scrotum.

Although a hydrocele is mostly of a pyriform shape, with the thicker part of the tumor downwards, it may assume other shapes. Thus, if much pressed upon by tight small-clothes, or any thing else, the form of the swelling may be altered by that circumstance. Perhaps, however, a deviation of the disease from its common shape may not always be referrable to a cause that we can trace. ni the museum of University College is a preparation, in which, In addition to the principal cavity of the hydrocele, there is ano-

ther pouch freely communicating with it. Sometimes the hydrocele forms two swellings, with the hour-glass contraction between them. If we puncture the lower compartment of such a hydrocele, we may discharge the fluid from both, which proves that they communicate. Such is the usual state of the case: but it sometimes happens that the two compartments do not communicate, a perfect septum being interposed between them. We are to believe, however, that the communication is open for a time at the contracted part, but that, in consequence of the adhesive inflammation, or other causes, the constricted part is at length entirely shut. Sir Benjamin Brodie records an interesting case, proving that a hydrocele is sometimes divided in this manner into two portions, perfectly distinct from each other. In the case alluded to, the first time the hydrocele was punctured, the trocar was passed into the lower cavity, which emptied both this and the upper one. About a year afterwards, the same method was repeated; but the upper swelling could no longer be emptied in this manner, the incomplete contraction having become a complete one in the course of twelve months.

Some hydroceles communicate with the cavity of the abdomen, in consequence of the upper part of the tunica vaginalis continuing unclosed. This case, which is termed *congenital hydrocele*, is seen principally in children, but occasionally in adults likewise. The quantity of fluid in hydroceles, which have existed some time, is mostly about eight or ten ounces; but Gibbon, the historian, who was attended by the late Mr. Cline, had a hydrocele, from which six quarts of fluid were drawn; and many instances are recorded of the tumor reaching down to the knees. Such an occurrence can only be the result of great neglect.

The fluid is also subject to variety in its quality as well as quantity. Sometimes it contains flakes of fibrinous matter, the product of inflammation. The fluid is generally very transparent, and of an amber or pale straw color: it is also coagulable by heat, acids, and alcohol, and resembles the serum of the blood, except in having less albumen in it. Sometimes, however, it is of a much higher color, and even reddish, particularly when the case has originated with a degree of inflammation about the parts. We also meet with certain cases, in which loose cartilaginous or osseous substances are contained in the fluid. Occasionally, small, shining, greasy particles are observed in it, which are probably adipocire. In particular instances, the fluid, instead of being clear, is quite turbid and opaque, a circumstance generally proving, that the inner surface of the tunica vaginalis has been previously the seat of an inflammatory process.

When a hydrocele is complicated with a loose cartilaginous body in the tunica vaginalis, Sir Benjamin Brodie believes, that the loose cartilage is the original disease, and that it is the irritation of it

which keeps up the increased secretion of fluid within that membrane. If the extraneous substance could be felt, and secured in one place directly after the discharge of the fluid, we should cut upon it and take it out. This proceeding would, no doubt, bring about the radical cure of the hydrocele, both by removing its cause, and by exciting a degree of inflammation. Sir Benjamin Brodie relates the following case:—A patient with hydrocele, whom he used to see occasionally for some years, always experienced vast suffering whenever the fluid was let out. On those occasions, the patient invariably threw himself on the floor, and groaned dismally for a quarter of an hour. After his death, it was ascertained, that the tunica vaginalis contained a cartilaginous body, which, whenever the fluid had been voided, appeared to have been the cause of the patient's agony.

In hydroceles of long standing, the tunica vaginalis, the cremaster, and the cellular tissue, are often excessively thickened. Examples also occur, in which that membrane has ossifications upon it.

The testicle itself is usually healthy; sometimes, however, trivially increased in size; sometimes rather lessened. The testicle may also be diseased, constituting what is termed *hydrosarcocele*.

Among the best diagnostic signs of a hydrocele, I would specify its transparency, its fluctuation, its commencement at the lower part of the tunica vaginalis, its gradual extension upwards, its pyriform shape, and the circumstance of a portion of the spermatic cord between the abdominal ring and the upper part of the swelling remaining free and unsurrounded by the fluid.

We are able to discriminate a hydrocele from a sarcocele, or diseased testicle, by the latter being much heavier, more globular or oval, and flatter at the sides than a hydrocele; by its being also more solid, and productive of a peculiarly sickening pain when compressed; by its being attended with a greater degree of pain in the loins, and very frequently with an unhealthy sallow look, which is not by any means a characteristic of a hydrocele, which is often seen in very healthy persons.

Then a hydrocele may generally be known from a hernia, by the present or previous possibility of reducing the latter, the impulse in it on the patient's coughing, the direction in which the tumor has passed, its course from the abdominal ring downwards into the scrotum and not upwards to the ring, its lying over the upper part of the cord, and, if the case be a bubonocele, and not a congenital hernia, by the possibility of feeling the testicle below the swelling.

But sometimes a hydrocele is conjoined with a hernia. Under these circumstances, we generally find, that the hydrocele lies in front of the hernia, and if we should be called upon to operate for the latter disease in a state of strangulation, it would obviously be the safest mode of proceeding first to lay open the hydrocele.

A hydrocele, though not a very painful disease in its ordinary states, is a considerable annoyance; for it interferes with all active pursuits, and the tumor is much exposed to the effects of external violence. When large, it draws over it likewise a great part of the integuments of the penis, which appears buried, as it were, in the swelling, so that the disease is certainly a serious obstacle to coition.

I have seen a few cases, in which hydroceles were accidentally burst by falls or blows. The result is various; sometimes one of the veins of the tunina vaginalis being ruptured, hemorrhage takes place into the cavity of that membrane, and the hydrocele is converted into what is termed *hæmatocele*. In other instances, tunica vaginalis is rather more extensively torn, and the fluid of the hydrocele passes into the cellular tissue of the scrotum, the original tumor subsiding for a time, but almost always returning after the opening in the tunica vaginalis has closed again. However, if much inflammation were to ensue, the hydrocele might be radically cured by the accident; but the termination will commonly not be so fortunate.

Hydrocele of the tunica vaginalis, I mean the common form of it in adult subjects, that which comes on without pain, very seldom undergoes a spontaneous cure. Sir Benjamin Brodie gives one example, however, of such an occurrence. Probably, whenever a spontaneous disappearance of a hydrocele takes place, the event is owing to some previous accidental inflammation of the parts, or the effusion has happened as the effect of inflammation, on the subsidence of which the fluid is absorbed again, and the vessels resume their proper action.

Treatment.—In children the disease, when not attended with a communication between the cavity of the abdomen and that of the tunica vaginalis, may generally be cured by lotions containing the liquor ammon. acet., the hydrochlorate of ammonia, or other ingredients calculated to excite the absorbents. Iodine ointments rubbed into the scrotum, friction with soap liniment, strengthened with the tinct. cantharidum, or blistering the scrotum, as practised by Dupuytren, will also frequently succeed.

The common hydrocele of adults will rarely yield to such plans, and we are obliged to resort to other measures. Now the nature of our proceedings should be chiefly regulated by the consideration, whether the patient is desirous of temporary or permanent relief; in other terms, whether he is willing to submit to what is called the *palliative*, or the *radical treatment*, which latter is necessarily attended with more pain. The *palliative* treatment simply consists in discharging the fluid by means of a small trocar and cannula. We are to grasp the back portion of the swelling with the left hand, and puncture it in the central line, about two thirds of the way downwards from its uppermost part, taking care to incline the point

of the instrument a little upwards. In choosing a trocar, we are to be careful that it is well adapted to the cannula, and, in particular, that the extremity of the latter does not form too great a circular projection on the trocar by being too wide or too thick; for when this is the case, the entrance of the trocar into the tunica vaginalis will be very likely to be stopped by the circular prominence of the cannula, and then we shall either not get the cannula into the hydrocele at all, or succeed only by forcible and repeated trials, which give the patient considerable pain, and form a display of awkwardness not likely to keep us in favor with the party operated upon. Attention to minute things in the practice of surgery, such as the make of a trocar, is often of great importance to a man who values his professional reputation; and I have known serious mischief done by inattention to the construction of this instrument. Having withdrawn the trocar, and let out the fluid, during the flow of which we must keep the cannula well introduced (for if it slip out of the tunica vaginalis we shall not be able to put it in again), we may place a bit of plaster over the puncture, and apply a suspensory bandage, which latter, however, is not essential, and is often dispensed with.

If any accidental circumstance bring on inflammation after the operation, it may lead to a complete cure; but this only happens in a small proportion of cases, and hence the method, now described, is called by surgeons the *palliative treatment*.

The *radical* consists in discharging the fluid, and then adopting some measure calculated to excite inflammation of the testicle, or rather of the inner surface of the tunica vaginalis. We may fulfil these indications by different proceedings. About half a century ago, surgeons sometimes applied caustic to the scrotum, which produced a slough, the separation of which was followed by the issue of the fluid, and the requisite inflammation of the tunica vaginalis. This plan was at length renounced as unnecessarily severe, and uncertain of success. At the same period, the practice also prevailed of passing tents and setons into the tunica vaginalis for the cure of this disease. The seton was in favor for a long time, and even now, though not used for the present form of hydrocele, is sometimes employed in another variety of it. Then, another plan of cure consisted in making a free incision into the swelling, so as at once to let out the fluid, and make such an exposure of the cavity of the hydrocele as was followed by inflammation, suppuration, granulation, and the obliteration of it. This last mode of treatment is still advisable under particular circumstances. But, in general, the best practice, and that to which all the most experienced surgeons in this country give the preference, is to discharge the fluid, and immediately afterwards to throw some stimulating fluid into the cavity of the tunica vaginalis, for the purpose of bringing on the necessary degree of inflammation. This operation requires a simple but well-made apparatus, composed of

a trocar and cannula, and either a syringe with a pipe adapted to
the cannula, or else an elastic gum bottle with a brass neck, fur-
nished with a stopcock, and of a size exactly adapted to the mouth
of the cannula. Some surgeons use an injection containing sul-
phate of zinc; others, employ a solution of alum, or brandy and
water. Port wine and warm water in equal proportions, were pre-
ferred by the late Sir James Earle. Of late, an injection, com-
posed of ℥ij. of tinct. iodinii, and ℥vj. of tepid water, has been
used, on the ground, that the cure is sooner accomplished by means
of it than other injections, a larger quantity of which is also stated
to be necessary, so that the passage of some of it into the cellular
tissue is more likely to happen. The port wine and zinc injections
are the only ones, which I have hitherto employed. The wine in-
jection should be made stronger than what is above specified; if
two thirds of it be wine, it will not be too stimulating. I have also
frequently put ℥iss. of the sulphate of zinc into a pint of warm wa-
ter, and believe that the chance of a failure of the operation is there-
by lessened. The fluid of the hydrocele having been discharged,
and the elastic bottle filled with the lotion, we push the end of the
stopcock into the mouth of the cannula, and throw the injection into
the tunica vaginalis. Before we do this, however, we are to be
sure, that the internal end of the cannula has not receded from the
cavity of that membrane; for if it has done so, the injection will
pass, not into that cavity, but into the cellular tissue of the scrotum,
and bring on extensive abscesses, or even a dangerous sloughing
of the parts. I remember once assisting a surgeon in this opera-
tion, and telling him to be on his guard against this accident, the
risk of which he seemed to think very trivial. He told me that he
had tapped numerous hydroceles without the occurrence; and yet,
from not paying attention to keep the cannula well in during the
discharge of the fluid, and the shrinking of the tunica vaginalis, the
very thing now happened which he considered to be impossible un-
der his management. Abscesses and some gangrenous mischief
followed; but I believe the hydrocele was radically cured, which
might not have been the result. On the average, the injection may
be kept in from five to ten minutes. In young persons, three min-
utes will suffice. The quantity of injection should not be quite
equal to the quantity of fluid discharged, because if we distend the
tunica vaginalis too much, some of the injection is apt to flow out
by the side of the cannula into the cellular tissue, and occasion sup-
puration, or even sloughing. If the testicle should be affected with
chronic enlargement, this circumstance ought not always to deter
us from employing the injection, which, in such a case, has often
brought about a cure. After the operation, we are to put a piece
of adhesive or soap plaster over the puncture, and when inflamma-
tion has come on, apply a poultice. At one time it was supposed,
that this method could not produce a cure, except by obliterating

the cavity of the tunica vaginalis, or by exciting the adhesive inflammation in it, followed by the union of the loose tunica vaginalis to the portion of it reflected over the testicle; and that, unless such union took place, the hydrocele would return. But it is now well ascertained, that a hydrocele is often cured without the cavity of the tunica vaginalis being obliterated, and on another principle, namely, the injection excites inflammation of the interior of that membrane, followed by some permanent change in the state and action of the vessels of the part, whereby they are prevented from continuing to secrete a redundant quantity of fluid; and there seems to be a restoration of the due equilibrium between secretion and absorption.

With regard to the variety of hydrocele, in which its cavity is divided into distinct bags or cells, one ciucumstance merits notice, namely, that we cannot treat it efficiently, or, indeed, with the slightest prospect of a cure, by injection; and the proper plan is that of making a free incision into the tumor, and discharging the fluid from the several pouches in which it is confined. Thus a radical cure may be accomplished with tolerable certainty. In some cases, where a hydrocele is found to have two distinct cavities, this peculiarity depends upon a hydrocele of the tunica vaginalis being combined with an encysted hydrocele of the spermatic cord.

In all ordinary cases, the treatment by injection should be preferred, as the mildest and surest. Where, however, the hydrocele contains several different cavities, not communicating together, where likewise the nature of the disease is doubtful, or the case is variously complicated with a hernia, or the presence of a hernial sac, or the method of injection has already failed, it may be the most prudent course to practise an incision, in preference to a puncture, and this, under some of these circumstances, even with extreme caution. When, however, the doubt is, whether the disease is hydrocele or a medullary tumor, a puncture with a small trocar seems to be followed by no ill consequences; and it is, I think, preferable to an incision, which, in the event of the case being hydrocele, would be an unnecessarily severe mode of cure. When an injection has not answered, the seton may be employed, if the surgeon prefer it, as a milder practice than the treatment by incision. In a few such cases, I have tried acupuncture with success; but in others without it. In two or three examples, I have resorted to acupuncture after a partial return of hydrocele, and completed the cure. If acupuncture be tried, pressure may be combined with it.

We should never proceed to puncture a hydrocele of the tunica vaginalis, without having examined it most carefully; for various cases are recorded, in which the testicle, instead of having the fluid in front of it, has been adherent to the front of the interior surface of the tunica vaginalis, and actually been wounded with the

trocar, none of the fluid collected at the sides of this body being discharged. One of the best ways of avoiding this serious error is to examine every hydrocele with a wax taper, in the manner already specified; for if the forepart of the tumor seem opaque, and, when compressed, occasion the sickening pain always arising from compression of the testicle, we may infer, that this body is adherent to the front of the cavity of the hydrocele, and would be wounded by the introduction of the trocar in the usual place.

CONGENITAL HYDROCELE

Signifies a collection of water in the tunica vaginalis, attended with a narrow communication between the cavity of the latter membrane and the interior of the peritoneum. In the fœtus, the testicle is contained in the abdomen, whence it descends into the scrotum, generally a little while before birth, but sometimes not till after this event. The production of the peritoneum, by which it is accompanied, and which is to constitute the future tunica vaginalis, usually closes soon after the descent of the testicle is completed. But before this happens, fluid may pass into it from the cavity of the peritoneum, and a peculiar form of hydrocele, termed *congenital*, be the result. This case has one symptom that does not characterise other hydroceles; namely, pressure makes the swelling disappear by forcing the fluid up into the cavity of the peritoneum. In this respect, then, we see a similarity to hernia. The hydrocele, however, is a transparent, soft, pyriform swelling, in which a fluctuation can be plainly felt. A congenital hydrocele not only diminishes or disappears under pressure, but also when the patient lies on his back; resuming its ordinary shape and dimensions as soon as he puts himself in the erect posture again. It may take place either when the testicle has descended properly into the scrotum, or when it has not descended, and is not even perceptible; or it may occur while the testicle is somewhere in the inguinal canal, or can be felt just at the abdominal ring. In these latter cases, the tunica vaginalis is elongated and extended from the place where the testicle is lodged down into the scrotum. These are circumstances very necessary to be remembered, because they influence the treatment. This must be manifest, because we cannot prudently attempt any thing for the cure of the hydrocele that would interfere with the descent of the testicle, or be likely to injure it.

The best mode of treating congenital hydrocele, when not complicated with a retarded descent of the testicle, is to apply a truss; for thus we at once remove the danger of a protrusion of the bowels, and promote the closure of the passage between the scrotum and the belly. No sooner has the obliteration of the opening been accomplished, than a further supply of fluid from the cavity of the peritoneum is cut off, and what is contained in the tunica vaginalis is ab-

sorbed.   This practice is more advisable than the old method of cure by means of a stimulating lotion thrown into the tunica vaginalis, while an assistant made pressure at the ring, in order to keep a portion of the fluid from entering the cavity of the peritoneum.   I deem the treatment by means of a truss more advisable; first, because unattended with any risk of bringing on peritonitis; and secondly, because it is adapted to expedite the closure of the communication between the scrotum and the belly,—a desideratum which is entirely out of view in the treatment with injections.

HYDROCELE OF THE SPERMATIC CORD

Is much less frequently met with than hydrocele of the tunica vaginalis, and is commonly described as an accumulation of fluid in a thin membranous cyst within the sheath of the cord.   Sir Benjamin Brodie, indeed, regards this encysted hydrocele as corresponding to a cyst filled with fluid, produced in any other organ of the body, and takes notice of its loose connection to the surrounding parts. While, however, Sir Astley Cooper admits this mode of formation, he conceives that, in certain examples, the production of the disease is owing to the adhesion between the peritoneal investments of the cord happening to be imperfect in one place, so as to leave a cavity between them.   This is also Scarpa's explanation, who published, many years ago, an interesting memoir on the present complaint.   The swelling is generally oblong, or globular; and, if it be so placed as to admit of being grasped and pushed forwards, it will often present a light blue color, with a degree of transparency about it, and considerable tension.   Few specimens of it attain much magnitude, its ordinary size not exceeding that of a pigeon's egg, and pain is not one of its characters.   We now and then hear, or read, however, of a large one, including several ounces of fluid.   When situated in that part of the cord which is within the inguinal canal, the tumor is liable to be mistaken for hernia, though I may observe, that it is free from pain, as well as from the guggling sound or feel perceptible in intestinal herniæ, and that the functions of the alimentary canal are not in the least disturbed or interrupted.   Though such a tumor may be forced a little way up the inguinal canal, we cannot bring about its perfect reduction.   When the tumor is on the outside of the abdominal ring, we recognise its nature by various circumstances.   We advert to its transparency, its fluctuation, its giving no sudden impulse to the finger when the patient coughs, and to its being unconnected with any of the organs in the abdomen, even though it may admit of being pushed into the ring.   Under these or any other circumstances, it can never be put completely up into the belly, and, when left to itself, it soon descends into its usual place, above which the cord is free.

The fluid of a hydrocele of the spermatic cord is generally paler

and more limpid, than that of a common hydrocele, and contains less albumen.

One of the best modes of treating this disease is, to make an incision in it, and then fill the cavity with lint. In the case of a lad in University College Hospital, I removed a slip of the front of the cyst, and the disease was soon cured. Another eligible plan of treatment consists in passing a seton of two or three threads or silks through the swelling. These may be introduced in the way recommended by Sir Astley Cooper, with a common curved needle. The latter method deserves the praise of mildness, and I believe is tolerably certain of answering, though, perhaps, less so than the treatment by incision. If we fill the cavity with lint, after laying it open, there will be no occasion for the removal of any portion of the cyst, in which proceeding there is some risk of doing injury to the vessels of the cord. The cavity will suppurate, granulate, and soon be obliterated.

Hydrocele of the spermatic cord, when small, produces little or no inconvenience; and, on this account, some practitioners scarcely consider it as a case requiring the performance of any operation. If, however, the patient's mind is rendered continually uneasy by the tumor, or the tumor should be in any way a source of inconvenience, or show a disposition to enlarge, it is right to attempt its cure. Injections have so often failed in the treatment of this form of hydrocele, that they are now abandoned in this metropolis.

Besides this kind of encysted hydrocele, there are other varieties, situated on the epidydimis, or the testicle. The former lies, as Sir Benjamin Brodie has explained, between the epidydimis and the inner layer of the tunica vaginalis; the latter between this membrane and the tunica albuginea.

HÆMATOCELE,

Which, etymologically speaking, means simply a tumor composed of blood, at the present day always denotes a collection of blood in the tunica vaginalis. The swelling is of a pyriform shape, like hydrocele, from which it may be distinguished by its want of transparency, its greater weight, its obscure fluctuation, and the manner of its production; the cause being usually a blow on the scrotum, or a wound of an artery, or vein of the loose portion of the tunica vaginalis, or an injury of the testicle itself. Sometimes, I suspect, an enlarged or diseased vein gives way spontaneously, after the water has been discharged from the tunica vaginalis, and, continuing to bleed into the cavity of this membrane, leads to the formation of hæmatocele. We know, however, in many instances, that a largish vessel has been wounded, for the fluid of the hydrocele, as it flows out, is more or less mixed and tinged with blood. If a lancet be used for this purpose, the risk of hæmatocele is increased.

Some persons have become the subjects of hæmatocele in consequence of a blow on the testicle from the pummel of the saddle, in riding on horseback; and, in such cases, probably the bleeding is often from the vessels of the testicle itself.

Some time ago, I visited with Mr. B. Cooper a gentleman, who had a large hydrocele on each side of the scrotum, and one of these he had converted into a hæmatocele by a trial of his own ingenuity. Perceiving that all that a surgeon did, when he let out the fluid, was to make an opening in the swelling, he fancied that he could invent an instrument that would make the attendance of a surgeon unnecessary. After a little study, he contrived an instrument, very much like what is used by farriers for bleeding horses, only it was on a larger scale; the blade, which darted out on touching a spring, being something like a dagger. With this weapon he perforated the swelling, indeed, and let out the water, but wounded some of the blood-vessels, so that in a few hours the tumor was as large as ever, and a great deal more painful. In short, the cavity of the tunica vaginalis had become distended with blood. The blood soon began to putrefy, the parts inflamed, considerable fever ensued, and, partly from the constitutional disturbance and the approach of gangrenous mischief, the patient's life was in danger. If a prompt and free incision had not been made, I fully believe his condition would soon have been hopeless. By this operation a considerable quanity of putrid blood, matter, and a most offensive gas, sulphuretted hyodrogen, having been discharged, the patient recovered very favorably.

One hydrocele was radically cured by this proceeding; but, notwithstanding the inflammation was considerable, it had not the effect of curing the other hydrocele.

Hæmatocele is only painful when complicated with inflammation, or with mechanical injury of the testicle. Some cases, therefore, are painful, and others not so. In certain examples, a hæmatocele is combined with hydrocele: this may take place when a person, who has a hydrocele, receives a severe contusion of the scrotum, and one or more blood-vessels of the tunica vaginalis are ruptured by the violence, and the blood, which flows from them, is added to the fluid already in the tumor. The state of the case may be known by the previous accident, the sudden increase of the swelling following the injury, and the dark opaque appearance of the tumor, which no longer exhibits its former transparency, when a lighted taper is placed behind it.

The treatment of hæmatocele varies according to circumstances. When the quantity of blood is inconsiderable, we should not interfere with it by any operation, but endeavour to promote its absorption by means of brisk purgatives and lotions containing vinegar, spirit, and hydrochlorate of ammonia. The absorption of a more copious effusion of blood in the tunica vaginalis is not likely to be accomplish-

ed; for we hear of cases in which the blood continued nearly twenty years unremoved, though changed in its appearance, and turned into a pale brown lamellated substance, very much like what is met with in an old aneurism.   Sir Astley Cooper gives one instance, in which he cut into a hæmatocele that had existed seventeen years and in which the blood, originally effused, still remained, though in an altered condition.   When hæmatocele arises from a blow, antiphlogistic treatment at first is the most prudent; we are to keep the patient quiet in the recumbent posture, and try what benefit can be obtained from purgatives, leeches, venesection, low regimen, and cold evaporating lotions.   In a later stage, if the swelling should continue of any material size, or threaten to bring on suppuration, sloughing, and other troublesome or urgent consequences, we should of course make a free incision into the tunica vaginalis, discharge the blood collected in it, and then apply emollient poultices, unless there was a tendency to a renewal of bleeding, to which circumstance linen, wetted with cold water, or the Saturine lotion, would be better than warm applications.

If the disease were combined with hydrocele, or to follow the puncture of the latter kind of swelling, I should lay open the tunica vaginalis, take out the blood, and then apply warm or cold applications, according as there might or might not be a disposition to a return of bleeding.   In almost all cases of hæmatocele, requiring an operation, antiphlogistic means are indispensable at first; and I have seen several cases in which it has been necessary, on account of the inflammation and constitutional disturbance, to employ the lancet and other means of depletion very freely.   In cases where the effusion of blood follows the puncture of a hydrocele, that is, where there is a communication formed between the cavity of the tunica vaginalis and the external air, the blood soon putrefies, and becomes a source of considerable irritation; matter forms; a tendency to sloughing is produced; sulphuretted hydrogen gas is generated in the swelling; and the patient gets into an urgent state of danger, from which the formation of a free and immediate opening into the disease is the only means of extricating him.

VARICOCELE, OR CIRCOCELE,

Consists of a varicous enlargement of the spermatic veins; the disease being more common on the left side than the right, in consequence, as Morgagni believed, of the termination of the left spermatic in the renal vein, the current of the blood in which is not in the direction of the left spermatic vein, as the course of the blood in the vena cava is, with reference to that of the right spermatic vein.   In former days, the first of these terms was generally restricted to a mere varicous dilatation of the veins of the scrotum, an affection requiring no particular notice; while the expression *circocele*

was used to denote more particularly a varix of the spermatic veins themselves, a case more deserving of consideration, because surgeons are often consulted for it, and it occasions a swelling that has frequently been mistaken for hernia. In the present day, these two terms are mostly employed synonymously; and when we hear of a modern surgeon speaking of varicocele, he is almost invariably alluding to a morbid enlargement of the spermatic veins, and not of those of the scrotum. When the veins of the cord are thus altered, they assume a tortuous course, their coats are considerably thickened, and the vessels have a knotty feel, attended with a greater fulness below the ring on the diseased side than the other, and with more or less uneasiness, sense of weight, and occasionally a severe pain in the testicle, inguinal canal, and loins. The swelling is sometimes large, and of a pyramidal shape, with the base just above the testicle. When we examine a varicocele with the hand, we feel the cluster of dilated veins, which are commonly described as communicating a sensation, as if we were taking hold of a bundle of earth worms. We may distinguish varicocele from a hernia, by placing the patient in the recumbent posture, and pressing the blood of the large veins upwards, or returning the protruded viscera, so as to reduce the swelling; we then cover the abdominal ring with our fingers, and desire the patient to rise while we keep the fingers thus steadily over the ring. Now, if the case be a varicocele, the spermatic veins fill again, and assume their former distended condition directly the patient is in the erect position, notwithstanding the abdominal ring is covered and compressed; but if the case be a hernia, no protrusion can happen, while we keep our fingers on the ring, and consequently, so long as they are thus applied, there can be no return of the swelling, though the patient change his posture from the recumbent to the erect. The swelling of varicocele, when it returns, makes its appearance also in a more gradual manner than a protrusion of the abdominal viscera.

In the generality of cases, varicocele is not a very painful disease, and the patient finds any uneasiness from it relieved by supporting the testicle with a suspensory bandage or a silk net, by bathing the scrotum and groin with cooling lotions, and keeping his bowels regular. If there be greater annoyance, or any severe degree of pain, he should, in addition to the foregoing measures, observe the recumbent posture, and apply leeches. In a few rare instances, the sufferings produced by varicocele have been such as to induce the patient to submit to castration; but, in the present state of surgery, I am reluctant to believe that such proceeding is justifiable. Another experiment has consisted in putting a ligature round the largest of the varicous veins; but by this we should expose the patient to the risk of phlebitis; and one of the late Sir Everard Home's patients nearly lost his life after such an operation. Some practitioners have had recourse to another plan; after

dividing the integuments, they have compressed the most distended veins between the blades of forceps constructed for the purpose, and thus obliterated their cavity. Fricke's method consists in passing a seton of three or four threads through the bundle of varicous veins. One of the most serious occasional consequences of the disease, and also of treatment of it with the forceps, is atrophy of the testicle.

[In cases of circocele, when it is necessary to have recourse to an operation, I have succeeded with the needle and twisted suture. I first separate the vessels from the vas deferens with the thumb and fingers, and then pass a long needle behind them, and apply the thread over the needle as in the hare lip suture. But little pain is experienced, at least for a day or two; if much inflammation follow, the patient should be kept in the recumbent position, diet low, bowels open, and cold applications should be made to the part. I allow the needle to remain until the vessels below it are hard and cord like.

I operated in May, 1844, upon a young man twenty-one years of age, and modified the above operation, by dividing the scrotum over the vessels after the needle was introduced, and then the suture as it was twisted, lay between the lips of the wound, and in this way, the pain from the strangulation of the skin was avoided. My friend Professor Gross from Kentucky, suggested this modification.—Ed.]

DISEASES OF THE SCROTUM.

The scrotum is liable to anasarca and ecchymosis, which, however, are here attended with no peculiarity, no circumstances different from those accompanying such affections in other common textures of the body. It is also occasionally the seat of phlegmonous erysipelas, and then, from its abundance of loose cellular tissue, which becomes distended with a serous fluid, is productive of a considerable degree of swelling, often extending to the very end of the prepuce, and causing there a phymosis. On first sight of such a case, where the swelling is equal in size to a child's head, the suspicion at first raised is, that the urethra has given way, and that the urine has been effused. Whether this has really happened or not, free incisions should be made; and, if any doubt exist about the state of the urethra, a catheter ought to be introduced, and kept in, as it can do no harm, even if the urethra should be sound, and, in the opposite case, will be of essential service in preventing the further escape of urine into the cellular tissue of the perinæum and scrotum. The scrotum is sometimes the situation of tumors; and I remember one case in St. Bartholomew's, where an excrescence in the shape of a horn, and of a horny consistence, was formed on it. In warm climates, the scrotum is often converted into an enormous mass of adventitious or hypertrophied cellular tissue, often amounting to half a hundred-weight or more, and not only bury-

ing, as it were, the penis and testicles, but absolutely disqualifying the patient for exercise or any kind of employment requiring locomotion or muscular exertion. Now and then a similar distressing disease has been seen in Europeans; Delpech operated upon some remarkable cases of this kind, in one of which the swelling weighed seventy or eighty pounds. In Mr. Liston's collection is another tumor of this nature, which he removed, and the weight of which must be very great. It is generally, however, in warm climates that the disease is met with. Larrey relates the particulars of several cases which he saw in Egypt, and facts of the same kind abound in the records of surgery. The case of a native of China, who died under the operation attempted for his relief in Guy's Hospital, must be fresh in the memory of all surgeons in London. Many successful removals of the diseased mass, however, have been performed, especially by Clot Bey, in Egypt; and it is the only expedient that can afford relief, where the patient's life is rendered a burden by the magnitude of the adventitious formation. In practising these operations, there are three principal points to be attended to: first, we are to take care to secure every large artery as soon as divided, so that the patient may not die of hemorrhage before the operation is finished; secondly, we are to avoid injuring the testicles and urethra; thirdly, we are to give the patient a cordial draught, or a little brandy with a proportion of laudanum in it, before the operation, so that his nervous system may be better enabled to bear the long and unavoidable agony, or the shock, of the operation.

CHIMNEY-SWEEPERS' CANCER

May be strictly denominated a disease of the scrotum; for the instances, in which it has been known to commence in other parts are very unusual. It seems to arise from the lodgment and irritation of soot in the rugæ of the scrotum; and, perhaps, if other parts of the integuments were as well adapted for the reception and detention of this substance, we should more frequently notice the disease in them. A few cases, in fact, are related, in which the disease occurred on the face and limbs, and this even in persons who were not chimney-sweepers; but then it is to be observed they were gardeners, or laborers in some other way, requiring them to handle soot. The disease commonly begins in the form of a smallish wart or induration upon the scrotum, such wart or induration soon presenting a broken surface, from which a particularly fœtid matter is poured out, but, drying, is converted into a kind of scab, or incrustation. From time to time this is rubbed off and followed by a more and more copious effusion of very offensive bloody ichor. At length, an ulcer of some extent is produced under the scab, with hardened, everted, or contorted margins. In time, the

ulcer reaches the tunica vaginalis and the testicle, and the absorbent glands in the groin swell, burst, and sometimes change into similar malignant ulcers. I have known a chimney-sweeper's cancer commit such ravages that the artery in the groin was laid bare by it. In some cases, indeed, the patient dies of profuse bleeding; but more usually he dies hectic, exhausted by irritation, long suffering, profuse discharge, and extension of the disease to the lymphatic glands in the loins.

This is a malignant disease, over which internal medicines and external applications possess little or no control. If, therefore, we meet with the disease in its early stage, before the testicle, the spermatic cord, or the lymphatic glands are involved, we ought to lose no time in trying useless medicines and dressings, but at once take away the disease with a knife. Even then the result will be uncertain; and, in the course of my time, I recollect more instances, in which the operation was followed by a relapse, than a permanent cure. I attended, at the Bloomsbury Dispensary, a chimney-sweeper afflicted with the disease in the state of ulceration, with one or two glands in the groin enlarged, which seemed to me a prohibition to the operation. He went into one of the hospitals, where the diseased portion of the scrotum was removed; but, I am informed, he soon died of a return of the disease higher up in the body. By these remarks, I would not wish it to be supposed, that the operation will never succeed when the inguinal glands are swollen. I am sure it will not answer, if those glands participate in the morbid action; but, if they be merely enlarged from irritation, then a cure may be the result, the glandular enlargement gradually subsiding after the disease has been removed. About two years ago, I operated under these circumstances on a chimney-sweeper in University College Hospital; and, though the inguinal glands afterwards suppurated, the man was cured in a few weeks. The same thing, it is well known, is occasionally noticed after the removal of a scirrhous breast.

One remarkable difference between chimney-sweeper's cancer and common cancer is this: in the former case, if the whole of the diseased parts be taken away, there will be no relapse; in the latter, the same practice will not secure the patient from a return of the disease in the same or other parts.

CANCER OF THE PENIS

May commence on the glans, or the prepuce, and afterwards not only involve both these parts, but extend its ravages much further, so as to cause excessive induration even in the corpora cavernosa themselves, and sometimes to destroy the greater portion of the penis, by a process of malignant ulceration as high up as the pubes. In the museum of University College is a fine specimen of scirrhus

of the penis, in which the corpora cavernosa and septum penis are involved; it was taken from an old man, who was under my care as a patient of the Bloomsbury Dispensary, and whose water I used to draw off daily for some time before he died. At certain times, he suffered acute pain in the organ, which was much enlarged, and the hardness of which was very remarkable. His great age, the state of his prostate gland, and the diseased condition of his bladder, prevented me from proposing the removal of the penis. He died, indeed, from a complication of diseases, and not exactly from scirrhus of the latter organ. In many instances, the disease originates in the form of a warty induration, either on the inner surface of the prepuce or on the glans, and it may continue in this state many years, without much change, though more generally it is soo followed by ulceration, the discharge of a thin peculiarly offensive ichor, and the formation of a malignant sore, with hard everted, or contorted, edges. In the case of the old man to which I have alluded, the disease had existed a very considerable time, without getting into the ulcerated stage. The late Mr. Hey, of Leeds, took particular notice, that, in many instances of cancer of the penis, the patients had a natural phymosis; for, in eight out of ten examples, which he attended, this was the case. The observation was corroborated by the reports of M. Roux, of Paris. Mr. Travers has never known a Jew to be the subject of cancer of the penis; but he operated on a man, who had been cut for phymosis ten years previously, in whom a pimple on the side of the frænum ulcerated, and assumed the form of cauliflower fungus, completely surrounding the glans, while the latter continued sound. Perhaps, the following consideration may explain why many cases are combined with phymosis, which may not in every instance be natural, or have preceded the other disease: when a cancerous affection begins on the inner surface of the prepuce, or when a cauliflower induration exists either there or on the glans, the irritation of the prepuce, arising from such a cause, may lead to a swelling, thickening, and enlargement of that part, just as we know that common warts, in the same situation, frequently do. Yet, I believe, that congenital phymosis does not predispose to cancer of the penis, as Mr. Hey suspected; for, undoubtedly, those who have a long prepuce, and neglect cleanliness, are more liable to disease within that part than others, whose foreskin is short. Sooner or later, after scirrhus or cancer has begun in the penis, the glands in the groin enlarge, and the ravages of the disease may gradually extend from the extremity of the penis to the pubes, and have a fatal termination. Other ill-conditioned, or fungous diseases of the penis, however, must be carefully discriminated from cancer. I should say, with Mr. Travers, that whenever the disease begins as an irritable pimple of the glans, or prepuce, and this breaks into a spreading ulcer, within an indurated base, and a disposition to throw

out a fungus, the case must be viewed with great suspicion, whether the glands in the groin be affected or not, particularly if the patient has passed the age of fifty.

The only chance of freeing a patient from a cancerous disease of the penis depends upon the timely removal of the affected portion of the organ with the knife. The earlier this is done, the greater the prospect of success; for, when the inguinal glands are involved, the operation is too late. Trivial sympathetic swellings of those glands, however, are not accounted by every surgeon a just prohibition of the operation, though the discrimination of such enlargement from one of truly scirrhous kind is by no means easy. One thing has been fully proved by repeated experience, namely, that the patient is not certain of not having a return of the disease, though the operation be done at a period when no glandular enlargement exists. When the disease returns, it may either reappear upon the stump, or in the shape of cancerous buboes in the groin, which, after a time, often bleed profusely, so as to bring the patient very quickly to his doom.

DISEASES OF THE PROSTATE GLAND.

A swelling of the prostate gland may be of different kinds, and depend upon a variety of causes: thus it may originate from *common inflammation of the part, abscesses, calculi within its substance, a varicous enlargement of the veins in its vicinity, or a chronic alteration of its texture,* by which its shape, size, and consistence are materially affected. This latter case, though attended with great induration of the part, and often termed *scirrhus,* is different from any cancerous affection, not betraying any disposition to affect the lymphatic glands, or to communicate a truly scirrhous form of disease to other textures and organs. The gland itself, when examined, does not present the texture of scirrhus, but is a dense, compact, nearly homogeneous substance. Whatever danger attends it (and great danger does frequently accompany it) proceeds from the difficulty of passing the urine, and its injurious effects on the bladder and kidneys, to which such state of the prostate gland, when far advanced, inevitably leads. The prostate gland, besides being liable to the several affections which I have mentioned, is also subject to scrofulous disease and abscess; and perhaps, when a chronic enlargement of it takes place in a young person,—one under the age of thirty, for instance,—there is reason to suspect the affection to be scrofulous; for the other chronic enlargement, to which I have adverted, rarely happens in persons much under fifty.

With respect to *acute abscesses,* I believe they are generally formed around, or in the vicinity of, the prostate gland, and not in its substance. They may occur, however, in the cellular tissue, between its lobes. Most of the examples which I have seen, fol-

lowed suddenly suppressed gonorrhœa, or were produced by the irritation of strictures in the urethra. They interfered seriously and urgently with the evacuation of the urine; and consequently required free and prompt incisions for the discharge of the matter. Sometimes they burst into the urethra, or make their way out in the perinæum. All inflammatory complaints about the neck of the bladder and the prostate gland generally cause more or less difficulty in passing the urine; and such is the ordinary effect of abscesses in this situation. In the early stage, we should employ every means in our power, calculated to prevent the inflammation from advancing to suppuration; and, for this purpose, we should apply leeches freely to the perinæum, bleed from the arm, administer calomel and brisk purgative draughts, and employ fomentations, or even the warm bath. But, directly matter has formed, the sooner an incision is made the better.

With regard to *prostatic calculi*, they are composed of phosphate of lime, their size varying from that of a pin's head to that of a nut. Sometimes they pass into the urethra, and are discharged. When they cause much annoyance, and can be felt from within the rectum on the finger being introduced into this bowel, they should be removed by making a suitable incision into the gland with the aid of a staff. When they project into the urethra, a similar operation will be required. If possible, they should always be extracted without actually cutting into the bladder itself.

The disease of the prostate gland, most interesting to the practical surgeon, is a *slow enlargement* of it, by which its bulk is sometimes enormously increased, from that of a chestnut, its natural size, to that of a large orange, or even a melon; for it has been known to attain the magnitude of fifteen times its natural size. The museum of University College is particularly rich in specimens of diseased prostate gland, bladder, and urethra. One preparation exhibits the bladder with the prostate gland, not only much enlarged, but torn or fissured by the repeated attempts of the surgeon to get the instrument into the bladder. Small calculi are lodged in the bladder in the depression behind the prostate; and we learn from the history of the case, that an abscess had formed between the bladder and rectum, which burst by an opening, which is still discernible, into the former of these organs.

Chronic enlargement of the prostate gland is most common in the decline of life, at which period there is a natural tendency to it, such that, in persons of advanced age, this part is always increased in size. The alteration of the prostate gland does not usually render the contiguous portion of the urethra narrower, in the manner of a stricture, but compresses the sides of that canal together, and either bends it more suddenly upwards, pushes it to one side, or turns it in spiral or other diversified modes. These facts enable us at once to understand why this disease of the prostate gland should

render the patient liable to retentions of urine, and why he should have symptoms and complaints very similar to those of stone.

The urethra has been known to be widened. Thus, Sir Benjamin Brodie has recorded a case of diseased prostate gland, where the urethra was dilated into a sinus, capable of holding two or three ounces of urine. The urethra, however, is generally more or less compressed and distorted, at the same time that it bends more suddenly up into the bladder. In consequence also of the prostate gland acquiring an increased magnitude, the prostatic portion of the urethra must necessarily be lengthened; and this may happen in such a degree, as to make the urethra two or three inches longer than natural. Frequently the gland is more enlarged on one side than the other; a circumstance that gives more or less obliquity to it. As the principal part of the prostate gland naturally lies below the urethra, the greatest part of the swelling occupies the same place. In many of these cases, there is a swelling of a portion of the gland just behind the vesical orifice of the urethra. Such a swelling may act like a valve at the neck of the bladder, and, in many preparations, it is actually seen constituting a large prominence in the bladder, attended with the effect of mechanically forcing the urethra forwards towards the pubes, and of obstructing the passage of instruments, or of preventing the surgeon from readily touching with a sound a calculus situated behind and below it. In one specimen in University College, the prostate gland is irregularly enlarged, and one part of it projects into the bladder, so that it was wounded in the attempts to introduce the catheter. Small calculi are also adherent to the inner surface of the bladder. In many of these cases of enlarged prostate, there are calculi in the bladder: in another preparation in the same museum, several calculi form a very serious complication of the other disease.

This chronic enlargement of the prostate gland comes on slowly and insidiously, not indeed exciting attention until the size of that organ generally, or of the third lobe in particular, begins to bring on first a frequent desire to make water, and occasional tenesmus, or uneasiness about the rectum, followed, after a time, by more or less difficulty of voiding the urine. There is not only pain in making water, but a desire and straining to discharge more, after the bladder has been emptied as far as it can be. The muscular coat of the bladder, being obliged to exert itself very frequently, and having a mechanical obstacle, as it were, to overcome, becomes of course considerably thickened. In fact, in an early stage of the disorder, the patient finds that he is obliged to make a greater effort than usual to get the urine to flow; he is compelled to strain a good deal ere it will begin to escape; but when once the first difficulty is surmounted, the contents of the bladder pass out tolerable well. However, in proportion as the diseased gland continues to increase in size, the difficulty of passing the water also increases; more

straining is always required, and at times there is a complete or incomplete retention. No doubt, in a great number of instances, the projection of the third lobe, as it is sometimes termed, just behind the vesical orifice, has a mechanical effect in obstructing the discharge of urine; and probably it is when such prominence begins, that the inability to empty the bladder with perfect facility is first experienced. In one preparation in the museum of University College, the projection resembles a nipple in shape; in another it represents a complete ridge. Sometimes, when the third and one of the lateral lobes project considerably into the bladder, their surface has an irregular ulcerated appearance, and on this account the patient suffers aggravated pain in expelling the last drops of urine, as well as distressing attacks of spasm at the neck of the bladder, symptoms also noticed in cases of stone. An ulcerated state of the projecting portion of the gland will also explain the great disposition to hemorrhage, exemplified in some of these cases on the introduction of a catheter.

In all advanced cases, the patient is annoyed with distressing irritation about the rectum, tenesmus, and flatulence; and a desire to go to stool often takes place so suddenly and irresistibly, that it is with great difficulty he can reach the proper place for relieving himself.

Generally, the patient voids large quantities of a viscid ropy mucus from the urethra, which was supposed by the late Sir Everard Home to be derived from the prostate gland itself. No doubt, a great deal of it is secreted by the inner coat of the bladder, which sometimes becomes the seat of inflammation.

In a considerable proportion of these cases, after a certain period, not only is the muscular coat of the bladder much thickened, but the inner coat protrudes between the muscular fasiculi in the form of cysts, or little sacs. A *sacculated bladder*, as it is termed, is a frequent complication of enlargement of the prostate gland. Now, these cysts may also include calculi, and instances have been known in which they were filled with pus. But this is not all the mischief resulting from disease of the prostate gland; for, amongst other bad consequences, the complaint, by deranging the functions of the urinary organs, may bring on, and frequently does bring on, a morbid enlargement of the ureters, and fatal disease of the kidneys.

Several of the symptoms of diseased prostate gland are like those of stone in the bladder; but, in the former case, the patient is able to bear exercise and the motion of a carriage much better than in the latter disorder. In a case of stone, there is also less tendency to retention of urine, but a greater disposition to paroxysms of violent pain in the hypogastric region, and to the discharge of blood with the urine after exercise. I occasionally visit an old gentleman, who has long had a considerable swelling of the prostate gland, yet, except at periods when he is laid up with retention of urine, he is able to walk into the city daily. In all doubtful cases, the state of

the prostate gland should be examined from the rectum, and the patient sounded.

The museum of University College contains one specimen in which, besides the enlargement of this organ, a considerable thickening of the muscles of the ureters is seen, and likewise sacs formed by a protrusion of the inner coat between the fasciculi of the detrusor urinæ, from one of which sacs a culculous had been extracted. In another specimen, the prostate is very much increased in size, while the muscles of the ureters form a ridge adapted to give lodgment to calculi. Another preparation is the bladder of an old man, who died of retention of urine. The prostate is vastly enlarged, its lateral portions rising up, and its naturally posterior part projecting forwards; whereby the course of the urethra was so altered, that no instrument could have been introduced, unless it had been forced through the substance of the gland.

An enlarged prostate is an awkward complication of a case of stone, not only because it sometimes carries up the neck of the bladder almost above the pubes, and removes the cavity of that viscus very far from the perinæum, but because it may create impediment to the passage of a staff, and certainly will render the operation more difficult and protracted.

Another instructive preparation is a bladder with diseased prostate gland, and four calculi in the former viscus. The third lobe is enlarged. In trying to introduce the catheter, the surgeon forced it between the bladder and rectum; and the patient died.

I do not know whether disease of the prostate usually produces a tendency to disease of the rectum; I suspect that it does, more especially hemorrhoids. In the above museum is a diseased prostate, complicated not only with a thickened sacculated bladder, but with stricture of the rectum.

One occasional effect of disease of a prostate is a vast dilation of the ureters. In the above-mentioned collection is a tuberculated enlargement of the prostate gland, with the mouths of the ureters remarkably widened.

In another specimen of diseased prostate, taken from a patient who died of retention of urine, there is a fungous mass projecting from it into the bladder. The preparation also affords a specimen of the anatomical luses of three ureters.

In the *treatment* of chronic enlargement of the prostate gland, occurring in persons above the middle period of life, we are to remember, that it is an organic disease, for the removal and complete cure of which no surgeon possesses any effectual means. Yet, notwithstanding this disagreeable truth, it is some consolation to know, that surgical assistance is often of essential service; and this not merely by obviating some consequences, which would be likely to abridge the patient's life, and even cut him off very abruptly, but by rendering the usual inconveniences of the complaint much more

bearable than they would otherwise be. By the due regulation of the stomach and bowels with alterative and aperient medicines; by directing the patient to avoid sitting long at table after dinner, and not to expose himself to wet, cold weather, the stoppages of urine are rendered much less frequent, and the annoyance from tenesmus, flatulence, &c., ordinarily experienced by patients laboring under the disease, materially diminished. Setons and issues in the nearest part of the perinæum to the prostate gland have been tried; but I have never seen any good from them; and the same observation applies to various internal medicines, with respect to their power of reducing the swelling of the gland, especially iodine, mercury, and hemlock.

A retention of urine, arising from this disease of the prostate gland, will not often yield to the warm bath, opium, or hyoscyamus; and the reason of this fact seems to be explained by the consideration, that the obstruction is less of a spasmodic nature than of a mechanical description. Local bleeding is occasionally serviceable, and, as a degree of spasm may, and probably does contribute, with the mechanical effects of the disease on the urethra, to prevent the discharge of urine, I conceive that, when a catheter cannot be immediately introduced, the surgeon ought not entirely to neglect the trial of the warm bath and opium in the form of an enema, though he should not place much confidence in them, nor defer the use of the catheter. In fact, it is always best to resort to the catheter at once, because a prompt discharge of the urine is the only method of preventing the ill effects of a forcible distention of the bladder. The bladder itself rarely or never bursts in these cases, even if the water be not discharged; but the constitutional disturbance increases, the action of the kidneys is interrupted, the inner coat of the bladder inflames, and the patient dies comatose. I have seen examples, in which, when the water was drawn off, it had a completely purulent appearance, and no recovery followed; and Mr. Travers has seen two cases of long retention of urine from disease of the prostate gland, where the mucous membrane lay like a slough, loose in the bladder.

The catheter used in these cases ought generally to be of full size, greater length than common ones, and rather more bent upwards towards its beak. Some cases require the catheter to be thirteen or fourteen inches in length, as a shorter one will not reach the bladder. The late Sir Everard Home, who had considerable experience in the treatment of disease of the prostate gland, preferred elastic gum catheters, so constructed, that they retained a particular curve, even when the stilet or wire was withdrawn from them. These he sometimes left in the urethra several days; for they were calculated to bear warmth and moisture better than other common ones of the elastic kind. For the purpose of retaining them in the passage more surely and conveniently, a catheter brace-

let was employed. A flexible catheter should be preferred to a silver one, when it is deemed most advantageous to keep the instrument any time in the passage; for it will remain there with much less annoyance than a metallic one. But, on the other hand, we are sometimes able to pass a silver catheter, when we cannot succeed with one made of elastic gum, which, unless the wire be of unusual thickness, has not always sufficient firmness to overcome the impediment arising from the compressed state of the urethra, or the alteration of its course. In these cases, whatever catheter be employed, it generally passes to the anterior portion of the prostate with perfect facility, and here its beak is stopped, sometimes partly by the compressed state of the urethra, but chiefly by the new curvature of the passage, which we cannot always get an instrument to follow. In fact, there are few instances of considerable enlargement of the prostate gland, without the urethra included in it being propelled forwards and upwards, or to one side, or twisted in various ways. Perhaps, where the passage is tortious, an elastic catheter of moderate size is the most likely to find its way; and this instrument has one advantage over a silver one, deserving to be well remembered in practice, namely, by withdrawing the wire at the period when we are trying to make the instrument pass the obstruction, we are able suddenly to increase its curvature, and thus often succeed in getting it into the bladder when no silver catheter could be introduced.

Generally it is necessary either to leave the catheter in the urethra, or to draw off the water once or twice a day, according to circumstances, removing it directly after each evacuation. These plans are to be continued, until the patient regains the power of expelling the urine himself. When the case is such, that the introduction of the catheter is always difficult, the wisest plan, after getting the instrument into the bladder, is to keep it introduced for a few days, and, as soon as the patient can empty the bladder by his own power, it may be withdrawn. An elastic gum catheter, if it can be passed, should here be preferred. A surgeon should always be provided with catheters of various kinds, diameters, lengths, and curves; and one improvement, made by Sir Benjamin Brodie, I consider entitled to commendation, namely, that of having the handles of the wires of elastic catheters made large like the handle of a staff; for thus we acquire a greater command over the instrument, and can guide its beak with greater precision and delicacy. I approve also of the wires being thicker than those in common use, and of the plan of keeping some catheters prepared, so that they will retain their curvature after the wire is taken out of them.

The gum catheters which Sir Benjamin Brodie prefers, are mounted, not on small flexible wires, but on strong iron stilets, having the curve of a silver catheter. The stilets of the larger ones have flat iron handles resembling those of common sounds. Gum catheters

should be kept thus prepared for a considerable time before they are used; they will then have the proper curvature. Sir Benjamin Brodie tries first to pass the gum catheter without the stilet; if he fails, he then tries the instrument with the stilet. In the present disease, large catheters are more easy of introduction than small ones; and the stilets of elastic catheters ought to be considerably curved. In passing them, it is now a common plan to keep the handle, at first, close to the left groin, introduce them as far as possible in this position, then bring the handle forwards nearly to a right angle with the pubes, and the handle is then to be depressed slowly and gently by placing one finger on it. When this is done, the point generally glides into the bladder, though sometimes this does not happen till the stilet is withdrawn. In particular examples, it is necessary to bend the point forward by means of a finger within the rectum, or on the perinæum.

If no catheter can be introduced, we must either puncture the bladder above the pubes, or form a passage through the diseased mass of the prostate. At the same time, I may observe, that we can almost always succeed with a catheter, and that puncturing the bladder is rarely called for.

STRICTURES OF THE URETHRA.

A stricture of the urethra may be defined to be such a contraction or alteration of a part of the passage, that here it becomes considerably narrower than what it is by nature, or even entirely obstructed. With the subject of strictures, however, it is usual to consider several states of the urethra: as first, the *irritable urethra,* as it is termed; secondly, *spasmodic strictures;* and, thirdly, *permanent strictures.* Respecting the irritable urethra, I believe the term is rather employed for its convenience than its precision; and, generally, what is said upon this reputed irritability of the urethra, is vague and of little value. Frequent desire to make water, and more or less uneasiness in passing it, are commonly specified as symptoms of an irritable urethra: occasionally attended also with a discharge. Now, these effects may result from so many various causes, that really it is difficult to admit the propriety of taking them as proofs of an irritable urethra. Any inflammation in the urethra will cause the symptoms; so will an incipient stricture in certain constitutions.

Now, nothing shows more clearly the unsettled notions, attached to the subject of irritable urethra, than the widely opposite modes of treatment adopted for its relief by different practitioners. Thus, some surgeons treat it by prescribing, three times a day, one eighth of a grain of the bichloride of mercury, and ℥j. of nitrous spirit of æther: some, referring it to disorder of the digestive organs, prescribe the blue pill and sarsaparilla; some, viewing it as connect-

ed with the inflammatory state of the canal, employ leeches to the perinæum, and take blood from the loins by cupping; some, judging that it is the same thing as the alleged spasmodic stricture, give hyoscyamus or compound powder of ipecacuanha; while others, regarding it merely as too sensitive a state of the passage, endeavor to blunt its extraordinary tenderness by the occasional introduction of bougies.

The division of strictures into spasmodic and permanent is not satisfactory to all surgeons, some of whom have a difficulty in believing, that the lining of the urethra is endued with muscularity. The observations of John Hunter maintain the latter doctrine, in favor of which several facts are usually adduced. Thus, a man, if otherwise healthy, voids his urine one day in a full stream; on the following day, he exposes himself to damp and cold, or takes punch, or acidulous wine; and next morning he cannot void his urine; but is relieved by going to bed, taking a dose of compound powder of ipecacuanha, and, after having had the bowels emptied by medicine, he passes his water as well as usual. Then the effect of large bougies, or nitrate of silver, in enabling another patient to make water in a considerable stream, is also adduced as an argument on the same side of the question. The difficulty of passing water in such cases comes on suddenly, and ceases suddenly; the cause is temporary—not a permanent disease. The canal of the urethra certainly varies in its diameter at different periods, and cold appears to have great effect in rendering it narrower. In practice, it has always appeared to me, that bougies and other instruments will enter the urethra much more easily in the same patient at some periods than others; and that opium, hyoscyamus, and other narcotics, often facilitate the passage of such instruments. But then it is maintained that the resistance, when it occurs, is not anterior to that portion of the canal which may be conceived to be affected by the action of muscles in the perinæum. Abroad, the doctrine of the muscularity of the membrane of the urethra, and of spasmodic strictures, has gained, I believe, no advocates. There, the formation of strictures is invariably ascribed to the effect of inflammation in thickening parts of the canal; and the same view is adopted by Sir C. Bell and many other practitioners in this country, who explain various circumstances, which have been referred to spasm of the urethra itself, by the action of muscles in its vicinity. A permanent stricture is attended with a conversion of the contracted part of the lining of the urethra into a substance of the consistence of ligament, but without its fibrous texture. The contracted part has, it must be confessed, no resemblance to muscular tissue.

One of the earliest symptoms of a stricture is the *retention of a few drops of urine in the urethra after the patient has made water*, which drops soon escape, and slightly wet the linen; while another small quantity, collected between the neck of the bladder and the

stricture, may be expelled by pressure below the urethra. The next thing noticed is, that the patient *cannot retain his water as long as usual*, but is obliged to empty the bladder once, twice, or oftener in the course of the night. As the disease increases the stream becomes *forked*, *spiral*, or *scattered*; and in a still more advanced stage, *the water is voided only by drops or altogether stopped*, especially when the urethra is under the influence of cold, irritation, or the effects of intemperance. In addition to these symptoms, the patient has pain about the glans penis, and there is commonly a thin gleety discharge from the passage, a circumstance, which often leads to the serious mistake of treating the case as if it were merely a gonorrhœa or gleet.

In consequence of the natural sympathy between the urethra and testicles, one of the latter organs is liable to be attacked with inflammation, more especially, however, during the use of bougies. Whether a stricture be at first merely spasmodic, and capable of relaxation, as the Hunterian doctrines teach, is a disputed point; but it is universally admitted that, after a time, the part of the urethra, which is the seat of stricture, is thickened, as well as contracted; that the diminution of this portion of the canal is not a temporary or periodical affection: in other words, that the stricture is permanent.

In old and aggravated cases of stricture, the bladder usually becomes considerably thickened, and does not admit of its usual degree of expansion. Frequently it inflames, and pours out a viscid kind of secretion like pus. And, when the obstruction in the urethra attains a certain stage, ulceration takes place between the bladder and the first and principal stricture; abscesses form on the outside of the canal, and, bursting, produce channels for the escape of the urine, called, on account of their situation and their usual indisposition to heal, so long as the obstruction in the urethra is not removed, *fistulæ in perinæo*.

Strictures in the urethra sometimes give rise to paroxysms of intermittent fever. I have seen many examples of this fact, and, in some of them, the ague had been treated without any suspicion having been entertained of its real cause.

A stricture, when examined in the dead subject, is often found not to occupy a great extent of the passage, the contraction being sometimes not broader, than what would originate from a piece of packthread drawn tight round the urethra. In some cases, however, a stricture does not correspond to this description; but the urethra is contracted along a considerable portion of its course, in which event its inner surface is exceedingly irregular, and sometimes as indurated and tough as cartilage. In particular instances, the contraction or diminution of the tube is only on one side of it; while, in others, it amounts to a complete circular constriction of the passage.

The most frequent place for a stricture is just behind the bulb of

the urethra, or about six and a half or seven inches from the orifice, in the anterior part of the membranous portion of the canal. Perhaps the situation, next in order of frequency, is about four and a half inches from the extremity of the penis; then three and a half; and sometimes close to the opening in the glans. Strictures anterior to the bulb are less liable to be influenced by spasm, if they can be so affected at all, than other strictures placed more backward in the canal. It was the doctrine of Sir Everard Home, that, in the generality of cases, where only one stricture exists, it is just behind the bulb; and that if others are found more forward, we are almost sure of meeting with one in the former situation.

In the advanced stages of stricture, there is frequently a remarkable dilatation of the passage behind the stricture. In one case, under the care of Sir Benjamin Brodie, whenever the patient attempted to make water, a tumor, as large as an orange, was formed in the perinæum. When strictures have continued a long time, and increased to a certain degree, the bladder is required to make greater efforts than natural to expel the urine, and the result is a great thickening of its muscular coat. The same change is commonly seen likewise in persons, whose discharge of urine is not so free as it ought to be; and who suffer occasional retentions of it in consequence of the effects of disease of the prostate gland, or the portion of the urethra pervading this body. In cases of stricture, when the patient has repeatedly suffered from retention of urine, it is no uncommon thing to find, after death, the ureters themselves vastly dilated. I have known them to assume the appearance of two glass tubes, three quarters of an inch in diameter, distended with transparent urine.

Amongst the bad consequences of stricture, is the unfortunate and too often fatal occurrence of a rupture of the bladder or urethra, arising from unrelieved retention of urine. The bladder itself sometimes gives way; but far more frequently a portion of the urethra behind the stricture ulcerates, or sloughs, and the urine becomes effused.

It is not an uncommon opinion, that strictures promote the origin and increase of disease of the prostate gland. They certainly do so, inasmuch as inflammation and abscesses about it are concerned; but I do not believe that they have any share in bringing on the indolent enlargement of that gland, so common in elderly persons. Bad strictures unquestionably keep up a disposition to chronic inflammation of the mucous coat of the bladder, and hence it may be thickened, as well as the muscular fasciculi of the detrusor.

An irritable bladder is a frequent complication or effect of strictures. Then another change resulting from strictures, is the formation of sacs or cysts in the bladder; a sacculated state of this organ, which we know is also a frequent complication of diseased prostate gland.

If strictures are suffered to reach a certain stage, abscesses form

about the neck of the bladder, the prostate gland, or in the perinæum. I have opened a good number of individuals, who died from the effects of very bad strictures; and, in a large proportion of these cases, I found not only extensive abscesses in the cellular membrane of the pelvis, but disease and suppuration in the kidneys.

In studying diseases in general, we should always make ourselves acquainted, if possible, with their causes. Now, with regard to strictures of the urethra, it is a common belief, that gonorrhœa is the most frequent cause of them; a view, however, that was rejected by John Hunter, on the ground that most of the ducts and passages in the human body, lined by mucous membrane, are subject to stricture. Then, another idea is, that though gonorrhœa may not have this effect, the astringent injections, employed for its cure, may bring on strictures. This is a point on which the highest authorities differ. A long residence in the East or West Indies, and the mode of life there pursued, give a disposition to strictures. At all events, in the better classes of society, strictures are particularly frequent among those individuals who have passed a considerable portion of their lives in a tropical climate.

The treatment of permanent strictures is conducted on various principles:—

1st. On the principle of mechanically dilating the contracted part of the urethra with common bougies, catgut bougies, elastic gum bougies, metallic instruments, or sounds, or elastic gum catheters retained in the passage.

2d. On the principle of producing a destruction of the stricture by making it ulcerate with the pressure of bougies or metallic instruments, or slough from the effect of escharotic applications to it.

3d. On the principle of perforating the obstruction with a conical sound; a plan, however, only sanctioned in bad cases, not yielding to milder methods.

4th. On the principle of piercing the stricture with a sharp instrument, introduced down to it through a tube.

5th. By cutting down to the stricture, removing the obstruction with a knife, and then introducing a catheter and healing the wound over it.

The Cure by Dilatation may be regarded as that which, on the whole, retains the greatest share of approbation, though particular circumstances may sometimes call for some of the other methods. The cure by dilatation is accomplished by common bougies, flexible metallic bougies, and sometimes by means of steel sounds and silver catheters of various sizes. They are all intended to act upon the principle of a wedge, and thus to dilate the contracted part of the canal. However, the action of such instruments is different from what it would be on inanimate matter; and the living parts, pressed upon and distended by them, undergo certain changes,

which are the result of processes depending upon life. Thus, the parts either adapt themselves to the pressure, or recede by ulceration.

Strong as the symptoms of stricture may be, which have been enumerated, we require a more unequivocal proof of its existence; and we wish also to know what part of the urethra is contracted, and in what degree. For this purpose, we first carefully examine the urethra with a well-oiled bougie of nearly full size; for, if too small a one be employed, it may pass through a moderate stricture without any stoppage, or it may deceive us by its point becoming entangled in one of the lacunæ of the mucous membrane. All bougies above a certain size should be cylindrical, or not too conical, which shape would immoderately distend the orifice of the urethra. The stoppage of the instrument, together with well-marked symptoms of impediment to the free escape of the urine, may be regarded as a proof of stricture. If doubts exist, we should pass a metallic sound, or silver catheter warmed, and try whether more positive information can thus be obtained.

Supposing a stricture to be ascertained, the next object is to get as large a bougie through it as it will admit; but often only a small one will pass; and, if we can succeed thus far, we then know that the dilatation of such stricture is in our power; for, after leaving this small bougie in the passage for a few minutes, we find the constricted part of the canal still more capable of receiving this bougie again, or even another bougie of rather larger size, on the next trial, which should be made in a day or two. This is next to be withdrawn, and one of still larger size introduced. In this manner, we proceed gradually from small to full-sized bougies, with which the cure is to be completed.

With respect to the questions—how often a bougie should be introduced, and how long kept in the stricture, there is no invariable rule to be followed; but much must depend upon the patient's capability of bearing the bougie without too much irritation. With this qualification, I may observe, that generally the bougie may be employed every other day, and be worn for twenty minutes, half an hour, or an hour, if the patient has favorable opportunities for it. The principle is to increase the size of the bougie, as fast as the yielding of the stricture will allow.

Of late years, metallic bougies and conical sounds of different sizes and curvatures, have been extensively employed. Sometimes they pass more readily along the passage, with their point directed to either side; an advantage which does not belong to common flexible bougies. The latter also, in consequence of their bending or cracking, are not so well calculated for those strictures, in which an instrument must be used with some degree of force. To common and flexible metallic bougies we can give any curvature deemed proper; but, with respect to steel and silver sounds and catheters, they are always constructed with determinate curves, adapted to the urethræ of different individuals.

The advantages of a waxen bougie are, that one of much smaller size, than any metallic instrument, can be safely employed; because metallic instruments if constructed of similar slenderness, would be liable to break. I scarcely need observe, that the minute diameter of some bougies is an important advantage, when the stricture is close, and will not admit a larger instrument.

Small sounds are usually made of silver; the large, of steel plated. I believe it is best to have them but slightly curved, and not more than eight or nine inches long. In using them, too much violence must not be exerted, which would make a false passage; and we shall more certainly avoid this risk, if we take care to make the beak glide along the upper surface of the urethra. After having passed one of the sounds, we may repeat the introduction of it again in two or three days. In many cases it is best to begin with small bougies, and then to go on with sounds, in the manner recommended by Sir Benjamin Brodie. The latter instruments are frequently advantageous for old gristly strictures, and cases complicated with a false passage.

It may be asked, to what size should we carry bougies, sounds, and other instruments used for the removal of strictures? In answer to this question I may remark, that some practitioners gradually proceed to bougies which are thicker than the little finger; but I never follow their example, finding that instruments of more moderate diameter answer every purpose. Bougies act, as Mr. Hunter has observed, on the living parts, constituting the obstruction or contraction: and these parts recede, or, in other words, are absorbed under the application of the instrument, so as not to require the passage to be distended in any extraordinary degree.

In common strictures, the most successful practice is conducted on the principles of gentleness and skill; and those surgeons, who employ great force and rough manual proceedings, not only put the patient to a great deal of unnecessary pain, but expose him to the danger of abscesses in the perinæum, profuse hemorrhages from the urethra, and the formation of a false passage.

It is well known to all men of experience, that strictures of the urethra are very liable to return: when, therefore, we have dilated the contracted part or parts of the passage, so far as is considered advisable, we should recommend the patient still to use a large bougie occasionally. In my opinion, it is much better for a man to pass the instrument himself once a fortnight, or once a month, for some considerable time after the end of the treatment, than to run the risk of having a relapse.

The method of curing strictures with elastic gum catheters has been preferred by several eminent surgeons abroad to all others as a general one. If we resort to this method, and succeed in getting the catheter through the stricture, it is a good rule to do what Sir Benjamin Brodie recommends; viz. to let the instrument be

22*

kept in the passage day and night, for three or four days; then taken out, and one of larger size passed, and allowed to remain. This mode of treatment is deemed by Sir Benjamin Brodie advantageous. 1. When the patient's time is of high value; because the stricture can thus be more quickly removed, than by any other means. 2. Where the stricture is dense and cartilaginous. 3. Where the urethra is irregular, or a false passage has been made. 4. Where rigors follow the use of the common bougies: for it is an observation made by Sir Benjamin Brodie, that such rigors are most disposed to take place when the urine first comes in contact with a part of the urethra that has just been dilated; which contact is prevented by the catheter, through which the bladder should always be emptied.

In very close strictures, we sometimes cannot succeed in getting any bougie immediately through them. In this circumstance, we must either endeavor to make way through them by exciting ulceration,—that is to say, by pressing the end of the bougie with some force against the obstruction daily until the part ulcerates, —or try some of the other methods to which I have alluded. Now, it was the difficulty of getting through some strictures, which led to the employment of escharotics for their destruction. Another reason was also urged in favor of this practice, namely, that it produced a radical cure; whereas the treatment, on the principle of dilatation, was alleged only to relieve the patient temporarily, as the stricture generally returned some time after the discontinuance of the bougie. I believe that, in this respect, one method is not better than the other; and, whether we use common or caustic bougies, the patient will sometimes have a relapse.

So long ago as the time of Wiseman, red precipitate was conveyed on the end of the bougie down to strictures; but it was not till the period of John Hunter, that a more skilful way of applying caustic to them was suggested. This was by passing a piece of the nitrate of silver through a cannula, by means of a piece of wire down to the stricture. Afterwards a still better method was introduced by Sir Everard Home, who caused a portion of the nitrate of silver to be fixed within the extremity of a common bougie; which, thus completed, was called an *armed bougie*.

A full-sized common bougie is first introduced down to the stricture, and a mark made with the finger-nail on the instrument close to the orifice of the urethra. Thus we have the measure of the distance of the stricture from that orifice. We withdraw this first bougie, and taking the armed one, which should be of the same size as the common one previously introduced, we make a mark upon it precisely at the same distance from its point, as that already made on the bougie employed for the first measurement of the distance of the stricture from the orifice of the urethra. We then oil it, and pass it quickly along the urethra, until the arrival of the mark at the orifice of

the urethra denotes that the caustic has reached the stricture. The caustic is then to be steadily applied for a minute or two against the stricture, and the bougie immediately afterwards withdrawn. This plan is followed up three or four times a week, and each stricture attacked in succession, until the urethra is free.*

By some judicious and experienced surgeons it is still maintained, that this treatment is advisable for spasmodic strictures, for old strictures with spasm, and for peculiarly irritable strictures. The following objections, however, are urged against the practice by others, viz. hemorrhage—severe constitutional disturbance—the risk of making a false passage—the bringing on of inflammation of the passage, and retention of urine—swelled testicle, or abscess in the perinæum.

The late Mr. Whately brought forward another mode of treating strictures with caustic. In short, he boasted of the wonderful effects of minute atoms of pure caustic potassa, weighing only one-seventeenth of a grain. They were taken out of a bottle at the moment when they were wanted, and pressed into a depression at the end of the bougie, and smeared over with cerate. No doubt Mr. Whately cured strictures, but he did not cure them in the way he supposed; his bougie, armed with this soapy mixture of fat and one-seventeenth of a grain of potash, would have no caustic effect, but operated merely on the principles of pressure and dilatation. For my own part, I ascribe much of the action of other armed bougies to the same principles.

The employment of caustic has, for some time, been going gradually out of fashion in this country; and, in France, the practice was never adopted to any great extent. Ordinary cases do not require armed bougies; and bad cartilaginous strictures, attended with induration, and more or less extensive contraction and thickening of the mucous membrane, are manifestly examples, which the nitrate of silver would never relieve. At the same time, I believe, that where a stricture is peculiarly irritable, such irritability may sometimes be more quickly removed with the nitrate of silver bougie, than any other instrument.

Now, what is to be done where all common plans completely fail? Ought we to cut down to the stricture, after having passed an instrument into the urethra, as far as the commencement of the obstruction, endeavoring next to cut through the diseased portion of the passage, so as to find the continuation of it between the stricture and the bladder, and then to convey the catheter into that organ? I have seen this operation sometimes done with success; but more frequently the operator failed to find the continuation of the urethra.

---

* A superior contrivance for the lateral application of the nitrate of silver to strictures was invented, a few years ago, by M. Ducamp: it can be procured of Weiss and Son's, Strand.

The difficulty proceeds from the great change and thickening of the urethra; and not only of that canal itself, but of the cellular membrane and more external parts. We have to cut into a mass likely to cause much perplexity. At the same time, the point of the staff, or catheter, is an important guide; and it is to be remembered, that, in the generality of these cases, the membranous portion of the urethra behind the stricture is considerably dilated; a circumstance that ought to facilitate the detection of it. I believe the danger of the operation is overrated, though not its occasional difficulty and frequent failure.

Then another method consists in perforating the stricture with a stilet, adapted to a kind of catheter, or tube, out of which it is made to project after the instrument has been passed down to the stricture; an old practice, revived in modern times. In 1795 it was introduced again by Dr. Physic, of the United States, who found it very successful. Of late years it has been practised in England by Mr. Stafford and others. The objections, commonly urged against this method, are the risk of hemorrhage, and the chance of not making the perforation in the right direction. But, in obstinate cases, some risks must, I believe, be encountered; and this will happen whether we cut down to a cartilaginous stricture, perforate it through a cannula, or force a conical sound through it. Mr. Stafford's cases, many of which he has published, seem to prove, that the danger of bleeding has been exaggerated. With regard to the forcible passage of a conical sound through the stricture under urgent circumstances, I entertain an unfavorable opinion of the practice, and should be exceedingly reluctant to adopt so uncouth and unscientific a method, which must always be attended with great danger of producing a false passage.

[There is still another mode of treating permanent strictures, as recommended by Martial Dupierris in his excellent memoir upon permanent strictures of the the Urethra. The method is entitled the treatment of strictures by malaxation. The process is as follows :— a bougie is carried through the hard stricture, and the instrument is retained as long as the retention of water will permit ; and during this time, the hard band which forms the stricture is firmly pressed by the fingers, or by compress and bandage, around the bougie ; and in this way absorption or malaxation is produced. The same author is a strong advocate for dividing the stricture internally. He has invented some of the most ingenious instruments for the operation, that I have ever seen. After he has divided the hard band, he introduces and retains a catheter, and in a short time the stricture is resolved or removed by the absorbents.

My own experience leads me to apprehend very little danger from hemorrhage in the operation, and I am confident that there are many cases, in which it is the preferable mode of treatment.—Ed]

A false passage, as it is termed, is one caused by the laceration of the mucous membrane of the urethra by the forcible and unskil-

ful introduction of a bougie, sound, or catheter in a wrong direction. One consequence of such an injury is, that when an instrument is afterwards introduced, the end of it goes into the new passage, and cannot be made to act upon the stricture, or find its way into, the bladder. It scarcely admits of a doubt, I think, that a false passage is sometimes made, and heals up without any inconvenience, except a degree of hemorrhage at the time of the accident. Indeed, if we were to suspect the occurrence directly after it had happened, we should, perhaps, give the patient the best chance of the laceration healing up without trouble, by directing him to retain his water a few hours, and then to pass a catheter of larger size, and more curved, than that which produced the false passage, so that its beak might be kept close against the upper surface of the urethra. I suspect, with Sir Benjamin Brodie, that a false passage is generally made by letting the end of the instrument press too much against the lower surface of the membranous portion of the urethra; though the forcible propulsion of this part of the canal to one side or the other may lead to similar mischief. However, by endeavoring to make the beak of the catheter glide along the upper surface of the passage, we elude the lacuna magna, the sinus of the bulb, the orifices of the prostatic ducts and the sinus pocularis; all points in which the end of the instrument may be entangled, and all situated on the lower surface of the canal.

When a false passage had been produced in the treatment of a stricture, Mr. Hunter used to introduce a staff as far as it would go, which he calculated would generally be to the bottom of the new passage, and of course beyond the stricture. The end of the instrument was then felt for outwardly, and cut upon. The new passage was next slit open to its junction with the urethra, at a point beyond the stricture; a probe or director was now passed in the direction towards the glans penis, and necessarily towards the stricture. On its further introduction being impeded by the stricture itself, this was cut through; and the operation was finished by withdrawing the probe, and introducing two cannulæ, one through the wound, and the other through the urethra, until they came together, when they were held securely, a perforator pushed through them, so as to divide the obstruction, and then a bougie, after which the tubes were removed. The operation is now simplified by passing a catheter directly the structure is divided, which part of the operation can also be now more conveniently done with Mr. Stafford's instrument.

Sometimes *profuse hemorrhage follows the introduction of bougies or catheters;* in such cases, the effect of cold lotions on the perinæum, or, what is still better, the cold bath itself, may be tried. If the patient be a strong, robust subject, we may also have recourse to venesection. In one instance, under the care of Sir Astley Cooper, the hemorrhage was so profuse, that it was judged neces-

sary to divide the artery of the bulb; a measure which had the desired effect.

Fistulæ in Perinæo are ulcerated openings in the perinæum, which are not unfrequently formed in examples of bad strictures, as outlets for the urine, the urethra ulcerating behind the obstruction. When they are about to form, the patient generally experiences an increased difficulty of making water; perhaps he is attacked with shivering, followed by other febrile indisposition, and then considerable tenderness begins to be felt in the perinæum,—a hard tumor, with some degree of œdema, presenting itself in that part, or its vicinity. The skin next inflames, and a fluctuation is felt. The abscess bursts, or is opened, and fetid pus discharged, sometimes blended with urine from the first, and, in other instances, no urine coming out of the aperture till two or three days have elapsed. The discharge of pus then diminishes; but the urine flows out of the new passage in larger quantities, and whenever the patient makes water, a part of it escapes through the natural channel, and the rest through the orifice of the abscess. Sometimes instead of one, there are several external openings produced.

In consequence of the urine continuing to flow through the cavity of the abscess, the track of the purulent matter becomes lined with a texture closely resembling that of mucous membrane, and the adjoining parts assume a hard and callous consistence. Fistulæ of the same nature may form in the scrotum, in the groin, or even on the penis near the pubes. When the fistulæ in perinæo are established, the patient is no longer liable to attacks of retention of urine. Some time ago, I had a patient in the Queen's Bench Infirmary who was in a curious state; for, in consequence of the whole of his urine having passed for several years through fistulæ in the perinæum, all the urethra anterior to their communication with it appeared to have been completely obliterated.

In a few cases, urinary fistulæ form a communication between the rectum and the portion of the urethra behind the stricture; a complication, the possibility of which ought to be recollected. I may lay it down as a general principle, that abscesses in the perinæum, or near the prostate and neck of the bladder, should be opened early. The cure of fistulæ in perinæo must obviously depend upon that of the strictures themselves; for, in proportion as these give way, the urine resumes its natural course, and the fistulous openings heal. If they should not do so, however, we may pass a gum catheter into the bladder, and confine the patient for a few days to bed. Sometimes, however, when the communication with the urethra is unusually large; or when the urine flows too freely by the side of the urethra; or when the catheter excites a great deal of suppuration in the passage; the foregoing plan will not answer. Under these circumstances, let the patient be taught to pass the catheter himself, and let him for some time never make water without having

first introduced it, as advised by Sir Benjamin Brodie. We should also do another thing which he particularly recommends, namely, stimulate the bottom of the fistula with nitrate of silver, while we retard the healing of its orifice by touching it once a week, or once a fortnight, with the potassa fussa.

RETENTION OF URINE

Should not be confounded with *suppression*, which properly means an interruption of the secretion of that fluid, none being discharged, because little or none is formed by the kidneys. Examples of the latter disorder were commonly noticed in the late epidemic cholera.

In *retention*, the urine is poured into the bladder by the ureters, but, either owing to the want of power in the bladder, or to an obstruction in the urethra, it is not properly discharged. Of course, there is a distension of the bladder—very perceptible in the hypogastric region,—the swelling, indeed, often reaching as high as the navel; attended with a distinct fluctuation that can be felt through the parietes of the abdomen as well as within the rectum. The patient suffers great torture; there is a hot, dry skin; thirst, an accelerated pulse; and other marks of febrile disturbance.

The bladder often continues distended with urine, notwithstanding, the patient may void it at periods in a stream, and even pass, in the twenty-four hours, the quantity usually discharged by a person in health. But, then, he discharges merely the overflowings of the bladder, as it were; and though the water may dribble away, or even occasionally flow out in a stream, that receptacle is never truly emptied, but remains with an accumulation of urine. This is the *retention par regorgement*, as it is termed by French surgeons. In cases of this description, serious mistakes are apt to be made in practice. A certain quantity of urine is discharged from time to time; a retention is not suspected; and the patient, of course, does not receive the benefit of proper treatment. All surgeons, therefore, should remember well these retentions *par regorgement*, and, in doubtful cases, examine the hypogastric region, and introduce a catheter. This last proceeding can never do harm; it is fraught with no peril, not even with severity; and I can affirm, from repeated observation, that it will often be the means, and the only means, of saving the patient's life.

The division of retentions of urine into *complete* and *incomplete*, or *total* and *partial*, appears to me truly practical—a valuable and well-founded distinction, well calculated to put us upon our guard against taking a wrong view of particular cases. I believe, that if we examine the hypogastric region, and connect the fulness perceptible in that situation with other symptoms, we shall rarely be deceived, whether the patient discharge a part of his urine or not. If corpulency should conceal the hard circumscribed swelling of the

bladder, so manifest in thinner persons, we ought of course to follow the manifestly prudent rule, which I have laid down for doubtful cases, and immediately pass a catheter. In fat subjects, I would also recommend the introduction of a finger into the rectum, where we may plainly feel the prominence of the distended bladder, and also a fluctuation, if, while the finger is applied to the prominence within the rectum, we tap briskly on the hypogastric region with the fingers of the other hand. This method, I should say, is particularly useful when the bladder is so thickened and contracted, that it does not rise above the pubes.

I constantly inculcate the maxim of letting the treatment of diseases be always guided, as much as possible, by the consideration of their particular causes, the removal of which must of course be a principal object in view. Now, retention of urine may depend upon a variety of causes, the nature of which entirely influences the prognosis and treatment; nor is it possible to form any just opinions, with regard to the treatment of this urgent disorder, without a constant recollection of the different circumstances concerned in its production.

The general indications are, first, to bring about, if possible, the discharge of urine through the natural passage; which object is sometimes accomplished by means of the warm bath, fomentations applied to the hypogastric region and perinæum, bleeding, opium, hyoscyamus, &c., and sometimes by the removal of mechanical obstacles to the flow of urine; but still more frequently by the skilful use of catheters. 2dly, When all these means fail, it becomes necessary to have recourse to some operation by which an outlet is made for the urine.

CATHETERS.

Some are of course designed for the male urethra, and others for the meatus urinarius. Another general division of them is into *flexible* and *inflexible* ones. The former, or *elastic gum catheters*, as they are usually named, are now brought to great perfection, being made of many different sizes, to each of which, a number is assigned. Some of them are of such a construction, that they will retain their curvature permanently; while another advantage is their being composed of materials calculated to resist, for a long while, the warmth and moisture of the urethra. It is only the best sorts, however, that are superior in this respect. They are provided with stilets and wires, which give them the requisite degree of firmness, and the particular curvature needed at the period when they are about to be introduced into the urethra. Those employed by Sir Benjamin Brodie are furnished with firm iron stilets, and flat, broad handles like those of common sounds, by which means the surgeon acquires a greater command over the direction and management of the beak,

Elastic gum catheters are frequently the only means by which the lives of patients, laboring under retention of urine from different causes, can be saved; and they render this important service by accommodating themselves to the displaced and contracted state of the urethra, admitting of being passed through a very small channel. While those of diminutive diameter are frequently the most advantageous for strictures, the larger ones answer best for the retention of urine arising from disease of the prostate gland. Generally speaking, when other circumstances are not opposed to it, a large catheter is preferable to one of small size, as it distends the parietes of the urethra, and is much less likely to be obstructed by any of the irregularities, which the internal surface of the canal presents at different points of it.* Elastic gum catheters may be introduced either with or without the stilet, or, when partly introduced, their curvature may be suddenly increased by withdrawing the stilet at the same time that they are pushed further into the passage. All instruments about to be introduced into the urethra, should be smeared with sweat oil or lard.

Inflexible or *silver catheters* are introduced in the same way as a sound or staff, either with the convexity at first towards the pubes, succeeded by the *tour de maître*, or with the concavity of the instrument always upwards, that is to say, towards the pubes, or else with the handle kept in the first instance inclined towards the patient's left groin; a plan which Sir Benjamin Brodie follows, and which I often find advantageous. Whichever mode is followed, the catheter gets into the same position after its beak has reached the perinæum, and the *tour de maitre* has been practised in the first manner of proceeding. We have now to direct its beak through that point of the urethra encircled by the margin of the opening in the deep perineal fascia; and, as soon as this is cleared, we should bring the handle of the catheter gently forwards and downwards, by which manœuvre the beak will be made to ascend through the membraneous and prostatic portions of the urethra into the bladder. In this part of the operation, we should particularly aim at keeping the beak of the catheter against the upper surface of the urethra, so as to avoid the risk of making a false passage. If the instrument were forcibly and rudely pushed towards the bladder, without its handle being depressed at the proper moment, the canal would certainly be ruptured.

Sometimes the catheter is passed while the patient is standing with his back against a bedpost or the wall. If he be in bed, he should lie evenly, with his knees somewhat raised and separated. Mr. Morton's description of the mode of introducing the catheter

---

* See Th. Morton, on the Surgical Anatomy of the Perinæum, p. 62. 8 vo. Lond. 1838.

is perfectly correct. " The operator, standing upon the left side of the bed, takes hold of the penis with the thumb and fore finger of the left hand, and raises it gently, so as to efface the curve or angle, which the penis forms, where it bends down in front of the scrotum. Holding the catheter in his right hand, lightly poised between the thumb and two first fingers, the surgeon introduces its point into the orifice of the urethra, and continues to pass the instrument onwards, until the point reaches the bulb, which is about an inch below the arch of the pubes. During this time, the concavity of the catheter is directed towards the symphysis pubis, while the straight portion is held parallel with the front of the abdomen. The point of the catheter having reached the bulb, the position of its handle is now to be changed from the horizontal direction, in which it has hitherto been held until it has been brought into a perpendicular position, and thus forms a right angle with the axis of the patient's body. This movement of the handle of the catheter will cause its point to rise out of the sinus of the bulb, after which it may be safely pushed onwards through the opening in the triangular ligament, and thus enter the membranous portion of the canal. By gradually depressing at this time the handle of the catheter, a little more between the thighs of the patient, it will glide smoothly onwards through the remaining portion of the urethra into the bladder."*

The same well-informed surgeon delivers the following valuable remarks on this subject:—" The natural obstacles, which most frequently oppose themselves to the passage of the catheter are, first, the lacunæ of the urethra, and the sinus of the bulb; after which comes the opening in the triangular ligament. When these are passed, the anterior border of the prostate gland, the orifices of its ducts, and the sinus pocularis, may all serve to obstruct the introduction of a small catheter by entangling its point; and, lastly, the elevated ridge, which marks the commencement of the neck of the bladder. It will be observed, that all these natural obstacles to the easy introduction of a catheter are situated upon the inferior surface of the urethra, and therefore they will be best avoided by keeping the point of the catheter gently directed against its superior wall. The margins of the opening in the triangular ligament will not give any trouble, if the situation of the circular aperture that transmits the urethra is accurately understood: it is nearly one inch below the arch of the pubes, and equidistant from the descending branches of the same bones. When the point of the catheter is arrested in either the membranous or the prostatic portions of the urethra, it will be found of considerable advantage to introduce the left forefinger into the rectum, which will frequently enable the operator to distinguish the situation, as likewise the cause of the difficulty, and

---

* See Morton's Surgical Anatomy of the Perinæum, p. 62.

also to direct the instrument with greater certainty into the bladder." Mr. Morton very properly cautions surgeons against grasping the catheter too firmly, instead of holding it lightly, like a pen; and explains, that if the end of the catheter be kept *too strictly* against the upper side of the urethra, it will be stopped by the superior margin of the opening in the triangular ligament, or, if it pass that, by the edge of the prostate gland.

Women are much less subject than the male sex to retention of urine, the meatus urinarius being short and capacious; not liable to stricture; nor to those consequences, which originate in the other sex from disease of the prostate gland, and from abscesses situated near, and pressing upon, the urethra.* Neither does the inflammation, accompanying severe gonorrhœa in females, lead, as it frequently does in men, to retention of urine. Yet women are now and then afflicted with retention of urine, from causes very different from those which bring it on in the male sex. Polypi of the the uterus, or vagina, ovarial dropsy, cancer uteri, displacements of the womb, especially that termed retroversion, and inflammation about the neck of the bladder after parturition, are the usual causes of the disorder in women.

The catheter for females is shorter than that for the male subject, and has but a slight curve. It should be passed without subjecting the patient to exposure: we should hold the catheter in the right hand, and pass the left forefinger between the nymphæ, and on the smooth surface between them, about three quarters of an inch below the clitoris, we shall readily feel the papilla denoting the orifice of the meatus urinarius, into which we are to direct the instrument upwards with its concavity kept forwards. Here we have none of the difficulties which are met with in the male sex from the length and curvature of the passage, the resistance of the deep perineal fascia, the yielding of the membranous part of the urethra, the impediment formed by the prostate gland, the hitching of the end of a small catheter in the orifice of an enlarged prostatic duct, or in the sinus pocularis of the verumontanum, the stoppage of the beak of the instrument in the sinus of the bulb, or by spasm of muscles in the perinæum.

Men advanced in years are particularly liable to retention of urine. This is partly explained by their being remarkably subject to disease of the prostate gland, and partly by the bladder, after a certain period of life, losing some of its irritability and contractile power so that it no longer retains the capability of lessening its cavity beyond a certain point. Hence the expulsion of urine in old persons is never complete, a portion of it always remaining in the bladder after each evacuation. At length the infirmity increasing,

---

* I have known, however, great difficulty of voiding the urine, and severe pain, arise from an abscess of one of the lacunæ of the meatus urinarius.

the quantity of urine voided each time lessens; the desire to empty the bladder becomes more and more frequent; and, in the end, the urine only comes away by drops, or in a dribbling stream.

In this state the sufferings are not very great; the tumor, formed by the bladder above the pubes, is indolent, and, if compressed, a certain quantity of urine will sometimes flow out of the urethra. In short, this is a case of *incomplete* retention; frequently as much urine being discharged in the twenty-four hours as is natural, but the bladder is never emptied. However, the symptoms are generally less urgent than in other exanples; because this form of the complaint does not, like others, lead to a positive interruption or total suppression of the urinary secretion, nor to a rupture of the bladder.

The weakened state of the bladder from age can never be removed; but when there is a greater tendency than usual to an accumulation of water, the use of the catheter should never be omitted, as it will afford immediate relief to the patient's uneasiness, and also prevent that degree of distension, which would terminate in incurable disease and total paralysis of the bladder, if not in a rupture of it, and fatal effusion of urine.

Retention of urine often proceeds from injuries and diseases of the spine and pelvis, by which the bladder is rendered paralytic; cases remarkable, on account of the strongly ammoniacal quality of the urine soon produced under such circumstances, and the propensity in the coats of the bladder to become softened and ulcerated. In such cases, the treatment should consist in the regular use of the catheter, in cupping the injured part of the back, or bleeding the patient in the early stage of the case, followed up by purgatives and counter-irritation, as blisters, the moxa, or an issue. Fractures of the spine or pelvis, however, would call for particular treatment, one essential thing in which would be to keep the injured bones as quiet as possible.

Another *retention of urine, accompanied also by a paralytic state of the bladder*, does not depend upon any injury of the spine or pelvis, but altogether upon the detrusor urinæ muscle having suffered long and immoderate distention, in consequence of a previous accumulation of urine in the bladder from some other cause. Here, whatever benefit can be rendered, must be derived from the catheter, tonics, cold bathing, the exhibition of the tincture of cantharides, or the tinctura ferri sesquichloridi, and the application of blisters to to the region of the sacrum.

Retention of urine from inflammation in or near the urethra is often exemplified in severe gonorrhœa, and in acute inflammations about the prostate gland and lower portion of the rectum. In all probability, when some practitioners describe a retention of urine, as arising from spasm or irritation, they would be speaking more correctly if they were to refer the disorder principally to the effect of

inflammation somewhere about the urethra or the neck of the bladder.

When retention of urine proceeds from inflammation in the urethra or neighboring parts, we should first try the effect of soothing antiphlogistic treatment, antimonial purgative medicines, bleeding, leeches to the perinæum, the warm bath, fomentations on the hypogastric region, and the effect of hyosciamus or acetate of morphia. If these means prove unavailing, the use of the catheter is not to be deferred.

Retention of urine is sometimes caused by the pressure of collections of matter on the urethra. Here the first indication is to discharge the abscess, and draw off the urine. Afterwards, with the assistance of antiphlogistic treatment, hyosciamus, or opium, and the warm bath, or fomentations, the patient will soon be able to discharge his water himself. I once visited a case with Mr. Holt, which was attended with a complete and obstinate retention of urine, arising from the pressure of an extraordinary mass of coagulable lymph effused in the corpus spongiosum, about two inches from the orifice of the urethra. The original complaint was a virulent gonorrhœa, accompanied by chordee. Here bleeding, the warm bath, narcotics, the tinctura ferri sesqui-chloridi, and leeches to the perinæum, did not supersede the necessity for the catheter.

Another *retention* arises from *fungous* and *carcinomatous diseases of the bladder.* Cancer is sometimes propagated to the bladder from the rectum or uterus. Here the treatment can only be palliative, and the catheter is not to be neglected.

Among the varieties of *retention* is that *depending upon foreign bodies in the bladder,* whether hydatids, coagulated blood, worms, or calculi, which may obstruct the passage of urine from the bladder into the urethra, or through the latter tube. Here the cure depends upon the removal of the substances causing the obstruction. Worms, hydatids, and coagulated blood would require the bladder to be washed out with a syringe and catheter of the largest size. In cases of worms in the bladder, turpentine has great power in promoting their discharge; and, what is remarkable, gets into the bladder, in a few seconds after it is swallowed.* Calculi, either in the urethra or bladder, not above a certain size, may be removed with the urethral forceps, sometimes without an incision in this canal, sometimes with it.

In children, one kind of *retention* is *produced by the diminutive*

---

* Mr. Law, of Penrith, Cumberland, was kind enough to send me some specimens of what were supposed to be tæniæ, voided from the bladder of a young woman under his care; but if Mr Owen's report be correct, the patient must be guilty of deception, as the specimens, which I presented to the College of Surgeons, were found by him only to be imitations of tæniæ, made from the intestines of some small bird. From a kind of monomania, she seems to have introduced some thousands of pieces of these sham tæniæ into her bladder.

23*

size of the orifice of the prepuce, or a congenital phymosis, as it is termed. In such a case, the prepuce is sometimes distended by the urine into a large pouch, from which it escapes slowly and difficultly. Instances of urgent danger from such a cause are given by Petit.

In retention of urine from stricture in the urethra, a difference of opinion exists about the right principle of treatment. Many surgeons begin with an antiphlogistic soothing plan, and try the effect of the warm bath, bleeding, leeches, aperient medicines, or opium, given by the mouth or in clysters. This plan may be the best, if the retention is quite recent, and the patient is not in much agony. In the opposite case, it is proper to resort to the catheter at once. Thus, instead of the method adverted to, Sir Benjamin Brodie takes one of the smallest gum catheters, which has been kept for a considerable time on a curved iron wire, and which consequently will retain its curved form after the wire is withdrawn. He introduces it without the wire, and keeps the concavity of the catheter towards the pubes, elongating the penis at the same time. The instrument will then be likely to pass the stricture and enter the bladder, the urine to flow out in a fine stream, and the patient to be instantly relieved.

If this plan fail, we may try a small catgut bougie. We are to introduce it as far as we can, and then elongate the urethra by drawing the penis forwards, when the bougie will often pass. Certainly, as Sir Benjamin Brodie has justly observed, it is not always necessary that it should pass into the bladder; if it enter the stricture, that is sufficient,—we should then let it remain there, until a violent effort to make water occurs, when it is to be taken out, and the urine will frequently follow it.

If this expedient should not answer, we may take another small catgut bougie, and bend its point upwards before it is introduced, by which means we shall be enabled to keep its point against the upper surface of the urethra, and to avoid the lower, where the obstruction is mostly, if not always, the greatest.

When a catgut bougie will not succeed, a *silver* or an *elastic gum catheter*, mounted on a firm iron stilet, will sometimes pass. When the stricture is recent, the catheter should be of nearly the full size of the urethra; but, if the stricture is of long standing, the instrument should be considerably smaller. Sir Benjamin Brodie prefers one that is shorter and less curved than usual; and if it is made of silver, he advises the tube to be fixed in a wooden handle, which will enable us to direct its point more delicately and with greater effect. If we use an elastic gum catheter, the iron stilet should have a handle, like that of a common sound. The rules and advice, given by Sir Benjamin Brodie on these matters, appear to me particularly valuable. We are to pass the instrument as far as the obstruction, and then, having withdrawn it for about half an inch, we

are to pass it on again towards the bladder, keeping the point against the upper part of the urethra. No violence is to be employed; for, if we tear the urethra, we cannot succeed. I recommend steady and moderate pressure against the stricture, to be maintained for a little while, and then perhaps the obstruction will begin to relax or yield, and the instrument enter it. If a gum catheter has been used, we should leave it in the urethra for a day or two, which will have a great effect in curing the stricture. Even if we do not succeed in getting an instrument into the bladder, the pressure employed may still do good, by bringing about a relaxation or yielding of the stricture, and on the instrument being withdrawn, a stream of urine may follow it. Experience confirms the frequency of such occurrences, and, if they can be brought about, the patient is extricated from an urgent state of danger, as well as from the torture to which a retention of urine from this cause necessarily subjects him.

Now, supposing we were not able, in a case of complete retention of urine, to relieve the patient by the catheter, and he were strong and full of blood, he may, in the first instance, be bled, and put into the warm bath, and then the catheter tried again; or, what is still more applicable to all cases, an enema should be injected, composed of ʒj. of tincture of opium, and ʒij. of mucilage of starch, or gruel—not more, as it would not be retained. As soon as the influence of the opium begins to be felt, if the hypogastric region be kept well fomented, sometimes the urine will begin to flow and, at all events, there will now be a greater chance of success with the catheter.

If all the measures specified were to fail, and the bladder were to continue distended beyond a certain time, either that organ, or a portion of the urethra behind the obstruction in it would give way, and the urine be extravasated in the cellular tissue of the perinæum and scrotum. Thus either a rapid and fatal inflammation, involving the peritoneum, would be excited, or more or less extensive abscesses and gangrene of the cellular tissue of the scrotum, perinæum, and interior of the pelvis be the consequences. In such unfortunate cases, the urine does not gravitate to the thigh or nates, but spreads over the scrotum, penis, the groins, and even higher up towards the navel and loins. The reason why it does not pass towards the nates is, that it is stopped by the connection of the deep perineal fascia, with the superficial, and the rami of the ischium and ossa pubis. When the urethra gives way, there is generally at first a small induration in the perinæum, which is sometimes rapidly converted into a dark, livid, extensive, and quickly spreading tumor of the scrotum, groins, and parts in the perinæum. Nay, sometimes the effusion of urine ascends, as I have said, far above Poupart's ligament. Now, wherever the urine passes, it is sure to produce suppuration or gangrene, and sometimes the whole scrotum sloughs

away, leaving the testis hanging by the spermatic cords, totally des-
titute of their natural coverings. The only way of preventing such
evils,—I mean those of effusion of urine,—is to procure, in some
way or another, an outlet for the urine from the bladder previous to
its rupture, or that of the urethra.

In stricture, this may frequently be accomplished by making an
incision in the membranous portion of the urethra behind the
stricture, which part of the canal is generally dilated into a sort of
tumor, by being distended with urine, forced thus far by the
bladder.

In diseases of the prostate gland, attended with urgent circum-
stances, we must either convey the catheter into the bladder, through
the tumor, by a combination of skill and well-directed force, or
puncture the bladder above the pubes; which last proceeding, how-
ever, is rarely necessary. I had occasion, however, to adopt it in
one instance in University College Hospital, as will be mentioned
more particularly when the methods of puncturing the bladder are
described.

But, if urine be already effused, the surgeon must never forget to
make free and deep incisions for its escape; and, if possible, a ca-
theter should be introduced, so that the urine may have a ready
outlet, and no more of it pass into the cellular tissue.

INCONTINENCE OF URINE.

An inability to retain the urine in the bladder is of three kinds:
in one, the water continually dribbles away, without any inclination to
void it, or any sensation of its being voided. In other instances,
the patient can hold his urine in a certain degree; but the propensity
to evacuate it comes on so frequently, suddenly, and irresistibly,
that he is compelled to discharge it. The third kind of incontinence
only occurs when the patient is asleep.

The first case depends on a weakness, or total paralysis, of the
sphincter muscle of the bladder. As the neck of this organ is con-
stantly open, every drop of urine escapes into the urethra, immedi-
ately it has descended from the ureters, and does not lodge in the
bladder at all. Sometimes the weakness, or paralysis, of the
sphincter is quite a local disorder; but, most frequently, it is symp-
tomatic of some other affection. In the first case, it is often the
consequence of a difficult labor, in which the neck of the bladder
has been a long while compressed; or of the formation of fistulous
communications between the vagina and the bladder. Sometimes,
incontinence of urine depends on a malformation of the urinary pas-
sages, and exists from the time of birth. The complaint is often
an effect of apoplexy, injuries and diseases of the spine, &c.

It is not dangerous, though exceedingly annoying, in consequence

of its continually wetting the clothes, causing a disagreeable smell, and even excoriating the parts over which the urine flows.

When the complaint is local, tonics and astringents are indicated; and the principal remedies are, cold bathing, bark, blistering the sacrum or perinæum, the tinctura cantharidum, the shower-bath, electricity, and rubbing the spine and sacrum with stimulating liniments.

When incontinence of urine is merely the effect of another disorder, the latter claims the principal attention.

The second species of incontinence of urine is of a spasmodic nature, and commonly depends on some irritation operating on the bladder. Hence, the indication is to find out the irritation, and if possible to remove it. Hemorrhoidal complaints, suppressed menses, a stone in the bladder, a fistula in ano, &c., may cause the affection. When the particular irritation cannot be discovered, general soothing and antispasmodic remedies, such as bleeding, opium, the warm bath, fomentations, &c., should be prescribed. The uva ursi is sometimes useful, of which a scruple, or half a drachm, may be given three times a day.

This kind of incontinence of urine is frequently only a symptom of epilepsy, or hysteria. Sometimes it originates from pressure made upon the bladder; and hence, it may be a symptom of polypi of the uterus, a prolapsus of this viscus, or difficult parturition.[*]

The last case is that, in which the urine is involuntarily discharged in the night-time, when the patient is asleep. The infirmity is mostly met with in young boys and girls; and, for the most part, spontaneously goes off as they approach the adult state. They should avoid drinking any fluid just before going to bed, and empty the bladder before they go to sleep.

When, in adult persons the complaint does not yield to the above precautions, one fourth of a grain of the powder of cantharides, given with milk of almonds, every evening, has been known to be of service. The effect of exhibiting a grain of opium, or two grains of ipecacuanha, every night, a little before bedtime, may also be tried. The best apparatus for catching the urine, where no cure can be accomplished, which I have ever seen, consists of a long tube, made of elastic gum, or other flexible water-proof material, and capable of holding about a pint and a half of fluid. It causes little inconvenience,

---

[*] Retention of urine, from paralysis of the bladder, is a case attended with an involuntary dribbling away of this fluid, if the catheter be not properly employed, and is a disorder that has frequently been mistaken for an incontinence of urine. As soon as the bladder is distended to a certain degree, the urethra being unobstructed, the continued secretion from the kidneys, instead of causing the bladder to give way, passes off through the natural channel. The discharge of urine leads the unwary surgeon never to suspect the real nature of the disease; but if a catheter chance to be introduced, the quantity of urine drawn off immediately throws light upon the true character of the disorder.

and, as it is so narrow as to be concealed by the trowsers, it occasions no disfigurement.

There is a particular incontinence of urine, arising from the formation of a preternatural communication between the bladder and vagina. It is usually the consequence of a slough, and sometimes follows difficult labors. The continual dribbling of the urine through the opening, generally prevents it from healing; but by making the patient lie a good deal on her abdomen, the water is hindered from constantly escaping, and the aperture will sometimes heal. The fistulous opening may occasionally be made to heal up, by scarifying its edges, and keeping them afterwards in contact with the twisted suture; the patient being made to lie on her abdomen, as much as possible, for two or three days. In the worst cases which admit of any chance of relief, perhaps, the actual cautery, applied with great caution and moderation, is what ought to be employed. Many cases on record attest its frequent efficacy.

GONORRHŒA,

Or *Clap*, may be defined to be an inflammation of the mucous membrane of the urethra, attended with a discharge of puriform matter, which is frequently believed to be of a specific quality, and which is well known to possess infectious properties. In women, the discharge takes place from the mucous membrane of the vagina, labia, nymphæ, and clitoris, as well as from the lining of the meatus urinarius, and, according to M. Ricord, sometimes also from the lining of the uterus itself.

A gonorrhœa is found to begin at an earlier period after infection than a chancre, generally within a week or ten days. However, some individuals are attacked in two or three days; and others experience no inconvenience, perhaps, for two or three weeks. The earliest symptom is an itching at the orifice of the urethra, sometimes extending over the whole of the glans penis, which, with the mouth of that canal, has a fuller and redder appearance than usual. The glans being reddened and smoothed by distention, is sometimes compared to a ripe cherry. The natural secretion of the mucous membrane of the urethra first loses its viscid quality, and becomes thinner, but soon assumes a thicker consistence, turning white, yellow, or greenish, so as to have the common appearances of pus.

About the period when the discharge begins, heat and pain are experienced in the passage, more especially at the time of making water. The urine passes with a scalding sensation, and sometimes with considerable difficulty, either in a very diminished, broken stream, or merely by drops. Occasionally, the irritation is such, that a complete retention is brought on. In ordinary cases, the inflammation does not extend further along the urethra than an inch and a half,

or two inches, from the orifice—the *specific extent*, as it was termed by Mr. Hunter; but, in severe examples, the inflammation passes through the whole course of the urethra, and even affects the mucous membrane of the bladder. When this happens, the patient's sufferings are considerably aggravated, the pain about the hypogastric region, perinæum, and hips, being particularly distressing. In such cases, small indurations, consisting of enlarged glands, may often be felt in the course of the urethra, and sometimes these, and Cowper's glands inflame and suppurate.

In general a common clap increases, or, at all events, maintains itself in an unabated degree, for ten days or a fortnight: the discharge then frequently begins to lessen; the pain and scalding sensation in making water to subside; and in a month or six weeks, none of the symptoms may remain. In this manner, gonorrhœa may undergo a spontaneous cure. Sometimes, however, the acute symptoms go off, especially the pain and heat in making water; the quantity of discharge is also reduced; but the urethra, instead of resuming its natural healthy mucous secretion, pours out a thin, colorless, or light green matter, which may continue for a long time to ooze from the passage, constituting what is called a *gleet*.

It was one of the opinions of John Hunter, that a gleet is essentially different from a gonorrhœa, in not being infectious, and in consisting of a discharge composed of globules, blended with the mucous secretion of the part; while the matter of gonorrhœa is made up of globules blended with a serous fluid. Gonorrhœa in its worst forms is truly a distressing disorder. Not only may the inflammation run along the urethra to the bladder itself, as already described, but fibrine may be effused in the corpus spongiosum urethra, so that, when an erection takes place, one side of the penis being less yielding than the others, the part assumes a distorted or bent appearance, termed *chordee*, and attended with great suffering. The irritation, accompanying gonorrhœa, gives a tendency to erections; which are perhaps a source of far greater suffering, especially when combined with chordee, than the ardor urinæ, or even the irritable state of the bladder itself.

Frequently, the inflammation extends to the prepuce, which becomes thickened, swollen, and œdematous, so that the glans cannot be uncovered; a state termed *phimosis*.

Sometimes other parts are affected, as the glands in the groin, and the testicle, which are attacked by acute inflammation. Hence *sympathetic buboes*, and the inflammatory painful enlargement of the testicle, absurdly called *hernia humoralis*. I may say, that tenderness of the glands in the groin, and of the testicles, is an ordinary attendant on clap, so that even when one of the latter organs does not actually inflame, it is often in a state in which the use of a suspensory bandage affords much comfort.

Several curious and interesting questions necessarily present themselves to our notice in the consideration of gonorrhœa.

The first is, whether a clap depends upon a specific virus? All surgeons know that simple irritation of the mucous membrane of the urethra will increase the quantity, and alter the quality, of its natural secretion, or will change the mucous secretion into one of pus, so as to bring on a discharge. Some practitioners denominate a case of this description a *simple* or *benign gonorrhœa*, reserving the epithet *virulent* or *venereal* for the case which is conceived to depend upon a specific poison.

A discharge of matter from the urethra may result from any kind of irritation affecting it, as that of the employment of bougies, or of the application of various acrid and unhealthy secretions to its orifice in the act of coition. Such altered secretions may be formed from the mucous surfaces of the female parts of generation, totally unconnected with the poison of syphilis. What experienced surgeon does not know, that when female children are violated, a discharge generally follows, in consequence of the injury done to the parts, even though there may be no actual laceration of them? And hence the offender is frequently alleged to have been in a state of disease when he perpetrated the crime, though this inference is far from being warranted, merely because the female is attacked with a discharge.

But, besides these gonorrhœas from simple irritation, it is contended that there are others, arising from the influence of a specific poison, and, as some surgeons maintain, from the identical poison that is concerned in producing the venereal disease.

As we know not what the poison of gonorrhœa is, nor what the syphilitic poison itself is in a separate state; nor even whether there may not be, as Mr. Carmichael conceives, several varieties of venereal poison, the determination of this question is particularly difficult. If we were to judge of the nature of the venereal and gonorrhœal poisons by their general effects, and consequences of each of them, we should be led to the inference that they are certainly not identical. We see in gonorrhœa, generally speaking, only a discharge from the mucous membrane of the urethra without ulceration, going through a certain course, and usually terminating of itself in three, or four, or five weeks, without any eruption, sore throat, or affections of the bones. In syphilis we see a disease that begins with ulceration of another texture, generally lasts considerably longer than a clap, and is disposed to bring on a train of secondary symptoms, denoting its influence over the constitution at large, and often lasting for several months.

The arguments, in support of the identity of the two poisons, are of the following kind:—

1st. The supposed conveyance of the venereal disease from a

country where it was known to be prevalent, to a very distant one, in which it then commenced for the first time. Now, Mr. Hunter supposed that it could only have been conveyed, during a voyage of several months, in the form of gonorrhœa, as he thought that a chancre on the penis would in this time have destroyed the organ.

2d. The occurrence of secondary symptoms after gonorrhœa. Mr. Hunter mentions a gentleman who had gonorrhœa three times, which was treated without mercury: about two months after each infection, he had secondary symptoms, which consisted of ulcers in the throat, and blotches on the skin.

3d. The result of an inoculation with gonorrhœal matter, as performed by Mr. Hunter himself; followed by bubo, ulcer on the tonsils, and blotches on the skin; all ultimately cured by mercury.

If the particulars of this case be closely attended to, it will be perceived that Mr. Hunter deviates from some of his common doctrines about the venereal disease. In the first place, the primary sores, resulting from the inoculations, he says, *healed up without mercury*; then the sore throat, after having been made to heal by mercury, *broke out afresh*, and required this medicine again. Now, if Mr. Hunter had not been intent on proving the identity of the gonorrhœal and syphilitic poisons, he probably would not have admitted, that a primary sore *could have healed without mercury*, or that a secondary one, after being healed, *could have broken out again*, without a new stock of infection; for these are the principles which he insists upon in other parts of his work, though, inasmuch as they are not correct, they do not really affect the inference deduced from the present case by Mr. Hunter, except by proving that this great man had no settled rules for deciding whether a complaint was venereal or not.

4th. The frequent production of secondary symptoms, when gonorrhœa leads to ulceration at the orifice of, or within, the urethra. According to the researches of M. Ricord with the speculum vaginæ, and his experiments with inoculation, ulceration or a true chancre in the vagina, or other concealed situation, is a much more common accompaniment of gonorrhœa in women than usually supposed; and he declares that syphilis is only inoculable with the discharge, and secondary symptoms liable to follow gonorrhœa, when such ulceration exists. As this is asserted by him to be the fact, with respect to women, he deems the inference warrantable, that the same combination of a discharge from the male urethra with a true chancre in that passage, is also not uncommon, and will serve to account for the very opposite doctrines frequently entertained respecting the dependence of gonorrhœa and syphilis upon the same poison. The fossa navicularis in men is found by M. Ricord to be the part of the urethra in which a primary venereal ulcer is oftener found,

than any other portion of the urethra. Every experienced surgeon must have seen chancres occupying the very mouth of this canal.

If these facts be admitted, the plain inference from them is, not that poisons of gonorrhœa and syphilis are identical, but that the former is a decidedly different disease, and that, unless a chancre exist in the urethra, no discharge from this passage, no mere gonorrhœa, can be the source of secondary symptoms.

While some surgeons observe no particular differences between these comparatively rare secondary symptoms of gonorrhœa and the more frequent ones of syphilis, other practitioners have attempted minutely to define such differences, more especially Mr. Carmicheal, who, as we know, attributes to gonorrhæa papular eruptions, soreness of the fauces, pains in the larger joints, iritis, and inflammatory swellings over the superficial bones.

Sometimes, though the doctrine of gonorrhœa originating from any specific poison is rejected, it is conceived, that the disease may arise from the operation of any mechanical or chemical stimulus, and that, in this way, infectious matter may be generated, which will even propagate, under certain circumstances, syphilitic as well as gonorrhœal complaints. This view seems to combine two things, namely, a denial of the existence of a specific gonorrhœal virus, and the admission that gonorrhœa may, if it lead to ulceration, give rise to syphilis itself. It is sometimes imagined that this hypothesis rather coincides with many of the anomalies in the history of the veneral disease, especially the probability of the infinite multiplicity of its origin in every country where promiscuous sexual intercourse prevails to a great extent; and that it tends to reconcile some of those extraordinary relations, in which soldiers, having intercourse with the same woman in quick succession, severally contract gonorrhœa, chancre, or primary sores of various characters, all from the same source of infection, a subject already discussed in the observations on syphilis. For my own part, I feel less difficulty in adopting the conclusions to which M. Ricord has been brought by his experiments with inoculation and the speculum.

The arguments against the identity of the gonorrhœal and venereal poisons are:—

1st. The rarity of secondary symptoms after gonorrhœa, and the frequency of them after a primary venereal sore.

2d. The differences between the secondary symptoms of each disease, when such symptoms do occur.

3d. If the poison were the same in each case, why should the matter of gonorrhœa not commonly produce chancres on the glans and prepuce, with which parts it is so much and so long in contact?

4th. Why should it be a disease completely beyond the control and influence of mercury?

5th. If the application of the poison to a secreting or mucous

surface be specified in explanation of the difference of effect, why does the syphilitic poison frequently produce chancres on the secreting surface of the corona glandis, and, occasionally, notwithstanding all assertion to the contrary, within the urethra itself? and why should women ever have chancre at all, as the poison in them must generally be applied to a mucous surface?

It is not an uncommon belief, that the various degrees of severity, which a gonorrhœa assumes, indicate only the stage and extent of the inflammation, which, wherever the natural susceptibility exists, is excited by the introduction of any irritating secretion.

It may here be remarked, that all this is true: yet, we find that persons have chancres secreting pus close to the orifice of the urethra, without gonorrhœa being brought on by it. This is certainly another fact, and what does it tend to prove? Not, that the two diseases depend upon the same virus, but, merely that the matter of chancre will not commonly irritate the urethra of the individual having such a sore upon the penis. Neither does it generally cause ulceration and chancre on the neighboring part of the penis. So far as the fact proves any thing on this question, it is, I think, decidedly against the conclusion, that these two diseases depend upon the same kind of virus.

TREATMENT OF GONORRHŒA.

Notwithstanding our ample experience in the treatment of clap, we are quite ignorant of any specific remedy for it. The disease, however, though characterised by a disposition to go on for three or four weeks (whatever be done), is capable of being rendered much milder by proper treatment, and also of being prevented from continuing for many weeks, and even months, in the form of gleet. The benefit, therefore, which a patient with gonorrhœa may derive from surgery is not unimportant.

Gonorrhœa is manifestly attended with inflammation of the mucous membrane of the urethra, as indicated by the heat, pain, and swelling, and often by the effusion of fibrine in the corpus spongiosum, and other effects. Its first stage should, therefore, be treated on antiphlogistic principles; the penis should be covered with linen wet with cold water or the lead lotion;—or, as preferred by M. Ricord, the penis, scrotum, and perinæum may be fomented with a decoction of poppy-heads, to which, when the pain is severe, laudanum may be added. Or the same parts may be fomented with a decoction of the leaves of belladonna. The patient should abstain from violent exercise, wine, full diet, and high seasoned dishes, and take purgative medicine every second or third day. When the discharge is quite incipient, M. Ricord finds the application of from twenty to forty leeches on the perinæum, according to the strength of the patient, and the exhibition of copaiba, or cubebs,

the most successful mode of checking the complaint. But, he considers the latter medicines, after a gonorrhœa is completly developed, as inefficient, and calculated to render the digestive organs averse to their exhibition in a later stage, when they may become necessary.* The urine is to be rendered less stimulant, by giving mucilaginous diluent drink, as barley water, linseed tea, or a solution of gum arabic, with a proportion of nitrate of potash and a little syrup of poppies in it. The liquor potassæ may be given in doses of ten drops, repeated eight or ten times in the course of the day; for it has the effect of rendering the urine less irritating. Medicines, calculated to promote the secretions in general, to keep the bowels open and the skin moist, are generally approved of in the early stage; as mixtures containing the liquor ammon. acet. and nitrate of potash, or powders composed of the nitrate of potash, and a small proportion of pulv. ipec. comp. The decoct. hordei comp., with nitrate of potash, and tinct. hyosciami, is a medicine very commonly prescribed.

When, from the violence of the pain about the bladder and perinæum, there is reason to believe, that the inflammation extends further than usual, or when the urine cannot be voided without the utmost difficulty, or is even retained altogether, the treatment must be still more active; leeches should then invariably be applied to the perinæum, venesection practised, the slipper-bath employed, the bowels freely and repeatedly opened, and the patient kept under the moderate influence of opium, or hyosciamus, with the view of lessening the spasm at the neck of the bladder. If complete retention come on, a clyster, made with two or three ounces of the mucilage of starch and from forty to sixty minims of laudanum, should follow bleeding and the warm bath.

After the inflammatory stage is over, and the discharge and some uneasiness about the passage are the chief inconveniences left, the indication is to employ means calculated to bring the secretion of the mucous membrane into its natural state again. For this purpose, we may direct the patient to take certain medicines, which act upon the membrane of the urethra by altering the qualities of the urine, as he balsam of copaiba, or cubebs: twenty drops of the copaibat balsam may be taken three times a day, in a glass of milk or peppermint-water, or it may be made into draughts with the mucilage of gum arabic and a little of the aqua pimento. The cubebs, or Java pepper, is to be given in doses of ʒj. or ʒij. twice or thrice a day, or we may employ injections, which may either be of an astringent or stimulating kind. The former generally consists of a solution of the sulphate of zinc, or of the acetate of lead in water, or rose-water, in the proportion of ten or twelve grains to six ounces of the fluid. The stimulating injections usually contain the bichlo-

* Ph. Ricord, Maladies Vener. p. 707—712.

ride of mercury, or nitrate of silver. Two grains of the bichloride in six ounces of distilled water make a strong injection, and about five grains of the nitrate of silver; though this has been of late sometimes used in the proportion of ten grains to an ounce for the stoppage of the discharge in the chronic stage. When the first periods of a gonorrhœa are attended with pain, I think with M. Ricord, that, though astringent, stimulating, or other injections sometimes stop the discharge, they mostly fail, and do more harm than good. But, should the discharge commence without pain, or other sign of inflammation, the balsam of copaiba, or the powder of cubebs, might be tried, with the view of putting a sudden stop to the complaint; but all bleeding is unnecessary. With the same object, M. Ricord has a good opinion of the efficacy of drastic purges; and joins many other surgeons in commending the trial of nitrate of silver injections; but, instead of beginning with one composed of ten grains to each ounce of water, as recommended by some modern surgeons, he prefers commencing with only a quarter of a grain to that quantity of water, and augmenting the strength of the injection by degrees.* I believe with M. Ricord, and many others, that, so long as there is a good deal of inflammation, it is best not to employ any kind of injection.

The erections, which occur in the acute stage of gonorrhœa, are the cause of great suffering. The best means for their prevention, or relief, consist in not letting the patient have too many blankets on his bed, or be in too warm a chamber; in applying cold water, or evaporating lotions to the parts; and in prescribing the tinct. hyosciami, vinum colchici, or, what M. Ricord joins in the praise of, camphor combined with opium, and given either in the form of pills, or that of an enema.

For the stoppage of profuse bleeding from the urethra, caused by laceration of the urethra during an erection, the following plans are recommended:—ice-cold water to the penis, inner side of the thighs, perinæum, and hypogastric region; acidulated beverages, not however taken too freely; an elevated position of the pelvis; not heating the patient with too many coverings on his bed; a towel rolled up, and kept firmly pressed on the perinæum with a T bandage; or circular compression of the corpus spongiosum. If these means prove unavailing, M. Ricord introduces a catheter, so as to compress the urethra from within outwards for a day or two, combining with it sometimes very moderate external pressure.† When gonorrhœa is productive of dysury, leeches should be put on the perinæum, blood taken from the arm, the warm bath used, and, as M. Ricord directs, the extract of belladonna rubbed on the perinæum. But, when urgent retention of urine prevails, a catheter is

---

* Op. cit. p. 711.   † Op. cit. p. 716.

to be introduced, No. 8. or 10., which will pass more readily than a smaller. In France, the instrument is sometimes smeared with an ointment containing a proportion of the extract of belladonna*; a method which may be more deserving of attention than it has yet been deemed in this country.

TREATMENT OF GLEET.

We may try injections of bichloride of mercury, or nitrate of silver, or the internal exhibition of balsamum copaibæ, cubebs, the tinct. ferri sesqui-chloridi, or tinct. of cantharides, in doses of ten or fifteen drops thrice a day; and in particular obstinate cases, the cold bath, sea-bathing, rough horse exercise, a blister under the urethra, bark, sulphate of quinine, and steel medicines.

Many gleets cannot be cured by any of the preceding measures, because the disease may not be simply a wrong action of the secreting vessels of the urethra, but dependent upon other diseases of that canal, or parts connected with it, as is exemplified in stricture and disease of the prostate gland. Hence, when a person applies to me for a gleet, and says that he has had it a long time, I generally make it a rule to pass a bougie, in order to ascertain whether there is any other disease of the passage.

[IRRITABLE URETHRA.

There is another subject pertaining to the urethra, which Mr. Cooper seems to have passed over, and which is one of very considerable moment; I refer to the *irritable urethra*. This disease is met with generally in young subjects, though I have seen it in men who were forty. The most common *cause* of the disease is self-pollution, though sometimes too much venereal indulgence gives rise to it. One of the most indomitable cases I have ever met with, was in a gentleman aged about forty, who possessed a robust constitution, and who from early life, had been excessive in his indulgence with women. He was married and had several children. When he consulted me, he could not obtain an erection, the semen flowed involuntarily, and was found commingled with the urine.

This sad disease occurs most often in young men of sedentary habits, of the sanguineo-nervous temperament, and of correct moral training; who, while they shudder at the idea of debauchery, frequently fall into the sad habit of Onanism, and thus induce the disease of which we are speaking. A *stricture*, situated anterior to the caput gallinaginis, is another cause of irritation in the prostatic portion of the urethra.

The *symptoms* are frequent involuntary emissions, while in a restless dreamy sleep, or they may occur during the day while the patient is walking, or while at stool.

---

* Ricord, Mal. Vener, p. 718.

The bowels are usually constipated. Lallemand cites one case in which the patient had no alvine dejection for *forty days*. The genitals are soft, flabby and small, often emitting either a seminal or garlic like odor; the testicles are often small and at times extremely sensitive. The appetite is capacious, the digestion imperfect, and the secretions of the alimentary canal and its collateral viscera are much diminished; hence the severe constipation. The renal discharge varies much in quantity and quality. Often, after a seminal discharge, the kidneys secrete very profusely, a pale, limpid fluid, accompanied by a dull oppressive pain in the loins. The circulatory apparatus is often far from a normal condition; the pulse is too rapid, small and feeble; the patient is greatly annoyed by palpitation of the heart, the extremities are cool, the capillary circulation is feeble, on which account the surface is livid, and covered with a cold clammy sweat.

The respiration is often hurried and irregular. The principal devastation is manifested in the nervous system. The patient complains of great bodily weakness, the limbs totter, and the hands tremble; the mind, once manly and full of high promise, becomes impotent, and shrinks from every effort; the poor victim avoids society, loves solitude, and the companionship of his own wretched and polluted musings, he dreads the approach of every human being, and never ventures to look any one full in the face. The downcast look, the shamefacedness and the dark gloom which overhangs the countenance, the tremulous lip, and the weeping eye, are unerring exponents of the frightful malady which has ruined mind and body, and not unfrequently epilepsy or insanity follow in the result.

The most unequivocal symptom of the disease, is discovered on the introduction of a metallic bougie, for when the point of the instrument reaches the prostatic portion of the urethra, the pain is often intolerable, and the spasmodic contraction of the surrounding muscles, renders the passage of the bougie impossible, until after the administration of a large anodyne.

The pathological anatomy in this disease, consists in a soft, thickened, and vascular state, of the prostatic portion of the urethra; the caput gallinaginis is enlarged, the ductus ejaculatorii patulous, often ragged or fissured for two or three lines, and the diameter of these tubes sometimes attains the enormous size of a crowquill. The vasa deferentia in severe cases are enlarged throughout, and involved in the disease. The epididymi are either enlarged and tender, or soft, and the didymi are atrophied. The prostate gland is hypertrophied, and often very sensitive. The vesiculæ seminales are filled with a morbid secretion, which is either mucus, pus, or a concrete tuberculous like matter. The urinary apparatus is often deeply involved in the irritation. Sometimes the mucous membrane of the bladder secretes a transparent, and sometimes an opaque viscid mucus, which is liable in such cases to be confounded with the watery semen. The ureters and kidneys share largely in the morbid sympathy; the latter are at times found hypertrophied, or they are atrophied, or they are filled with small abscesses. When the genital organs are feeble, and inclined to be irritable, there is often a copious secretion of urine

after the emission, because of the irritation communicated to the kid-
neys, from the ductus ejaculatorii and cervix resicæ ; similar to what
we see happen in cholera morbus, when some crude substance irritates
the ductus communis choledocus.

Effusions are often produced in the great cavities : the brain is
softened, or becomes apoplectic, and the vertebral column becomes
diseased.

The *diagnosis* is easy, when the investigation is thorough, especial-
ly if the bougie is introduced.

The *prognosis*, when the disease has not too far invaded the gene-
ral system, and there is no positive disorganization, is rather favora-
ble : but when disorganization has taken place, then we are to expect
impotency both of body and mind. The patient suffers from all
kinds of symptoms, and at length becomes a confirmed lunatic or an
idiot.

The *treatment* in these cases of irritable urethra is such as will
tend to remove the exciting causes and to invigorate the general sys-
tem. The patient should be compelled to desist from his solitary habits,
and made to mingle in society. A sedentary mode of life, should be
exchanged for one which requires labor and muscular exertion. Ev-
ery thing which tends to inflame the imagination must be avoided.
The patient must sleep in a cool room, on a hard bed, have but few
clothes over the genital organs, while the lower extremities as well as
the upper must be kept warm. He must bathe the genitals and loins
in cold water, night and morning, and the best mode of application
is by the shower bath, or douche, after which active friction should
be employed. Cold water injected into the rectum is also serviceable.

The diet should be strictly vegetable in most cases, and the patient
must not be permitted to eat after three or four P. M., in order that
the stomach may be quiet after going to bed, and that the rest may be
undisturbed by dreams. There is a tendency to constipation in these
cases, which must be overcome by the use of mild laxatives

As a *tonic*, I have never found any preparation so efficient, as the
muriated tincture of iron. Instead of the above, I have often found
much advantage from the use of the extract of nux vomica. Sul-
phate of iron and aloes made into a pill, and given four times in twen-
ty-four hours.

I attach much weight to the local treatment : this consists in the
use of a metallic bougie, every other day, until the urethra becomes
somewhat tolerant of its presence, and then in carrying the solid ni-
trate of silver, into the prostatic portion of the urethra, by means of
a *porte au caustigue :* it should not be allowed to remain longer, than
from half a minute to a minute. There is considerable pain for a
time, and ardor urinæ when the patient passes his water, but these
symptoms soon subside, the emissions cease, and he begins to recover
his strength of body and his spirits.

It is often necessary to repeat the operation three or four times, and
I have met with cases, in which the caustic has availed nothing,
though these were not, properly speaking, cases of irritable urethra,
for there was little or no pain when the bougie was introduced.

When the presence of the bougie in the urethra causes pain, I regard the case as a good one for the caustic.

The mucous membrane of the diseased part of the urethra, is at times thickened and fungous, and is easily torn by the spoon of the porte au caustigue. Much caution is therefore necessary, lest we inflict a severe injury upon the ends of the ductus ejaculatorii. In order to avoid such an occurrence, I have been obliged in these cases to use a No. 9. catheter, with a small platina syringe so adapted to it, as to make a porte au caustigue, for the application of the *solution* of the nitrate of silver, to the irritable part of the urethra; and have found it entirely safe and very successful.

If strictures be the cause of the irritation, remove them. When all the above means fail in producing a cure, I have advised the patients to try the life of a sailor, for a time; and when the advice has been followed, I have known them to be perfectly cured. Sailors are a class of men, who rarely suffer from this disease.—ED.]

CHORDEE

Takes place when the inflammation is not confined merely to the surface of the urethra and its glands, but affects the corpus spongiosum: in this circumstance, an extravasation of fibrine occurs in that texture, which becomes incapable of yielding in the same degree as the corpora cavernosa. Hence, during erections, there is a curvature of the penis—it is bent, as it were, with the concavity mostly at the lower side of that organ. The patient may suffer severely from erections, conjoined with the state of the penis termed chordee; for the irritation of gonorrhœa keeps up a determination of blood to the part, and it is difficult altogether to prevent them.

When much inflammation is present, we may bleed the patient from the arm, and, in all cases, apply leeches, cold lotions, or use cold bread-and-water poultices, with which may be blended the extract of belladonna.

The bowels are to be kept open, and the tincture of hyosciamus, or what is still more efficient, the vinum colchici, the acetate of morphia, or some other preparation of opium, administered, with the view of lessening the disposition to erections.

After the inflammation has subsided, the remaining hardness may be dispersed by frictions with ointment of hydriodate of potassium, or camphorated mercurial ointment.

SYMPATHETIC BUBO,

One of the occasional consequences of gonorrhœa, arises from mere irritation, and not from the absorption of any virulent matter. It is a simple inflammation of one or more of the inguinal glands, much less frequently advancing to suppuration than a venereal bubo.

Treatment.—Antiphlogistic, with cold evaporating lotions, or fomentations and poultices, leeches, aperient medicines, and quietude.

INFLAMMATION EXTENDING TO THE MUCOUS MEMBRANE OF THE BLADDER

Is another occasional effect of severe claps; it is attended with extreme suffering and annoyance. In this state, the bladder is so irritable, that it cannot contain the smallest quantity of urine, without the patient being put to intolerable pain; and when this affection is joined, as it frequently is, with a difficulty of discharging that fluid, and even with retention, the patient's agony may well be conceived. This state of the bladder demands prompt and vigorous measures: venesection, brisk purgatives, leeches to the hypogastric region and perinæum, the warm slipper-bath, fomentations, and draughts of the camphor mixture, with ten minims of the tinct. of opium and fifteen of that of henbane, every three or four hours; or an injection of the mucilage of starch with forty drops of opium into the rectum. The uva ursi is another medicine frequently prescribed in these cases, in the quantity of ℈j. or ℥ss. every six hours.

PHIMOSIS

Is either a congenital smallness of the opening of the prepuce; or else an accidental narrowness of the same orfice preventing the glans from being uncovered, and arising from any circumstance that produces a swelling of the prepuce whether inflammation, or an infiltration of the cellular tissue of the part with urine, or a serous fluid. It may arise from simple excoriations caused by the confinement and acrid quality of the sebaceous matter secreted round the corona glandis; primary venereal sores, particularly those which are formed on the inner surface of the prepuce, or which take place in clusters near its orifice. Phimosis is also sometimes induced by sores on the glans, especially such as are on or near the corona glandis, or on one side of the frænum. Occasionally, the pressure of warts against the prepuce will bring on phimosis. Sometimes the inflammation of the prepuce partakes of the erysipelatous character, and, whether it be of this kind or of the phlegmonous, the part frequently has an œdematous or anasarcous appearance behind the glans. When chancres occur, phimosis sometimes leads to serious evils; for the glans, being then situated between the sores and the orifice of the prepuce, the pus may be prevented from escaping. The result is an accumulation of matter round the corona glandis: ulceration begins within the prepuce; makes its way through it; and the glans protruding through the new opening, the whole prepuce seems thrown in the opposite direction. In certain instances, the swelling and thickening of the prepuce cause such

compression of ulcers on the glans, that unless a timely division of the prepuce be made, the whole of the glans is destroyed by sloughing.

Sometimes, phimosis produces obstruction of the passage of the urine through the orifice of the prepuce, and this fluid may then insinuate itself into the cellular tissue of the part; while in other examples, the retention may lead to ulceration of the urethra, and extravasation of urine around it.

Phimosis is not then itself essentially a venereal complaint: for it may arise from any kind of irritation producing inflammation of the prepuce, whether a gonorrhœa, a chancre, simple excoriations, the pressure and irritation of warts, or an accidental injury of the part. When it arises from a true venereal sore, it is itself only an example of the common inflammation usually produced in the vicinity of the specific disease.

The phymosis, from simple excoriation, and from the irritation of acrid secretions lodged under the prepuce, requires that tepid water, or the diluted liquor plumbi acetatis, should be frequently injected between the prepuce and the glans, so as to keep the parts clean. The penis may also be covered with linen wet with the lotion, the patient be kept in bed, or, at all events, from walking about, and purgative medicines and a low diet prescribed. When the inflammation is more severe, leeches or sacrifications will be useful, and the bleeding should be promoted by bathing the penis in warm water.

The phimosis, originating from severe gonorrhœas, chancres, or other sores, may require, in addition to local and even general bleeding, warm emollient poultices, or the steam of hot water. The sores are to be kept clean by freely throwing between the glans and the prepuce a weak solution of the sulphate of zinc, the black wash, or a lotion composed of two grains of the bichloride of mercury, ɒj. of the extract of opium, and six ounces of distilled water; or, when the inflammation is considerable, we may simply inject under the prepuce a tepid solution of gum arabic, with which the extract of opium is blended, in the proportion of ten grains to six ounces.

When a chancre is complicated with violent inflammation of the prepuce and phimosis, I believe, that the best practice is to suspend the use of mercury, and direct our endeavors to the reduction of the swelling and inflammation of the part. When these effects subside, mercury may be more advantageously continued.

The following are the circumstances, which, in cases of phimosis, sometimes render the division of the prepuce necessary:—

1st. An accumulation of matter under the prepuce secreted by sores in that situation, and not admitting of being readily washed out by means of a syringe. Here, if we neglect to divide the prepuce, an ulcerative process takes place upon its inner suface, and forms an opening through which the glans will protrude with a

very great degree of deformity. But this is not the only evil; for the chancres, under these circumstances, always continue to enlarge, and sometimes the glans and prepuce both become involved in gangrenous mischief.

If the glans had already protruded through an ulcerated opening in the side of the prepuce, the best plan would be to put a director from the natural opening through the new one, and divide the intervening portion of skin. In order to stop the progress of ulceration from within, and to prevent the protrusion of the glans, Mr. Hunter did not divide the prepuce completely, but merely punctured it, so as to let out the matter, as he would have done in any other common abscess.

In cases of permanent phimosis, combined with chancre, M. Ricord concurs with such practitioners as recommend the operation to be deferred, unless there is an urgency for it, until the chancres are healed, and thus all risk of the wound becoming inoculated will be avoided. If circumcision, which he prefers, be performed, while a chancre is present, he advises the sore to be taken away if possible, together with the portion of the prepuce; a method, which I have sometimes followed. But, if the chancre be left, M. Ricord immediately rubs it with caustic.

2d. Sometimes we meet with cases in which the compression of the swollen prepuce acts injuriously upon sores of the glans; and when there is reason to suppose that this cause is likely seriously to retard their cure, and even bring on sloughing, we are justified in dividing the prepuce.

3d. Phimosis, arising from the puckered and contracted state of the orifice of the prepuce after chancres are healed.

4th. Phimosis from the pressure and irritation of large warty excrescences.

5th. Examples of congenital phimosis producing impediments to the discharge of urine in infants, or even leading to the formation of calculous substances under the foreskin; and, in adults, creating an obstacle to sexual intercourse, and, in old persons, causing a predisposition to cancer of the organ.

There are several methods of operating. One consists in passing a director under the middle of the upper part of the prepuce as far as the corona glandis, and then, with a pointed curved bistoury, slitting the prepuce up to the point to which the director extends. We push the bistoury with its back in the groove of the director gently along this instrument, until the point reaches nearly to the corona glandis, when by raising the point and bringing the edge towards us, the division is made in an instant.

2d. Instead of this mode of dividing the prepuce, Cloquet and Wallace prefer making an incision, parallel to the fraenum, at the under part of the prepuce; because the line of the incision thus formed, is found to be, as soon as the prepuce is drawn backwards,

transverse in place of oblique, or parallel to the axis of the penis, and those angular flaps of skin are avoided, which cause great deformity when the operation is performed at the upper part of the prepuce. This plan I sometimes adopt. M. Ricord objects to it, as leaving a deformity very similar to that of hypospadias.

3d. A third method consists in the performance of circumcision: the prepuce is drawn forward, and taken hold of with a pair of forceps; as much of the extremity of it being left out of their grasp as needs removal: with one stroke of a common scalpel, guided along the forceps, as a pencil is along a ruler, a complete circle of the prepuce is cut away. In applying the forceps, as the upper part of the prepuce is quite unconnected to the glans, and longer than the lower portion, which is also united to the frænum, of course, a more considerable piece of the prepuce above should be left in front of the blades of the instrument than below.

After circumcision has been performed, the inner membrane of the prepuce and the outer skin are seen with their edges more or less separated from one another. If the inner membrane should still seem tight, it is to be slit up, or cut with scissors. Then, in order to keep the edges of the outer and inner skin of the prepuce together, a small suture may be passed through them. If the artery of the frænum bleed copiously, it must be tied, or twisted. For the prevention of inflammation and erection, cold water is to be applied, and camphor and opium, or the acetic extract, or the tincture, of colchicum prescribed.

PARAPHIMOSIS

Is the case, in which the prepuce is drawn behind the glans penis, and cannot be brought forward again. If the opening in the prepuce be narrow, as is often the case when the part is in an inflamed state, it will, when drawn behind the glans, produce such a constriction of the penis, as is not only followed by considerable swelling of the glans, but by the greatest difficulty, or even impossibility, of getting the glans back again through the narrow part of the prepuce. The glans is uncovered and of a livid color, its corona being overlapped by a tumid ring, formed by the œdematous lining of the prepuce. Behind this tumid circle is the seat of stricture or compression, produced by the contracted orifice of the prepuce. The extent of the swelling backwards is various in different instances. Neglected cases sometimes terminate in sloughing either of the glans, or the prepuce, or both parts together.

From what has been said, we may readily understand why a phimosis should frequently change into a paraphimosis, when the prepuce is imprudently drawn too far back.

In the treatment, if the case be recent, the inflammation considerable, and the patient a strong subject, venesection should be

practised.   The indication is to reduce the glans to as small a size as we can, by the application of cold lotions, or snow, or ice-water, and then compressing it equally, and unremittingly, for a few minutes, between the ends of the fingers and thumbs of both hands; and when we have pressed as much blood out of it as is practicable, and reduced it to the smallest size, we are then to press it back with the thumbs through the constriction of the prepuce, while the fingers are used at the same time for bringing the prepuce forwards over the glans.

When the attempt does not succeed, we may have recourse to leeches, purgatives, punctures in the anasarcous part of the swelling, and cold applications; but if we cannot succeed, notwithstanding these means and the manual proceedings which I have described, and the constriction be such as to threaten to produce sloughing, the portion of the prepuce forming the constriction must be divided with a sharp-pointed narrow bistoury.   The operator will always find the stricture behind the corona glandis, and separated from it by a tumid ring, consisting of the œdematous lining of the prepuce.   It is therefore in a kind of nepression, or groove.   Into this, the point of the knife is to be passed, deeply enough to go under the stricture, which may then be divided by cutting upwards. No preliminary incision is necessary.

Even when the stricture has been cut, the adhesive inflammation may prevent us from immediately bringing the prepuce forwards; but as the constriction has been removed, no sooner does the inflammation abate, than the parts resume their natural state.

DISEASES OF THE ANUS AND RECTUM.

ABSCESSES.——FISTULA IN ANO.

This last term is applied to almost every abscess which breaks in the vicinity of the anus; but very improperly; for, the idea of there being a fistula naturally leads to the adoption of measures totally different from those usually required for the cure of abscesses in general.   Sometimes, the complaint makes its attack in the form of phlegmonous inflammation, attended with a frequent, full pulse, and heat and dryness of the skin.   The formation of matter is often preceded by a fit of shivering.   A part of the buttock near the anus is considerably swelled, and presents a large circumscribed hardness, the middle of which soon becomes very red, and matter forms in its centre.   On other occasions, suppuration is preceded by erysipelatous inflammation, without any of the circumscribed

hardness which characterises the foregoing tumor. The redness spreads more extensively; the disease is more superficial; the quantity of matter small; and the cellular tissue sloughy to a considerable extent. Sometimes the complaint begins somewhat like a carbuncle. The skin is of a dusky red, or purple color, and although harder than in the natural state, not nearly so tense as in phlegmonous or erysipelatous inflammation. At first, the pulse is full an hard; but, if no relief be obtained, it soon becomes unequal, low, and faltering; and the strength and spirits are greatly dejected. The matter, formed under the skin, is small in quantity, and bad in quality, and the cellular tissue is deeply gangrenous. This species of the disease affects persons, whose habit is either naturally bad, or has been rendered so by intemperance.

These different affections often influence parts in the neighborhood of the disease. Hence retention of urine, strangury, prolapsus ani, tenesmus, piles, diarrhœa, or obstinate costiveness.

Sometimes the abscess begins as an induration of the skin near the anus; but without pain, and alteration of color; the hardness gradually softening and suppurating.

The matter may either point in the nates, at a distance from the anus; or near the latter part; or in the perinæum. The matter may escape from one opening, or from several. Sometimes there is not only an external aperture, but another internal one, communicating with the cavity of the intestine. In other instances, there is only one external or internal opening.

The matter may be formed at a considerable distance from the rectum, which is not even laid bare by it; in other cases, it is laid bare, but not perforated ; sometimes it is both denuded and pierced.

Many abscesses about the anus are connected with a bad state of the health. When quite local diseases, they generally arise from obstinate costiveness, and the irritation of the mucous membrane and cellular tissue of the rectum by the passage of indurated fæces. Individuals, who have long suffered from piles, are particularly liable to abscesses near the extremity of the rectum. Severe diarrhœa, accompanied with tenesmus and great determination of blood to the rectum, has also been known to bring on the complaint. Sir Astley Cooper is of opinion, that the most common cause is disease of the liver, which, preventing the free return of blood from the intestines, and influencing their secretions, leads to inflammation near the rectum.* In a few instances, abscesses at the side of the rectum appeared to have arisen from the penetration of the mucous membrane, and sphincter muscles, by fishbones, or other irritating extraneous substance in the bowel, one or two interesting examples of which are recorded by Sir Benjamin Brodie.

---

* Lectures, vol. ii. pp. 327, 328.

When the inflammation is phlegmonous, Pott advocates the doctrine, that the thinner the skin is suffered to become, before the abscess is opened, the better; but the generality of modern surgeons make it a rule to open every abscess near the rectum as soon as a fluctuation can be felt. This affords the best chance of preventing a fistula and sinuses extending far up. If the patient be of a full, sanguine habit, venesection, leeches, and mild purgatives, are proper in the early stage. The confectio sennæ with sulphur is one of the most eligible aperient medicines. An emollient poultice is the best application; and if the pain be severe, leeches and fomentations should be employed.

When the attack is of an erysipelatous kind, and there is a sloughy state of the cellular tissue, the sooner the part is opened the better. If we wait for the matter to point, we shall wait for what will not happen, at least not till after a considerable length of time, during which the disease will extend itself, and the cavity of the abscess be greatly increased.

When the fistula in ano commences with that kind of inflammation which a carbuncle exhibits, calomel, with opium, and mild aperient medicines, may be prescribed in the early stage; but the patient will not bear much depletion; and very soon tonics, with ammonia, or wine, will be required. The part should be opened early by a very free incision.

All suppurations in the vicinity of the anus do not necessarily interest the rectum; sometimes the matter is so distant from the intestine, that the surgeon has no more to do with this part than if it did not exist, and the abscess is to be treated upon general principles. Under simple treatment, the necessity of meddling with the rectum will often be removed. But it more frequently happens, that the intestine, although not pierced by the matter, has yet been so denuded, that the fistula will not heal, without laying the cavity of the abscess and that of the intestine into one. The difficulty of healing many abscesses near the rectum depends upon their being influenced by the action of the sphincter and levator ani muscles, which have a constant tendency to prevent the union of the granulations and coalescence of the sinus.

The operation consists in dividing the rectum, from the top of the hollow, in which the matter is lodged, down to the anus. Thus the fistula is converted into an open wound. The course and extent of the fistula is to be first ascertained. The patient may kneel on his bed, and at the same time lean forwards on his elbows, while the knees are kept close together; or he may get up, lean forwards on the back of a chair, and place his knees together. The forefinger of the most convenient hand, according to the side on which the fistula is situated, having been oiled and passed into the rectum, the surgeon introduces a narrow curved probe-pointed bistoury into the fistula, with its edge turned towards the rectum, until it has tra-

versed the fistula, and the probe-point is felt pressing against the extremity of the finger within the bowel. Then, by making a little pressure with the knife, held in a particular manner, the rectum will be pierced, and the probe-point having come in contact with the end of the finger, the latter is steadily withdrawn; and as the knife rests upon and is made to follow it, the edge divides all the parts intervening between it and the anus, including the external sphincter. When a silver director is bent, it will sometimes pass through the whole track of the fistula into the rectum: then the division of all the parts, interposed between it and the anus, should be performed under the guidance of this instrument. Or the director may be employed when the course of the fistula is tortuous. Then the director, if used, is to be withdrawn, and the operation is to be completed, by bringing the knife out, with its point applied to the finger, within the intestine. In this manner, all that is between the edge of the knife and the anus must obviously be divided. The sphincter muscle being included in the cut, not only is there a free and ready escape of the matter, but the action of the muscle which creates such a disturbance of the part, and prevents its heal ing, is for a time suspended.

Immediately after the operation, a soft dossil of fine lint should be introduced, from the rectum, between the lips of the incision. This first dressing should remain till loosened by suppuration. Afterwards, lint dipped in sweet oil or tepid water, is one of the best applications. A T bandage is usually employed.

We have now to consider fistulæ in ano, in the state, in which they are after having spontaneously burst.

When the matter has made its escape only through an external opening, the case is termed a *blind external fistula*. Sir Astley Cooper has several times known a fistula form on each side of the anus, and communicate round the rectum. He examined the body of a man, who died of a discharge from a fistulous opening in the groin, and who had a fistula in ano: the fistula passed under Poupart's ligament, took the course of the vas deferens, and descended into the fistula in ano. Sometimes the fistula only just reaches the spincter, and is extremely small, appearing at first merely as a suppuration of one of the follicles of the anus. Sometimes it reaches four inches up the side of the rectum.* When there is an opening in the intestine, and none in the skin, the fistula is called a *blind internal fistula*. Fistulæ, having an opening both in the skin and gut, are termed *complete*. The first and last cases are the most common. A probe is to be introduced to ascertain their nature, and the operation, already described, is the proper one for obtaining a cure. When there are several openings, and correspond-

---

* Sir Astley Cooper's Lectures, vol. ii. pp. 326, 327.

25*

ing sinuses, they are all to be divided with a curved bistoury, so as to make one cavity of the whole.

In cases of *blind internal fistulæ*, if the bursting and discharge of the matter should not produce a cure, which they sometimes do, though very seldom, an external opening is to be made, and then the same operation, as has been already described for other cases, is to be put in execution. The place for the opening is always sufficiently denoted by the induration.

Sometimes the health will require to be improved before a cure can be accomplished, and many patients, who cannot recover in hospitals, do so on removing into a better air. The medical treatment of fistula in ano, connected with disease, consists in restoring the secretions of the liver, and intestinal tube, by giving the chloride of mercury, or the pil. hydrargyri at night, and the compound infusion of gentian, with soda and rhubard, twice in the day.*

If any organic or visceral disease exist; such as disease of the liver or lungs, or carcinoma or stricture of the rectum, the operation ought not to be performed; for, under these circumstances, the fistula, though laid open, will not heal, or, if it should, the visceral disease will advance with a quicker pace.†

Besides the foregoing kinds of abscess near the anus, piles sometimes suppurate, and matter forms in their centre, as will be presently explained. Occasionally, also, abscesses form in front of the vertebræ, descend into the pelvis behind the peritonæum, and bursting somewhere near the termination of the rectum, become fistulous. The operation in such a case would be entirely useless.

PILES, OR HEMORRHOIDS.

In their texture, piles are subject to a great deal of variety. Sometimes they are merely dilated veins, or *varices*, situated near the anus, or lower portion of the rectum, forming prominences covered by its mucous membrane, or the delicate skin near the anus, and from which a bleeding takes place, whenever there is a great determination of blood to the parts.

In other still more frequent cases, the texture of hemorrhoidal tumors is more complicated; many of them being characterised by an areolar, soft, spongy structure, filled with blood. At periods, when these are in a quiet state, free from irritation, and without any particular determination of blood to them, they are small and shrivelled; but in the contrary circumstances, they swell, become firmer, undergo, as it were, a kind of erection, and blood is voided from their surface. Hence, their texture is compared by French pathologists to the erectile tissues. Numerous arterial branches are distrib-

---

* Vol. cit. p. 328.
† Sir B. C. Brodie, Lond. Med. Gaz. Oct. 1835. p. 29.

uted to them. Chaussier found, that if an incision be made in them, and a colored fluid thrown into the hemorrhoidal arteries, it will issue from numberless small apertures within the swellings.

Other hemorrhoidal tumors consist of one or more cysts, or cells, smooth internally, more or less vascular, retaining the blood for variable periods, but every now and then bursting, and occasioning hemorrhage.

Lastly, some hemorrhoids, originally having cavities, or cells, are gradually converted into solid swellings by the effects of repeated attacks of inflammation, and the effusion and organization of fibrine.

Hemorrhoids are divided into *internal* and *external*, according to their situation, either above the sphincter muscle, and in the inferior part of the rectum, or below the sphincter, near the verge of the anus, under the delicate thin integuments by which this part is covered. But, as an *internal* pile may protrude below the external sphincter, the best criterion is its texture; for it is always covered by the mucous membrane of the bowel; while an external pile is invested by the delicate skin near the anus. Those internal ones, which resemble *varices*, lie under the mucous membrane, which is often adherent to their surface, and so thin, that their bluish color can be plainly distinguished through it. Varicous piles make their appearance, chiefly when the parts are in a state of congestion, in the form of dark blue, elastic knobby swellings, not attended with much pain, yielding to pressure, but returning immediately it is discontinued. These venous dilatations under the skin, or under the mucous membrane of the rectum, are generally only a small part of those which exist around the bowel. M. Bégin has sometimes found the lower portion of the rectum involved in a plexus of enlarged veins, composing a thick vascular zone around it, and so gorged with blood, that if it had been cut in the living subject, a very dangerous hemorrhage must have been the consequence.

Internal hemorrhoids of the spongy and cellular kinds are always situated between the fleshy fibres and the mucous coat of the bowel, under which they project. They are of different sizes, from that of a pea to that of a nut, walnut, or even a small egg. Their number is equally various; sometimes only one or two; but occasionally so many, that the affected part of the bowel is filled and distended with them. Sometimes only a small portion of them projects into the bowel, the greater part of their mass being lodged in its cellular tissue; but, in other instances, the whole or greater portion of the swelling directs itself towards the interior of the bowel, and being gradually detached by the repeated passage of the feces from its original connection, at length hangs by a kind of pedicle into the cavity of the rectum.

External hemorrhoids of this kind also sometimes form slight prominences under the thin delicate skin near the anus; but in oth-

er examples, considerable and permanent tumors, which were often termed *mariscæ* by the old surgeons, from their shape and appearance.

Various circumstances may tend to bring on a determination of blood to the rectum, followed by hemorrhage from the mucous membrane, and, in many instances, by the tumors called piles. Plethoric individuals, and others in whom the circulation in the branches of the vena portæ is obstructed, are particularly liable to them. They are seldom met with in very young persons, being scarcely ever produced till the body is completely developed in breadth as well as height. An age between thirty and forty is the most common period for them to begin; and if in a full habit, they mostly continue during life. In the male subject, the occasional bleeding, from piles is frequently regarded, and not without reason, as a salutary evacuation.

In the other sex, menstruation seems to render this other spontaneous kind of depletion unnecessary; but, on the natural discontinuance of the menses, piles are disposed to form, and, in full plethoric women, the bleeding from them may then become a substitute for the uterine evacuation. Also during pregnancy and after delivery, many women are troubled with piles. In these cases the enlargement of the hemorrhoidal vessels depends upon the suspension of the menstrual discharge, the compression of the veins by the gravid uterus, and the efforts and local irritation accompanying parturition.

Whatever tends to bring on plethora creates a disposition to hemorrhoids; as taking more food than nature can properly dispose of, eating high-seasoned dishes, and drinking too much wine and other fermented liquors. Such excesses, combined with an indolent or sedentary life, will be still more likely to induce the disease. A similar effect may also proceed from any other circumstances occasioning a great determination of blood to the rectum; as the abuse of aloetic purgatives, and stimulating glysters; habitual constipation; the irritation of the bowel by the passage of indurated feces; and excesses in venery, whereby a larger quantity of blood is made to pass into the vessels of the lower part of the rectum, as well as into those of the genital organs.

By the expression *hemorrhoids*, some of the old writers signified bleedings from the rectum, whether attended with piles or not. In fact, a congestion of the hemorrhoidal vessels is sometimes terminated by a copious discharge of blood from the mucous membrane; but repeated congestions will not always end in this way, but often in inflammation, and the change in the size of the veins, or the formation of the tumors already described.

Few diseases are more painful than piles in the state of inflammation. About the fundament, there is an excessively painful feeling of tension, burning heat, and weight, extending from the anus,

through the pelvis, and to the neck of the bladder in the male, and to the womb in the female. The pulse is hard, quick, and contracted. The patient is continually wanting to go to stool, and the efforts made for this purpose generally have no other effect than that of subjecting him to severe torture. Sometimes the evacuation of the urine is attended with difficulty. The anus and surrounding parts are red, gorged with blood, and the seat of prominent, tense, elastic swellings, which are of a purple or deep brown color, and extremely painful on being touched. The sufferings are still greater, when the inflamed mucous coat of the rectum is propelled down, so as to form a circular projection, which is strangulated by the sphincter muscle. A corresponding increase of suffering results from a similar constriction of inflamed hemorrhoids by the fibres of the same organ, the action of which not only prevents the reduction of the protruded swellings into the bowel, but interferes with the return of the blood from them, and thus their tension and size become still further increased. Under these circumstances, it may be impossible for the patient to empty the bowel, and he may be attacked with the same symptoms as are noticed in cases of strangulated hernia.

When the irritation of the rectum, resulting from piles, is less intense, but protracted, a frequent consequence is a morbid secretion of mucus from its interior. In other instances, the effects are a thickening of its coats, a contracted state of the anus, and great induration of the adjoining cellular tissue. Piles, which have been repeatedly inflamed, sometimes occasion a permanent spasmodic action of the sphincter, or numerous deep fissures at the margin of the anus, rendering the evacuation of the feces exceedingly painful. Lastly, abscesses and fistulæ may become complications of hemorrhoidal swellings. Inflamed piles occasionally suppurate in their centre; and the matter, which forms within them, may long continue to be imperfectly discharged from them through a fistulous opening on their surface.

When persons experience little inconvenience from the tumors, or the hemorrhoidal flux, as it is termed, takes place from time to time in a plethoric subject, there is in the first case no real occasion for the removal of such piles; and in the second, the stoppage of the periodical bleeding may create a risk of bringing on some other more serious disease like apoplexy, which the discharges of blood from the rectum tend to keep off. It is on this account, that piles are sometimes regarded as safety-vales for the constitution. The prevention of constipation by the mildest laxatives is here the chief indication. The lenitive electuary, with sulphur or small doses of castor oil, are commonly preferred. Even when the evacuation of blood from the anus is rather profuse, it is not always proper to check it. So long as the pulse is strong, the color of the face natural, the muscular system vigorous, and the patient feels relief from the de-

pletion, it is best not to interrupt it. But, if the countenance be pale, the debility considerable, and the pulse much reduced, the patient should be kept in the recumbent posture, cold acidulous injections be thrown up the rectum, cold lotions applied to the anus, and all his beverages be of a low temperature, and acidulated with nitric or sulphuric acid. If there were pain about the rectum, and the pulse not too much reduced, venesection might also be proper, as calculated at once to relieve the irritation of the part, and to stop the determination of blood to it.

When the hemorrhage recurs very frequently from an internal pile, or the tumor often descends, and inflames from constriction by the external sphincter, the tumor should be extirpated. By the patient sitting over a pan of warm water, and making efforts as if at stool, the tumor may almost always be made to present itself at the anus, and then can be easily taken hold of with a tenaculum forceps, and tied. On account of the profuse hemorrhage, liable to follow the excision of internal piles, the removal of them by ligature is now almost constantly preferred by the London surgeons. If the pile cannot be made to descend in this way, a pint or two of warm water may be thrown up the rectum, and on its discharge taking place, the tumor will often present itself.

When an internal pile is above a certain size, it should be transfixed with a needle and strong double ligature, one half of which is to be firmly tied over each side of the neck of the tumor. The surgeon, after having secured each pile in this way, may cut off its convex portion, and snip off both ends of each ligature close to the knot, returning the remains of the pile and rest of the ligatures into the rectum. On the day before the operation, the bowels should be emptied by means of a dose of rhubarb, so that there may be no necessity for another evacuation for two or three days. After the ligatures have been detached, which usually happens in a week, and a little time has been afforded for the healing of the sores left after their separation, the patient should take some lenitive electuary and sulphur every night, and use a *lavement* of cold water every morning. Thus he will prevent a recurrence of the disease.[*] External piles may be safely removed with a cutting instrument.

INFLAMMATION AND STRANGULATION OF PILES.

Another inconvenience from piles, and, in some cases, not less serious than that resulting from their magnitude, or the bleeding from them, is their inflammation, which, in its very beginning, is usually conjoined with a protrusion, either of the hemorrhoidal swellings, or of a circular prominence of the rectum, in a state of

---

* Sir B. Brodie, Lond. Med. Gaz. 1834—35, p. 844.

great turgescence.   Nothing can exceed the sensibility which these parts acquire from distension, and the pressure made on their base by the sphincter muscle.   Violent nervous symptoms, extreme rest-lessness, severe febrile disturbance, and even subsultus tendinum, may arise from the inflamed and strangulated state of hemorrhoidal swellings.

Here the first indication is to push up the tumors completely be-yond the grasp of the sphincter muscle.   The patient is directed to rest on his knees and elbows, and the swellings, having been smear-ed with a little spermaceti ointment, are to be gradually pushed up by one of the surgeon's fingers, with the intervention of a fine nap-kin.   Then, in order to prevent the protrusion from taking place again, a thick compress is to be applied to the anus, supported by the T bandage.   At the same time, the patient is to be kept strictly quiet in bed, lying on his back, and restricted to a very low diet. Cold water is now and then to be thrown up the rectum, and, in the greater number of cases, local and general bleeding is indicated. When inflamed and strangulated piles cannot be returned into the rectum, antiphlogistic treatment is to be employed, especially vene-section, leeches, and either cold or warm emollient applications. Frequently I have at once relieved the patient by cutting off inflam-ed piles, which did not admit of immediate reduction.   In other ex-amples, where the anus is surrounded by a circular prominence of protruded, turgid, inflamed mucous membrane, attended with ex-cessive pain, a few deep incisions made in it will frequently give prompt relief, and bring about such a diminution of the part, that it may be returned.

What happens when the foregoing methods fail to accomplish the reduction of constricted hemorrhoids?   If the inflammation has not risen above a certain pitch, the irritation generally begins to abate in the course of four or five days, or a week, accompanied by a dis-charge of blood, mucus, or pus from the surface of the tumors, which, becoming diminished, gradually return into the rectum. These desirable changes are to be promoted with emollient applica-tions, leeches, and other means already specified.

In a worse description of cases, hemorrhoids, whether in the shape of tumors, or a prominent thick ring of the mucous coat, are so for-cibly strangulated that they mortify.   I have seen several instances, in which this has terminated in a cure.   Gangrene of strangulated piles, however, may extend beyond the tumors, thus involving the lower part of the rectum in the mischief, and bringing on likewise phlegmonous erysipelas and gangrene of the cellular tissue, not only around that bowel, but in the parts external to the anus.

External piles, inflamed, but not strangulated, may often be ren-dered less painful by anointing them with a cerate containing pow-der of galls and a little of the extract of opium, or belladonna; then applying a cold lotion to them, and, if requisite, leeches; care being

taken to keep the patient in the recumbent posture, and on a strict antiphlogistic regimen.

MUCOUS AND PURULENT DISCHARGES FROM THE RECTUM,

Arising from piles, require different modes of treatment according to circumstances. Thus, when piles suppurate in their centre, and become fistulous, the extirpation of the hemorrhoidal tumors accomplishes likewise the cure of the abscess. When, however, piles are attended with a chronic mucous discharge, this may be checked, or even completely cured, by cold astringent injections, the balsam of copaiba mixture, the sesquioxide of iron, a blister kept open over the sacrum, the cold bath, sea bathing, and exercise in the pure open air.

PROLAPSUS ANI,

Though generally described as a descent either of the mucous membrane alone, or of the mucous and muscular coats together, seems to Sir Benjamin Brodie to be always of the latter description, the other case being merely internal piles, which we know are only covered by the mucous membrane. He admits, however, that protrusions of elongated portions of mucous membrane take place, but they are arranged by him under the head of excresences and polypi. On the other hand, Mr. Salmon* represents prolapsus of the rectum to be *always* a descent of the mucous membrane, which is detached from the external coat; so that he differs from Sir B. Brodie in even a greater degree than the generality of other writers, who describe two forms of polapsus, one with descent of the mucous coat alone, the other with prolapsus of both.

Prolapsus ani is more common in infancy and old age, that any other period of life. It is particularly frequent in children with large tumid bellies, and confined bowels, where the whole mass of intestines becomes too large for the abdominal cavity. In children also the prostate gland, urethra, and vesiculæ seminales are not so much developed, and the attachment of the rectum to the surrounding parts does not extend so high up as in the adult. In grown-up persons, prolapsus ani sometimes occurs as a consequence of piles. In this case, the piles are seen at the upper part of the prolapsus, close to the anus, forming a zone round the gut; and the color and appearance of the mucous membrane, covering the protruded piles, is altogether different from that of the membrane investing the rest of the bowel.†

Treatment.—Except when prolapsus ani takes place in a child

---

* F. Salmon, on Prolapsus of the Rectum, p. 6, &c.
† Sir B. Brodie, Lond Med. Gaz. 1834–35, p. 845.

from the irritation of calculus in the bladder, when of course the cure will depend on the removal of the stone, relief may generally be derived from Sir Benjamin Brodie's plan: it consists in prescribing occasionally calomel and rhubarb, directing that the child may not eat much vegetable food, and injecting into the rectum every morning two or three ounces of a lotion composed of tinct. ferri chloridi 3j., aq. puræ ℔j. When, in an adult, prolapsus ani is a consequence of piles, the first indication is to extirpate the latter.

The prolapsus consists, as I have stated, in a descent of the mucous and muscular tunics of the rectum, the upper portion of which passes down in the manner of an intus-susception, within the lower as far as the anus, or even further, so as to protrude to the extent of from one to several inches. In general, the prolapsus occurs whenever the patient goes to stool; but, in some individuals, whenever they continue long in the standing position.

This state of the rectum is often combined with hemorrhoidal complaints, and a feeble, relaxed constitution. In certain chronic cases, where the prolapsus has existed a long while, the mucous coat becomes thickened and almost insensible; but, in most instances, the part is liable to attacks of inflammation, followed by ulceration. The disease is frequently attended with discharge of blood, mucus, or even pus. In the treatment of other examples, presenting themselves in the adult, the reduction of the bowel is the first thing to which the surgeon naturally directs his attention. In some cases, this is easily accomplished; but in others difficulty is experienced, in consequence of the swelling of the parts, and the spincter strangulating the bowel. In fact, the protruded portion of bowel may be twice or thrice its natural size, of a deep purple red color, marked with ecchymosis and sometimes in great danger of mortifying.

Under these circumstances, the immediate reduction of the bowel is urgently indicated. The patient may lay on his face, as Dupuytren directs, with a pillow placed under the pelvis; or he may support himself on his knees and elbows in bed, with the nates towards the surgeon. The protruded part having been covered with wet linen, and a compress laid over its extremity, pressure is to be gently made on its base, so as to diminish its bulk, while the same part is gradually pushed within the spincter muscle. Thus the reduction commences with the return of the portion of bowel last protruded. If this plan should not succeed, the effect of scarifications and leeches on the part is sometimes tried, though such practice is condemned by Dupuytren. Followed up by cold applications, however, it answers in a few examples.

Even when the reduction is accomplished, the condition of the parts producing the tendency to prolapsus yet remains, and, consequently, the relief is only temporary.

Cold astringent lotions and the cold bath are frequently employ-

ed, for the purpose of giving strength and tone to the sphincter, which may then make greater resistance to the descent of the bowel. This practice occasionally proves effectual, but not till it has been persevered in for a great length of time. Where the disease has begun in early life, and continued to the adult age, the horizontal posture, the use of a bed-pan, an astringent injection daily, and a course of Ward's paste, are the means recommended by Sir Benjamin Brodie, though he acknowledges that they will not always succeed. Astringent lotions, and compression, made with a piece of sponge, covered with fine linen, and supported with a T bandage, sometimes answer in children, but mostly fail in adults and old persons.

Under such circumstances, the excision of the whole circle of the protrusion, or of a part of it, or of any hemorrhoids on the mucous membrane, is advised. The risk of dangerous, and even fatal, hemorrhage is the objection urged against these proceedings by Dupuytren. If, says he, the cautery be used to stop the hemorrhage, the agony, and chance of a perilous degree of inflammation being extended to the upper part of the rectum and neck of the bladder, will yet form a prohibition to the practice. The extirpation of the protruded part, either with the knife or the ligature, must always be out of the question, so long as the bowel admits of being reduced.

Instead of these measures, I should prefer the less severe expedient, originally suggested and practised by Hey, and adopted by Dupuytren; it consists in raising up two, three, or more of the radiating folds of skin close to the anus with a pair of forceps, furnished with broadish extremities, and removing them with curved scissors. Afterwards, on cicatrisation taking place, the anus becomes lessened in diameter, and the relaxed state of the skin removed. The excision should extend up close to the anus, and even half an inch within it, if the relaxation be considerable. The number of folds to be taken away is also to be greater in proportion to the degree of looseness of the skin near the anus. Notwithstanding the remark made by M. Velpeau*, that the description of Hey's practice, in the dictionary of Practical Surgery, is so imperfect, that this improvement in surgery would have fallen into oblivion, even in England, if it had not been for Dupuytren; the fact is, that there are few British surgeons, of any experience, who have not been in the habit of performing Hey's operation for the last thirty years. I have practised it in several instances with complete success. Besides, if the Dictionary were not in existence, English surgeons possess Hey's Practical Observations in Surgery, containing his own explanations. At the same time I fully admit the

---

* Nouveaux Elém. de M d. Opératiore, t. iii. p. 1002.

merit of Dupuytren's more particular account of the subject. Mr. Salmon's plan of removing a triangular portion of the sphincter seems to be a modification of Hey's or Dupuytren's method. Many years ago, I performed this operation on a Jew, carrying on the trade of a furrier in Holborn; and last year (1838), I adopted it in University College Hospital, for a little boy, about four years old, who had suffered from a prolapsus ani almost from birth, and for which the plan advised by Sir Benjamin Brodie, after a long and strict trial, was found unavailing. The removal of two slips of integument was followed by a complete cure.

PRETERNATURAL CONTRACTION OF THE SPHINCTER ANI.

When the sphincter has been long in a state of spasmodic contraction, it undergoes considerable enlargement, and acts with a proportionable increase of power. The disease is chiefly met with in women, especially those who are disposed to hysteria; but sometimes also in men. In emptying the rectum, the patient is obliged to strain very much, particularly when the feces are hard, or even solid. Mr. Salmon even conceives, that this condition sometimes leads to prolapsus of the rectum; though a close state of the sphincter appears, I think, more likely to be an obstacle to any descent of that bowel. There is pain not only while the feces are passing, but for a long time afterwards. Frequently the disease is complicated with a small, but exceedingly sensitive, ulcer of the mucous membrane, or with irregular cracks or fissures, which M. Velpeau suspects may often be the cause of the spasmodic affection of the spincter.

Treatment.—Relief may be derived from aperients: which will keep the feces from being of a hard or solid consistence. A suppository of extract of belladonna has been tried by Sir Benjamin Brodie; but as it is apt to produce deleterious effects on the brain, he does not at present frequently resort to it. Another plan adverted to by him, and also by Mr. Salmon, is that of always dilating the anus with a bougie before the patient goes to the water-closet; a plan that must be attended with extreme annoyance. In obstinate cases, it is necessary to divide one side of the sphincter muscle. The pressure of the finger, or a plug of lint, will command the hemorrhage. An active purgative should be given the day before the operation, and opium afterwards to keep the bowels constipated for two or three days, so that the wound may not be disturbed. It is to be dressed with lint, and generally heals in about three weeks. If the surgeon avoid dividing the sphincter muscle in the female forwards, no inconvenience results from the operation, the patient retaining the feces after it as well as ever.

ULCER WITHIN THE RECTUM OR FISSURA ANI.

The ulcer, which sometimes accompanies a spasmodic contraction of the sphincter, may take place independently of it, on the posterior part of the rectum, opposite to the point of the os coccygis. It occurs principally in costive individuals, is difficult to heal, disposed to enlarge, and creates a great deal of pain during and after each passage of the feces. In some instances, it bleeds copiously.

Treatment.—Mr. Copeland's practice is to divide the mucous membrane longitudinally, so as to comprise the ulcer in the incision. According to Sir Benjamin Brodie, a cure may always be accomplished by dividing the spincter muscle, and very often without an operation of any kind, if the confect. pip. comp., or Ward's paste, be given internally, and the bowels kept open with lenitive electuary and sulphur. Ward's paste, blended with soap, he has also introduced into the rectum, as a suppository, twice a day, with advantage.

STRICTURE OF THE RECTUM

Consists of a thickening and induration of the mucous and muscular textures, and no doubt also in similar changes of the intervening cellular tissue. Sometimes the contraction extends three or four inches up the bowel; but, in other instances, the constriction is limited to a very narrow circle. Very often the gut is of its natural diameter close to the anus; but, about an inch and a half, or two inches above it, there is a circular contraction, while higher up the bowel is again of its natural diameter. Now, although the stricture is thus confined to a certain extent of the rectum, the mucous membrane is in an unhealthy state both above and below the contraction.[*]

The disease occurs in both sexes, but in adults more frequently than children, and comes on very gradually. At first, the patient experiences some slight difficulty in emptying the bowel, and is obliged to strain a good deal, especially if the feces be hard, which, when discharged, are found to be of small diameter. At length, the constricted portion of the bowel inflames, and the pain then becomes much more severe, attended with a discharge, not only of mucus, but of blood and purulent matter. If the disease proceed further, inflammation takes place in the cellular tissue round the rectum, and putrid abscesses form, which burst in various places near the anus, and occasionally into the urethra in men, or vagina in women. I lately attended a gentleman, from whom nearly a pint of matter issued from the rectum daily for some time before he

---

[*] Sir B. Brodie, in Lond. Med. Gaz. 1834-35, p. 28.

died, and there was pus under the glutæi muscles.   In some instan-
ces, the patient dies with symptoms like those of stragulated hernia,
in consequence of the stricture becoming completely blocked up
by indurated feces.   Great pain in the abdomen, vomiting, and a
tympanitic distension of the belly, are here amongst the most promi-
nent symptoms.   As Sir B. Brodie has explained, the bougie and
injections may remove this kind of obstruction once or twice, and
thus save the patient; but another attack coming on, the treat-
ment may not be equally successful.   In the advanced stage of the
disease, patients generally become completely hectic, but often lin-
ger many years.

Most of the strictures of the rectum met with by Mr. Salmon, he
says, were situated between five and six inches from the anus; but
many other surgeons, amongst whom is Sir Benjamin Brodie, rep-
resent the lower part of the rectum as their common situation.   At
all events, they occur high up in a certain proportion of cases, and
even in the sigmoid flexture of the colon.

The treatment consists in the occasional employment of mild
aperient medicines and injections; sometimes in the introduction of
a suppository of opium, or hyosciamus, and in dilating the stric-
ture with bougies.   The exact place and degree of the stricture
should first be ascertained, if possible, with the finger; and if the dis-
ease be not in too irritable a state, the use of the bougie may com-
mence at once.   The instrument should be kept in ten minutes, a
quarter of an hour, or longer, every day, or every other day, ac-
cording as the patient may be able to bear it without too much in-
convenience.   Mr. Salmon considers that it is better to pass the
bougie less frequently than usually recommended, and at intervals
of from three to five days.   In some cases, Sir B. Brodie divides
the stricture in two or three places with a *bistoire caché*, so adjusted
that the blade may be opened to about one sixth or one fourth of
an inch.   The incisions having been made, the larger bougie can
be at once introduced.

Frequently this disease is attended with such irritation of the
bowel, that bougies cannot be resorted to, unless this condition be
first obviated by other means.   A suppository of opium, or hyos-
ciamus, at night, followed by a mild aperient in the morning, will
sometimes enable the patient to bear the use of the bougie.   In
other instances, a draught, composed of half a drachm of balsam
of copaiba, fifteen minims of liquor potassæ, three drachms of mu-
cilage of gum arabic, and nine drachms of carraway water, taken
thrice a day, has answered the purpose.*   When the feces accu-
mulate above the stricture, and cause considerable irritation by dis-
tending the bowel, an elastic gum catheter should be introduced

---

* Sir B. Brodie, Op. cit. p. 29.
26*

through the stricture, and tepid soap and water injected, followed by warm water. By persevering in this plan every day, or every other day, the whole collection will soon be cleared away.

If the disease be much advanced, the mucous membrane ulcerated, and abscesses have formed, the case will rarely admit of complete cure.

I fully concur with Sir Benjamin Brodie, that bougies are scarcely ever, perhaps never, safe for strictures of the rectum, except when the obstruction is within reach of the finger.

MALIGNANT DISEASES OF THE RECTUM

Rarely occur till after the middle period of life. At first, the patient experiences some slight uneasiness about the bowel, followed after a time by difficulty of expelling the feces, which gradually increases, and becomes attended with acute lancinating pains, extending through the pelvis to the back, nates, hips, and thighs. Frequently, these pains are followed by a sudden gush of a fetid bloody discharge from the bowel, in consequence of ulceration having taken place. At length, the stomach gets out of order, and the general health declines. The patient has a sallow look, denoting the existence of a severe organic disease; and frequently the scirrhous or medullary affection of the rectum is accompanied by other visceral disease. Sometimes, but not commonly, in the advanced stage, there is copious hemorrhage from the bowel; and abscesses form around the part, and burst externally. In females, they burst into the vagina; and the ulcerated communication between this tube and the gut may be so free, that a large quantity of feces may be discharged through the former passage. In the male sex, the ulceration frequently makes a communication between the rectum and bladder, or the rectum and the urethra, and then the patient expels not only air, but feces, with the urine. Retention of urine is another frequent complication of the present disease. The patient after lingering a considerable time in severe agony, is at last exhausted. In some instances, the diseased mass completely obstructs the passage of the feces, and symptoms, resembling those of strangulated hernia, come on; or the bowel ulcerates immediately above the obstruction, and the feces, escaping into the cavity of the peritoneum, excite a fatal attack of peritonitis.*

Whether the disease partake of the character of carcinoma, or of medullary disease, it consists in the growth of a new substance, whose pressure seems to produce an absorption of the mucous and muscular coats of the bowel.† The cases, in which the mass projects into the bladder, or vagina, are, no doubt, examples of medul-

---

* Sir B. Brodie, in Lond. Med. Gaz. 1834–35, p. 238.
† F. Salom, on Stricture of the Rectum, p. 63.

lary cancer, or fungous hæmatodes. In some examples, the texture of the morbid parts is such, that it appears like a combination of scirrhus and fungous hæmatodes, some portions of it being of a soft medullary consistence, and others hard.

Attempts have been made to remove malignant disease of the lower part of the rectum with the knife. If ever such an operation be justifiable, as Sir Benjamin Brodie observes, it must be where the disease is very low down, and quite in its earliest stage. Under other circumstances, there would be no probability of the whole of the diseased textures being taken away.

Bougies render the disease worse. Opiate clysters, and injections of linseed oil, with or without lime water, sometimes allay the pain and irritation. Sir Benjamin Brodie speaks favorably of the liquor potassæ andbalsam of copaiba, as internal medicines. The sufferings of the patient always make the exhibition of anodynes indispensable, and the best are the acetate and muriate of morphia.

<hr>
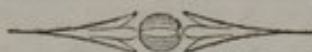
PARTICULAR FRACTURES.

FRACTURES OF THE OSSA NASI

Are by no means unfrequent, a circumstance accounted for by the prominence which these bones form, and their being so little protected by the soft parts. The injury can only happen from direct external violence, as blows, or falls on the face. Besides being accompanied by evident marks of contusion, there is bleeding from the nose; and in consequence of the movable state of the pieces of bone, a crepitus can be felt. In some instances, the fragments are not at all displaced; but in others, where the force applied has been greater, the ossa nasi are driven inwards towards the nasal fossæ, and, if there has been time for much swelling of the soft parts to come on, the injury and depression of the bone is to be ascertained by manual examination; for the tumefaction will conceal from the eye the nature of the accident. Sometimes, the fracture extends through the nasal process of the upper jaw-bone*, and across the nasal duct, attended with a great deal of ecchymosis, a regurgitation of blood from the lachrymal puncta, and an impediment to

<hr>

* Such a case was under the the care of my friend, Mr. Hooper, about three years ago. The injury was produced by a scrubbing-brush being thrown in the patient's face with immense force. There was likewise injury of the brain. The case soon ended fatally.

the passage of the tears into the nose. Lastly, the violence may be transmitted through the perpendicular plate of the ethmoid bone to its cribriform plate, which may also break, and symptoms of pressure, or injury of the brain, be excited. In other instances, there may be no fracture of the cribriform plate, yet the brain suffer concussion.

When a fracture of the nasal bones is not attended with displacement, all that is requisite to be done is to apply the cold evaporatting lotion; but, if the fragments are beaten inwards, they should be restored to their proper situation, by introducing a director up the nostril, and adjusting the pieces of bone with the aid of the fingers applied externally.

Generally, when the fragments are replaced, they have no disposition to quit their situation again; but, cases are mentioned, in which it was judged necessary to afford some support, by means of lint passed up the nostril. When the soft parts are much swollen, bleeding, leeches, and other antiphlogistic means are indicated.

FRACTURES OF THE MALAR AND SUPERIOR MAXILLARY BONES

Are rarely met with, except as the effect of gunshot violence, or other great mechanical force applied directly to the face. Thus, the cheek-bone is sometimes fractured by the kick of a horse, or the blow of a hammer; under these circumstances, there must be more or less splintering of the bone, and contusion, or even laceration of the soft parts.

Individuals sometimes attempt suicide by firing a pistol into the mouth. In such cases, the alveolary processes, with the teeth, are often forced away, together with the palatine processes of the upper maxillary bones, the palate bones, the lower turbinated bones, the vomer, and lateral portions of the ethmoid bone. The antrum is of course laid open. In one case, recorded by Dupuytren, the patient lived till the fortieth day; and after death, the cribriform plate of the ethmoid bone was found fractured, and a bullet lodged in one of the anterior lobes of the brain.

All action of the muscles about the throat is to be suspended, and only liquid nourishment given with a spoon, or injected through an elastic gum catheter, passed from the right nostril into the pharynx. Displaced portios ef the palate are to be reduced; splinters of bone removed; and any injurious effects on the brain counteracted according to the rules, delivered in the observations on Injuries of the Head. The soft parts are to be rectified as well as possible. Antiphlogistic remedies, inclusive of bleeding, will be indispensable.

FRACTURES OF THE LOWER JAW-BONE

May take place in its *body*, its *rami*, the *coronoid process*, or the

neck of one of its *condyles*. A fracture sometimes occurs near the chin, though rarely in the precise situation of the symphysis, generally at some point between the symphysis of the bone and the insertion of the masseter muscle. From this insertion, as far back as the angle of the jaw, or root of the coronoid process, the bone is covered externally by the masseter, and inwardly by the internal pterygoid muscle, a circumstance explaining the diminished frequency of fractures in this particular portion of the bone. It explains also another fact, which is, that when fractures do happen in this situation, they are not very liable to displacement, because the foregoing muscles antagonise one another.

The lower jaw-bone may be broken in two places at once, namely, on each side of the symphysis, and, in this case, it is difficult to keep the middle piece in its right situation, because several muscles, concerned in depressing the jaw, are attached to that part of it, and draw it downwards and backwards.

Fractures of the lower jaw may be *perpendicular*, *oblique*, or *transverse*, that is, parallel to the base of the bone. These last are less common than perpendicular and oblique fractures; but, they are occasionally met with, detaching a portion of the alveolary process, with the teeth in it, from the rest of the bone.

Fractures of the lower jaw are sometimes *comminuted*, the bone being broken in several, or even many, pieces. When the *fracture* is *near the chin*, whether the bone be broken on one side or both, the fragment comprehending the symphysis is drawn downwards and backwards towards the os hyoides by the action of the digastricus, mylo-hyoideus, genio-hyoideus, and genio-hyoglossus.

Fractures of the ramus are not very common, because this part is protected by the zygoma and masseter. *Fractures of the neck of the condyle* are more frequent than those of the *coronoid process*; and the condyle itself may then be drawn forwards and displaced by the action of the external pterygoid muscle. When the ramus is fractured, the fibres of the masseter and internal pterygoid, being attached to both pieces, prevent any considerable displacement.

When a fracture of the lower jaw is accompanied by displacement, the nature of the accident is readily detected by the inequality in the line of the base of the jaw; by an irregularity in the arch of the teeth; by the inclination of the mouth more to one side than the other; and by the crepitus, plainly distinguishable by manual examination. When the gums are lacerated, or the injured portion of the bone is exposed by a wound, as is often the case, forming a *compound fracture*, the nature of the accident is still more obvious.

When the ramus, or the neck of one of the condyles, is broken, the patient will complain of severe pain in the ear; and when the jaw is moved, a crepitus is perceptible.

The reduction of a fracture of the lower jaw is easily accomplished by means of the thumbs introduced within the mouth, and the fingers applied externally to the base of the bone. The surgeon is to draw the displaced fragment upwards, and a little forwards, so as to bring it on a level with that fragment which retains its proper situation. By attending to the line which the base of the jaw ought to form, and the regularity or irregularity of the arch of the teeth, he may always judge of the correctness of the reduction.

Easy as the reduction is, the maintenance of it is sometimes troublesome, requiring that the arch of the teeth in the broken bone should be kept steadily applied to that of the teeth in the upper jaw. Hence, when the teeth are naturally irregular, or accidentally deficient, certain practitioners consider it advisable to introduce a piece of cork between such teeth as may be present, in order that there may be a smooth even surface, against which the lower jaw may be confined. Others inclose the fractured part of the jaw with pasteboard, which on its first application is to be softened with warm water, so that it may adapt itself to the shape of the part. Whether pasteboard is used or not, the broken jaw is to be well supported, and kept steady with a roller, or, what is much better, the four-tailed string bandage, the centre of which is to be put on the chin, and the front tails fastened over the occiput, and the posterior ones over the forehead. The assistance of a compress under the part that has a tendency to be drawn downwards and backwards, is frequently required. Mastication and conversation are to be avoided, as causing disturbance of the fracture. Hence only spoon victuals should be allowed. In bad compound cases, the administration of food and medicines through an elastic catheter is sometimes deemed advisable.

Fractures near the symphysis are very difficult to keep right, on account of the incessant disturbance of this part of the bone by the muscles attached to it and the oshyoides; viz. the digastricus, mylo-hyoideus, genio-hyoideus, and genio-hyoglossus, all of which are put in action in deglutition. For this case, Mr. Lonsdale has invented a simple, but ingenious instrument, which grasps the base of the jaw and the arch of the teeth, so as very effectually to maintain the reduction. Instruments, acting on a similar principle, have also been suggested by various surgeons both in France and Germany. They are not applicable to fractures of the ramus, coronoid process, or condyle.

When the neck of the condyle is broken, the condyle itself is drawn inwards and forwards by the action of the external pterygoid muscle; and, as it cannot be replaced, we should keep the neck of the bone inclined towards it, by making the bandage act, particularly on the angle of the jaw, with the aid of a compress.

Cases are on record, in which the detached condyle, instead of uniting, was discharged from a subsequent abscess of the part.

Sanson asserts, that when the coronoid process is broken, the fracture never unites; but that mastication is performed very well, the masseter and pterogoid muscles then fulfilling the office of the temporal.

COMPOUND FRACTURES OF THE LOWER JAW

Are by no means uncommon; and, when it is remembered that this bone can only be broken by blows, kicks, gunshot injury, and other species of direct external violence, the fact is sufficiently accounted for. The same explanation enables us to understand why the fracture is also, in many instances, *comminuted*, and several of the teeth knocked out, or loosened.

The treatment of a compound fracture consists in removing all loose splinters of bone; reducing the fracture, if attended with displacement; dressing the wound with simple unirritating application; applying the four-tailed sling bandage for the jaw; giving all food with a spoon in a liquid form, or, in very bad cases, through an elastic gum catheter, passed through the nostril into the pharynx; enjoining perfect quietude of the part; and adopting strict antiphlogistic treatment.

If abscesses form, an early opening should be made in them, and the mouth kept clean with a common gargle, or one containing the chloride of sodium. When necrosis takes place, the dead portions of bone should be removed, as soon as exfoliation has advanced far enough.

Fractures of the lower jaw are sometimes *complicated* with laceration of the artery or nerve, in the canalis mentalis. I have never seen an instance, however, in which the bleeding did not soon stop, after the reduction of the fracture.

As the lower jaw is a particularly vascular bone, the repair of its accidental injuries is generally accomplished with surprising quickness. Hence, even the worst fractures of it, *compound* and *comminuted* ones, generally have a favorable termination.

I have seen two or three horrible cases, in which nearly the whole of the lower jaw, and the integuments, and the muscles connected with it, and more or less of the tongue, were shot away; yet, the patients recovered, and in a more expeditious manner than might have been expected.

Instances are recorded, where fractures of the lower jaw continued united. In one case of this description, Dr. Physic of New York, succeeded in bringing about the union of the bone, by passing a seton between the fragments.

FRACTURES OF THE SPINE.

If we except the atlas, the tooth-like process of the dentata, and the spinous processes of the vertebræ in general, one of which may be fractured without any other injury of the spine, it is not usual for a vertebra to be broken singly. Generally, the body of one vertebra, and the articular or transverse processes, either of the vertebra above or below that of which the body is fractured, are likewise implicated.

Fractures of the spine, like those of the cranium, are important and dangerous, not by reason of the injury of the bones themselves abstractedly conisdered, but on account of the effects produced on the very essential part of the nervous system, which the vertebræ contain and protect.

Fractures of the spinous processes may not be accompanied by any injury of the spinal marrow; but those extending through one of the bodies of the vertebræ, and the neighboring articular and transverse processes, cannot happen, without a degree of violence, that never leaves the spinal cord entirely free from injury; and hence, the accident brings on a train of dangerous symptoms, which, sooner or later, generally have a fatal termination.

When the fracture is situated in the lower portion of the vertebral column, it mostly produces loss both of sensibility and of motion in the lower extremities, and paralysis of the bladder. When the injury is higher up, in addition to these symptoms, the abdomen becomes prodigiously distended with air collected in the bowels; when it is still higher, the intercostal and abdominal muscles are paralyzed, and the breathing difficult, because only carried on by the diaphragm.

When the lower cervical vertebræ are broken, and the medulla hurt, the upper extremities, as well as the lower, are both paralyzed. If the injury be situated above the fourth cervical vertebra, or the origin of the phrenic nerve, and, especially, if there be any displacement of the fragments, or compression or injury of the spinal cord, respiration cannot go on, and immediate death is produced.

Amongst the symptoms of fractures of the spine, priapism, and even emission of the semen, are by no means uncommon. Both of them were noticed in a young man under my care, who died from a fracture of the cervical vertebræ in University College Hospital, in October, 1835.

Such are the consequences usually induced, when a fracture of the spine is accompanied by displacement of the fragments, and with more or less compression, or injury, of the corresponding portion of the spinal cord.

On dissection, the spinous process of the displaced vertebra is found depressed; the body of the bone broken through; and a part

of it thrown more or less forwards or to one side. A displacement from laceration of the intervertebral substance is very rare. Sometimes blood is extravasated between the vertebral canal and the sheath of the spinal cord, and sometimes on the latter part itself. In slight displacements, the medulla is compressed and bruised; in more considerable ones, it is generally torn through; but the dura mater usually remains entire.

With respect to the symptoms of a fracture of the vertebral column, many of them, and indeed the most dangerous of them, may be brought on by a violent concussion of the spinal cord. Hence, the diagnosis is sometimes obscure. An inequality in the line of the spinous processes, a crepitus, and even deformity, are occasionally perceptible; and these circumstances, joined with the extent of the paralytic disorder, according to the situation of the injury, as already explained, will leave no doubt about the nature of the accident.

In consequence of the paralysis of the bladder and sphincter ani, the patient cannot void his urine, and the feces come away involuntarily. The qualities of the urine, also, undergo a remarkable change; for it becomes strongly impregnated with ammonia. It is likewise found, that when the patient continues to live a considerable time, with the urine in this state, the bladder itself becomes thickened, softened, and even ulcerated. The evacuations from the bowels are often remarkably dark and fetid.

Patients, who lie for weeks and months in a paralytic state from injury of the spine, are much exposed to risk of sloughing of the nates. Sir Astley Cooper mentions a case of fracture of the lumbar vertebræ, where the patient lived two years, and then died of such sloughing.

A fracture of the spine is capable of union, just like fractures of other bones. If the patient get over the danger, arising from the injury of the spinal cord, the fracture itself is certainly capable of reparation.

The chances of recovery and the length of time the patient may live after the accident, when a final recovery does not ensue, depend materially upon the situation of the fracture, and its degree of displacement; or, in other words, upon whether the fracture affects the cervical, dorsal, or lumbar vertebræ, and whether the spinal cord is contused, crushed, or otherwise wounded. The higher the fracture, the sooner does it generally prove fatal.

When the dorsal vertebræ are broken and displaced, the patient seldom lives beyond two or three weeks; but Sir Astley Cooper knew of one instance in which the patient lived nine months.

When the lumbar vertebræ are fractured, the patient often lives a month or six weeks; but he may live a considerable time, and ultimately perish of sloughing of the nates, or mortification of the

lower extremities, as happened in one of the cases recorded by Sœmmerring.

When the fracture is in the lower cervical vertebræ, and attended with displacement of the fragments, and consequent injury of the medulla, the patient rarely lives beyond the tenth day, death taking place sooner the higher the fracture is situated.

Fractures of the cervical vertebræ, involving one of the transverse processes, are attended with one danger not occurring in fractures of other vertebræ, viz. laceration of the vertebral arteries. It is the simultaneous injury of the spinal cord that is the principal source of danger, and a fracture of any part of the spine, if it were not for this circumstance, would be repaired like other fractures, and the patient recover. This is proved by many recoveries, known to have followed even fractures of the upper cervical vertebræ, where no material contusion or compression of the medulla had taken place.

Sir Astley Cooper mentions a case that occurred in Mr. Cline's practice, where the first vertebra of the neck was broken across, without occasioning death till a twelvemonth afterwards, when the fatal event arose from the dentiform process losing its support and becoming displaced.

In the museum of the College of Surgeons is a remarkable preparation, proving the possibility of a person living a twelvemonth after a fracture of the last dorsal vertebra, during which time nature had made the greatest efforts to bring about a cure. The patient was kept perfectly at rest, and the urine at first regularly drawn off with a catheter; but, by degrees, a power of emptying the bladder by the action of the abdominal muscles was regained, and the patient even became well enough to sit up and to creep slowly down stairs, notwithstanding the lower extremities were completely deprived of all power of voluntary motion. After death, the fracture was found completely united by bone. The greatest curiosity about the case is, that a fragment of the body of the vertebra had been forced at the time of the accident completely across the vertebral canal, so as to divide the medulla spinalis, the ends of which, as exhibited in the preparation, are an inch asunder.

Sœmmerring relates an instance, in which the patient lived six months after a fracture of the body of the first lumbar vertebra, and of the oblique and transverse process of the last dorsal one. After death, the fracture was found perfectly united by osseous matter.

In one of Cruveilhier's engravings, is the representation of a fracture of the second lumbar vertebra, attended with displacement. The patient recovered from paralysis of the lower limbs, and all other ill consequences of the accident, but died of another disease four years afterwards. The greater part of the broken vertebra was pushed towards the left side and backwards; but the rest of it, comprehending the right articular and transverse processes, and the

portion of the body connected with them, remained in its natural situation. The left oblique and transverse processes were fractured; bony matter had been thrown out for the repair of the injury—not from the fragments themselves, but, as Cruveilhier states, rather from the vessels of the surrounding parts, the cellular and fibrous tissues, and the muscles.

In the case recorded by Mr. Barlow (vol. xvii. Med. Chir. Trans.), consisting of a fracture of the first lumbar vertebra, sensation began to return in the legs and thighs after eight months, and the patient could raise himself in bed, and in twelve months could bear to be drawn out in a small chaise. After an attack of fever, sphacelation of the heel took place, pus was voided with the urine, and gangrene commenced over the sacrum, of which the patient died. The upper portion of the spine was found to be thrown forwards, and connected to the fore and upper part of the inferior fragment by callus. The articular processes of the first lumbar and last dorsal vertebræ were dislocated, the vertebral canal was lessened in diameter to one half of its natural extent, pus was found in the pelvis of each kidney, and the bladder was diseased.

Mr. Lawrence mentions a case of fractured spine, where the patient lived a considerable time after the accident, and at length died, when the fracture was found soldered together by bone; but the osseous matter had so nearly filled up the vertebral canal, that there was only just room enough in it for the end of a blowpipe. The spinal cord had been completely divided.

With respect to the *treatment*, we are first to consider what ought to be done when there is no displacement. Here the indications would be to draw off the urine once or twice a day with a catheter, and to keep off inflammation of the spinal cord and its sheath by antiphlogistic treatment, especially by bleeding, active aperient medicines, and perfect quietude in the recumbent position.

In a case of fracture with displacement, where the patient is not quickly destroyed by the extension of the paralysis to the diaphragm, and other important organs, or by the case being complicated with rupture of the kidneys, spleen, and internal hemorrhage, ought we to attempt to reduce the fractured vertebræ, as the only chance of removing the pressure from the spinal cord? Now, experience has little to adduce in favor of such attempts, which have been made from time to time, but generally in vain. In a patient, from whom a specimen in the museum of University College was taken, the attempt was made, but to no purpose. In the case recorded by Mr. Barlow, of Writtle, it was also made; not with any bad consequences, indeed, but without success, as on dissection the fracture was found united, but in a state of displacement. The reduction had not in reality been accomplished, or, if accomplished, had not been maintained. In making the experiment, there must be some risk of rendering things worse, so imperfectly must we always be acquainted

with the exact position of the fragments. But, even if the reduction were accomplished, and could be maintained, the injury, which the spinal cord has received, will yet remain, and all the bad consequences of it continue.

The notion of removing pressure from the spinal cord, as is done from the brain, by means of the trephine, led to the scheme of cutting away the spinous processes and adjoining bony arches in the situation of the injury with Hey's saws; an operation which, I believe, with Sir Charles Bell, would generally of itself destroy all possibility of the patient's recovery.

Neither would the removal of such portion of the vertebral column make any difference in the injury of the medulla already existing, unless, indeed, it were an augmentation of it; nor could it alter the position of the fragments of the body of the broken bone.

My views would therefore restrict the treatment to means calculated to lessen the risk of inflammation and suppuration of the medulla, especially common antiphlogistic treatment, including rest in the recumbent posture. The urine should be drawn off once or twice a day with a catheter, which in these cases should not be left in the bladder, as the beak of it is apt to produce inflammation and ulceration of that organ, followed by effusion of urine and peritonitis. The bowels are to be regulated with castor or croton oil. If possible, the convenience and comfort of a fracture-bed should be afforded; and when there is a tendency to sloughing of the nates, the hydrostatic bed should be employed.

Should life continue long enough to justify the inference that the fracture is united, though some of the paralytic effects of the accident still remain, we might try the effect of iodine liniments, blisters, the moxa, or issues. The internal and external use of strychnine has been suggested; but I know of no facts in its favor.

Very curious effects are sometimes exemplified in injuries and diseases of the spine, which are referrible to the double roots of the spinal nerves; the anterior of which are for voluntary motion, the posterior for sensation. Thus, a few years ago, I attended a man in Black-Horse Yard, Rathbone Place, who was paralytic in both lower extremities, in consequence of a blow on the spine, received in a fall from the mast of a ship; one limb having lost all feeling, the other all sensation. In fractures of the cervical vertebræ, below the fourth, the arms are paralytic, but one may be more so than the other; and lately in University College Hospital, I had a patient with fracture of the fifth cervical vertebra, with displacement, and of the arch of the fourth without it, who had no power of action in any of the muscles of the upper extremities, yet he possessed feeling in these limbs down to the elbow.

FRACTURES OF THE STERNUM

Are less frequent than might be expected, considering its exposed

situation in front of the chest. For this fact, there seem to be two reasons; the first is, that the sternum is a spongy bone, less brittle than many others; the second is, that it rests on the cartilages of the ribs, which form so elastic a support for it, that it is enabled to elude any common violence by the yielding of those parts. However, notwithstanding these circumstances, it is sometimes broken. In the course of the last five years, we have had in University College Hospital several examples of fracture of the sternum. It may be fractured by gun-shot violence, or by the passage of a heavy carriage over the trunk, or by any other considerable force applied directly to the sternum. But the fracture may occur in another manner, which would not be expected. M. David, in his Mémoire sur les Contrecoups, relates a case, which took place in the following way: a bricklayer fell from the top of a house, and as he was falling, the middle of his back struck against a piece of timber, and the consequence of this blow was a fracture of the sternum. Now, the explanation given by M. David of the mode in which the sternum happened to suffer injury, is, that it was broken by the violent action of the abdominal muscles, diaphragm, and muscles of the neck, connected with this bone, whereby it was powerfully drawn at once in different directions. The truth of this account is confirmed by the curious fact, that the sternum is sometimes fractured during parturition by the violent efforts of the muscles attached to it; for cases of this kind are upon record.

A fracture of the sternum is not in itself dangerous; but it may be followed by severe and even fatal consequences, on account of the thoracic viscera happening to be injured at the same time: thus, the lungs or the heart may be penetrated by a fragment of a broken sternum. In the Museum of University College, is a preparation, exhibiting a laceration of the right ventricle of the heart by a portion of fractured sternum. M. Sanson met with a similar case, in which the heart was torn by a sharp spicula of a broken sternum. Blood may also be copiously effused in the cellular tissue of the anterior mediastinum; and sometimes considerable inflammation of this texture will ensue, leading to the formation of abscesses, and to various degrees of necrosis in the injured bone. One occasional complication of a fracture of the sternum is *emphysema*, or an inflation of a great part, or of the whole, of the cellular tissue of the body, which can only take place, however, when a spicular of bone happens to wound the lungs.

As the sternum is a superficial bone, its fractures are readily detected if there be displacement, the lower portion is generally situated in front of the upper one, and sometimes overlaps it. In most instances, a crepitus is perceptible, produced by the motion of the fragments on one another in respiration, and particularly obvious when the patient coughs, if the surgeon's hand be applied to the front of the chest. The patient, indeed, is usually teased with a

frequent dry cough, and when the lungs have been pierced by a spicula of bone, there is a spitting of blood, which may be followed by emphysema. The cough is particularly annoying, from the motion and disturbance it causes of the injured part.

If there be no displacement of the fracture, no complication, the principal indication is to keep the fragments as quietly as possible in their present position, which is most effectually accomplished by applying a broad roller round the chest, and making it press on the broken bone and ribs, so as to limit and diminish their motion. The bandage should be rather tight, and kept from slipping down by passing a piece of tape over each shoulder, from the centre of the roller behind to a point in front of the chest. If the tapes were fastened too near the axillæ, they would slip off the shoulder, and not answer the purpose of their application. In order to keep the fragments as quiet as possible, the trunk should be inclined forwards and the pelvis raised, so as to relax the abdominal muscles. Whenever the sternum is broken, another indication is to bleed the patient freely, because the risk of inflammation in the chest must be guarded against. Bleeding is also one of the most effectual means of relieving the cough, which always occasions severe pain, and a great deal of disturbance of the injured part. The lancet, antiphlogistic measures in general, especially quietude, the application of a broad bandage round the thorax, the relaxation of the recti abdominis, and the administration of an emulsion with a little opium, for the palliation of the cough, may be said to constitute the principal means of treatment.

But, supposing the fracture were attended with displacement, some practitioners advise us to relax the abdominal muscles, asserting that we shall then more easily succeed in reducing the fracture by pressure; while others say it is best to extend the spine by putting a bolster under the loins, as they assure us, that, in this position of the patient, the fragments can be more readily reduced. Now, if we were unable to effect a reduction by these or other plans, then the question would present itself, whether we ought to perform an operation for the purpose of bringing about a coaptation of the bone? Whether we should be justified in making an incision down to the fracture, and trying to raise the depressed portion of bone to its proper level, by means of an elevator? Without pronouncing an unqualified condemnation of this scheme, I may safely remark, that before we think of putting it in execution, we should be sure that the existing bad symptoms are really produced by compression of the thoracic viscera, and that they are of a sufficiently urgent nature. A moderate depression of a portion of the sternum would not be likely to create any dangerous symptoms, inasmuch as that bone lies over the anterior mediastinum, which merely contains cellular substance, pressure on which would certainly occasion no perilous consequences. But, we are also to recollect that the thoracic

viscera may be injured, and that such injury may be the true cause of the urgent symptoms. In this case, merely elevating a moderately depressed portion of the sternum would promise little relief. However, what I wish to be well considered is, whether the bad symptoms are produced by mere compression of the thoracic viscera, or by any other description of mischief. A case is recorded by Petit, in which the patient recovered from an unreduced fracture of the sternum, but experienced severe oppression in his chest, and great difficulty of breathing during the rest of his life. It seems, therefore, that, if the fragments are left displaced beyond a certain degree, the patient may suffer from the sternum being united in this deformed state. The cases, in which we might be called upon to trephine the sternum (another proceeding fortunately oftener spoken of than done), are, first, those in which purulent matter is confined in the anterior mediastinum in considerable quantity, so as to occasion dangerous oppression of the lungs; and, secondly, others in which it might be deemed right to adopt the practice to expedite the removal of a portion of dead bone. But even circumstances of this kind, truly requiring the operation, are exceedingly rare, for abscesses make their way outward, and dead bone will in time separate by the process of exfoliation. The formal application of the trephine to the sternum, for the purpose of raising a depressed portion of it, I think, would hardly be deemed justifiable in the present state of surgery.

FRACTURES OF THE RIBS.

The ribs are broken almost as frequently as any bones which can be mentioned, except the clavicle and radius; the middle ones being those which are most exposed to the accident, and especially the part of them near what is termed their angle. The upper ribs are rarely fractured, because they are protected in front by the clavicle, and covered by the pectoral muscles; while behind they are shielded, as it were, by the scapula and the thick muscles of the back. As for the lower ribs, they generally escape, in consequence of their being so short and moveable. The displacement of the fracture can only take place either inwards or outwards. On account of the connection of those ribs, which are usually broken, to the sternum in front, and to the vertebræ behind, there can evidently be no displacement in the direction either backwards or forwards. Neither can the ends of the fractured rib be thrown upwards or downwards, because the intercostal muscles, which are attached equally to both fragments, resist such an occurrence. However, the ends of the fracture may be forced inwards, or they may incline outwards; but, in by far the greater number of instances, it is in the direction inwards that the displacement happens. The detection of a fracture of the ribs is not generally attended with difficul-

ty; for if we merely place our hand on the part that has been struck, and desire the patient to cough, we can mostly perceive a crepitus; or the natural movements of respiration will render the same symptom manifest, if we merely press our hand upon the injured part of the chest. However, when the ribs are broken towards their posterior ends, under the thick muscles of the back, we may experience a great deal more difficulty in detecting a crepitus. When one or more of the ribs are broken, the patient is annoyed with a sharp pricking pain in the situation of the injury, and has a frequent dry cough, which, by the disturbance it occasions of the fracture, gives considerable pain. Now, supposing we were not able to feel the crepitus, and the diagnosis were obscure, we should then act according to the wise maxim laid down by all the best writers on surgery; namely, adopt precisely the same treatment as if the occurrence of fracture were a matter of certainty.

A simple fracture of one of the ribs, unattended with any particular complication, such as a wound of the lungs, emphysema, or effusion of blood in the chest, is not productive of any serious danger, and generally has a favorable termination. But when several ribs are broken, and blood is extravasated in the chest, or the lungs are wounded, the accident often has a fatal result. We hear almost every day of cases, in which several ribs are broken by the passage of carriages over the chest, and the fracture complicated with injury of the thoracic viscera, effusion of blood in the thorax, or an extensive inflation of the cellular tissue, constituting what is termed *emphysema*.

When the accident is free from the complications which have been specified, the right treatment is obvious. It is a rule when a surgeon is called to a strong young person, who has broken one or more of the ribs, to practice venesection. This is done with the view of diminishing the risk of inflammation within the chest, and the chance of internal hemorrhage. Then, another indication is to keep the rib as free from motion as possible. We are to endeavor, therefore, to prevent the intercostal muscles from taking part in the performance of the function of respiration, and try to make the patient breathe principally by means of the diaphragm and abdominal muscles. For this purpose, a broad roller is firmly applied to the chest; or a strong napkin, the two ends of which must be brought from behind forwards, and then laced over the sternum. The patient is thus enabled conveniently to regulate the tightness of the bandage himself, and, for the sake of his own comfort, he will be sure to maintain the requisite degree of pressure; for, when the roller becomes too slack, he begins immediately to experience the pricking pain again, and his cough is more troublesome. It is evident, that whether we employ a broad roller, or a napkin, it would slip down towards the loins, if the precaution were not taken to attach two pieces of tape to the central part of it near the spine, each of

which is to be carried over the nearest shoulder, and sewed to a point of the bandage or napkin below the clavicle. The French apply another tape under the perinæum, to prevent the roller from slipping upwards, but this would only be necessary in very corpulent subjects, and is rarely or never made use of in this country.

Fractured ribs, not attended with the complications already noticed, are generally treated with great success; and, in four or five weeks, a firm union takes place. If the patient be left entirely to himself, without any kind of surgical assistance, a broken rib will also, for the most part, unite; but in the museum of University College, is a specimen of a fracture of six ribs, where the fragments are only connected by a fibrous or ligamentous substance. Without speaking positively, I should presume, that, in this example, no effectual means had been adopted to keep the ribs motionless during the treatment.

In old persons, the cartilages of the ribs and the ensiform cartilage are frequently ossified; and when they are in this state, they are liable to be broken. The ensiform cartilage has been known not merely to be fractured, but to be depressed, or beaten inwards, so as to lacerate the diaphragm, and tear the liver. The cartilages in their natural state may also be ruptured; and, when this happens, they do not unite by cartilage, but by osseous matter, a bony clasp being formed, by which the fragments are bound together. The treatment of the latter injuries is the same as that ordinarily adopted for fractures of the ribs.

FRACTURES OF THE CLAVICLE.

The *clavicle* is perhaps more frequently broken than any other bone in the body; and for this there are several reasons. The accident is of frequent occurrence, in consequence of the bone serving two offices, which expose it to the effects of violence applied either to the shoulder or arm; namely, it keeps the scapula at a proper distance from the sternum, and is, at the same time, a point of support for the humerus, every impulse communicated to which bone is transmitted to it. In addition to these considerations, it is to be recollected, that the superficial situation of the clavicle in front of the shoulder, across the upper part of the chest, must expose it to injuries from blows, the fall of brickbats, or other violence applied directly to it.

Its middle portion, or greatest convexity, is more frequently broken than any other part of it, unless the fracture happens from a direct blow; in which case the injury may occur where the violence is applied. In such a case, the soft parts are always contused, and sometimes lacerated. In this manner a *comminuted* fracture may be produced; and, if the violence be great, the subclavian vessels and some of the nerves converging to form the axillary

plexus, may be injured. But, although the middle of the clavicle
is more frequently broken than any other part of it; yet, in cases
of direct violence, it usually breaks precisely in that situation on
which the force has fallen: thus, if the blow has taken place towards
that end of the bone which is nearest the acromion, then the frac-
ture will be there; if towards the sternal extremity of the bone, then
that portion of it will be broken. But fractures of the middle
third of the bone are commonly produced in another manner. One
office of the clavicle is to hold the scapula at a convenient distance
from the sternum, so that the motions of the arm may have a due
degree of freedom and extent. Now, this disposition is one of the
principal causes of the great frequency of fractures of the clavicle;
for, as this bone supports the scapula, every impulse and force
transmitted to the shoulder is communicated to the clavicle, which,
being slender, first bends and then breaks, just as a stick would
break under a force similarly applied to it, namely, in its central
part. In consequence, then, of the clavicle serving as a point of
support for the scapula, and, indeed, in particular positions, for the
whole of the upper extremity, it necessarily follows, that, when a
person falls upon his arm, in an extended state, the shock will be
communicated along the humerus to the glenoid cavity of the sca-
pula, and thence to the clavicle itself; so that whether the person
fall on his hand, shoulder, or elbow, the clavicle is likely to be
fractured at its centre.

A material difference in fractures of the clavicle will depend on
one particular circumstance; namely, whether the fracture has taken
place more towards the sternum, than the two bands of ligament
which tie the coracoid and acromion processes of the scapula to the
clavicle. If it has taken place on the scapulary side of the coraco-
clavicular ligament, it must be clear, that there can be very little
displacement, because the outer fragment will be fixed by the liga-
ment binding the clavicle to the acromion, while the inner one is
prevented from quitting its place by the coraco-clavicular ligament it-
self. But when the fracture takes place within the latter ligament, or,
in other words, more towards the sternum, yet not within the limits
of the rhomboid ligament, which ties the inner end of the clavicle
to the cartilage of the first rib, there will then be considerable dis-
placement, because nothing prevents the outer fragment from being
drawn down by the weight of the arm and shoulder, or from being
carried forwards and inwards by the pectoralis major and subclavius
muscles. Hence, whenever the fracture is within the coraco-clavi-
cular ligament, the displacement must be downwards, forwards, and
inwards. Another fact to be remembered is, that it is always the
outer fragment that is really displaced; the inner one being kept
from quitting its natural level by the action of the sterno-cleido-
mastoideus, and of the pectoralis major, which antagonise each
other.

When the fracture takes place on the outside of the coraco-cla-
vicular ligament, there is little or no displacement; and, if any at
all occur, it is only in a trifling degree, such as may be produced by
the outer fragment being slightly depressed, so as to slope down-
wards more than natural.   In this case, if we take hold of the hu-
merus, and push it directly upwards, we find that the outer fragment
of the clavicle is brought to its proper level again.   Some fractures
of the clavicle are *comminuted*; this may happen when the injury
has been produced by violence; and then the nerves converging to
form the axillary plexus, are exposed to contusion and laceration.
The late Mr. Earle recorded an interesting case of comminuted
fracture of the clavicle, where these nerves had been so injured that
paralysis of the arm ensued; and it was singular that the patient
could not afterwards put her hand into moderately warm water with-
out the effects of a scald being produced, characterised by vesica-
tions, redness, &c.   The fact is curious, as proving the share
which the *innervation*, or the nervous influence, has in enabling the
different parts of the body to bear particular temperatures.

When the clavicle is broken by a force applied to the outer part
of the shoulder, the fracture is mostly oblique; and if the violence
has been very considerable, the end of the bone may protrude through
the skin, and the case be *compound*.

The symptoms of a fractured clavicle are of the following kind:—
There is a depressed and sunk state of the shoulder, more especially
when the fracture is within the coraco-clavicular ligament; indeed,
the shoulder will then be considerably depressed, and at the same
time inclined towards the sternum; so that the space between the
median line of the trunk anteriorly and the tip of the acromion will
be remarkably diminished.   An attentive practitioner will at once
notice the approximation of the shoulder to the sternum.   Then if
we pass our finger from the sternal extremity of the clavicle, regu-
larly along that bone, as soon as it reaches the situation of the frac-
ture, we shall perceive a sudden depression in the line of the bone,
arising from the circumstance already sufficiently explained; name-
ly, the inclination of the external fragment downwards, inwards,
and forwards.   When we push the shoulder upwards, backwards,
and outwards, so as to bring the external fragment into its proper
situation, a crepitus is perceptible; or, even without elevating the
shoulder, if the displacement is not so great as entirely to separate
the two ends of the fracture from each other; then the crepitus
may be distinguished by putting our finger on the injured part and
gently moving the humerus.   When we first come to a patient
whose clavicle is fractured, we usually find him sitting in a particu-
lar position, with his head inclined towards the affected shoulder,
and his fore-arm bent, and quietly supported on the other hand.
He spontaneously chooses this posture, in order to relax the sterno-
mastoid muscle, and to prevent all motion of the upper extremity,

which would be exceedingly painful to him. Another sign of a fractured clavicle is the patient's inability to put his hand to his forehead; and the reason of this circumstance is, that the humerus has now no fixed point of support, and is deprived of that fulcrum which the clavicle naturally affords it. The infirmity which I speak of will always present itself, unless the fracture be on the outside of the coraco-clavicular ligament; for then the patient can sometimes raise his arm, and imperfectly perform the movement referred to. In other instances, he cannot bring his hand into contact with his forehead, except partly by bending the fore-arm, without moving the humerus, and partly by inclining the head downwards, so as to make it meet the hand. Lastly, in consequence of the way in which the outward fragment is displaced, there is always a manifest prominence, occasioned by the end of the internal fragment; the *rising end of the bone*, as it was termed by the old surgeons, who erroneously considered it to be above its proper level.

In the treatment, we should always remember the direction of the displacement, and attend particularly to the circumstance, that the outer fragment is carried inwards, forwards, and downwards, and that the internal one remains in its natural situation; indeed, the outer one may be situated directly under it. Therefore, in order to replace the external fragment, we should carry the shoulder backwards, outwards, and upwards, and take off the weight of the upper extremity. Now in this country, in nine cases out of ten, the contrivances, used for the treatment of broken clavicles, are the sling and the figure of 8 bandage, with which the shoulders are braced backwards. A roller is passed round one shoulder, and then across the back to the other shoulder, round it, and then over the back again, crossing the first part of the bandage, and being continued in the form of an 8. But this bandage does not scientifically fulfil all the indications required; and it even has a wrong operation; for it tends to draw the shoulder inwards, or towards the sternum, as much as it inclines it backwards; and the more tightly it is applied, the more it will force the shoulder inwards. After the explanation which I have given of the nature of the displacement, I scarcely need remark, that this action of the bandage is contrary to the proper object in view, viz., that of inclining the shoulder outwards. The French surgeons, who seem to have devoted great attention to the treatment of fractures, have contrived a better method—one that is more judicious and efficient. Desault, the great surgeon at the Hôtel Dieu before Dupuytren, employed a cushion or compress, thick at the upper part, and thin below, or formed like a wedge. He put the thick end of this wedge-like compress immediately under the axilla, and fastened it there by means of two pieces of tape passed over to the other shoulder. Now this compress, when the humerus is pressed close to the side, has the effect of throwing the head of that bone outwards; so that Desault, in truth, made the humer-

us a lever, with which he inclined the shoulder outwards, upwards, and backwards, and the wedge-shaped compress was his fulcrum. The elbow ought to be confined and supported in a sling, and kept close to the side with a bandage. Various mechanical inventions are sold for the cure of broken clavicles; but, so far as I can judge, if we understand the indications to be fulfilled, we shall always be able to accomplish every purpose with the aid of a compress, roller, and sling.

Boyer employs first a belt, which is buckled round the chest; secondly, a piece of dimity or quilted cloth, furnished with four straps, and intended to be put round the arm. With these straps, the arm is fastened to so many buckles on the belt. Thirdly, Boyer employs a sling to support the fore-arm and elbow. When the fracture is within the coraco-clavicular ligament, greater attention will be necessary, than in other instances, to keep the displaced fragment upwards, outwards, and backwards, because the degree of displacement is more considerable.

If a young female of the higher class of society were to break the clavicle in the latter situation, she should not merely be treated with mechanical means, but kept quiet in the recumbent position for two or three weeks, because any deformity of the neck, caused by irregularity in the union of the bone, which it is often difficult to prevent without such precaution, would be a considerable disadvantage to her.

[Our author does not give us any definite treatment for fractures of the clavicle, after all. In this country many surgeons prefer Desault's bandages, but I do not regard them as meeting the indications, and consider them worse than useless. I have seen one patient, who had lost the use of his arm, from the pressure upon the nerves by the wedge shaped pad, over which the limb is confined, in order to *pry* the shoulder outward. Fat persons, and those whose lungs are feeble, cannot endure the confinement of the chest, which the bandages impose.

The figure of 8 bandage, confined over a cushion placed between the scapulæ, draws the shoulders back, and brings the fractured portions into coaptation, nearly as well as it can be done. Mr. Cooper says this form of bandage draws the shoulder *inward:* now such cannot be the case. The principal objection to this bandage is, that it presses upon the outer fractured portion, and depresses it.

A shoulder splint is sometimes employed, which draws the shoulder upward and backward, and thus completely fulfils the indications. The length of the splint must be equal to the breadth of the shoulders. One end is confined to the sound shoulder, by means of a silk handkerchief, which passes under the axilla, between the shoulders it rests upon a fulcrum or pad, and then a second handkerchief passed under the axilla of the wounded side is tied over the other end of the splint and draws the shoulder upward and backward and brings the fractured ends into place. This splint and the figure of 8 bandage are better than all the apparatus ever invented.—ED.]

FRACTURES OF THE SCAPULA.

The greater portion of this bone is so deep, and so protected by thick muscles, that fractures of it rarely take place. The acromion is oftener broken than any other part, and next the lower angle. The coracoid process is sometimes fractured, but much less commonly than is generally believed; and, I think, the same observation may be made with regard to the neck of the scapula, which is so strong and so well guarded from the effects of external violence, that a fracture of it is by no means a common occurrence. In some instances, portions of the glenoid cavity are broken off; but this also is an event which is oftener talked of than really met with. The body of the bone is but seldom broken. Its fractures may be perpendicular, but the greater number of them are transverse. Sometimes the scapula is fractured in more than one place; and it may be broken in several pieces by great and direct external violence.

Fractures of the body of the scapula can only be produced by direct violence, as by a blow, a gunshot injury, or the passage of a heavy body over it. I know of no other way, in which such an accident can happen; and this fact explains why severe injury of the soft parts generally accompanies it. Sometimes the violence of the injury is such as to extend its effects to the thoracic viscera, and to cause effusion of blood in the chest.

When the *acromion* is *broken*, the patient inclines his head towards the injured shoulder, the arm hangs motionless by the side of the trunk; an acute pain is felt in the situation of the injury; when the patient attempts to move his arm the pain is much aggravated, and, in consequence of the deltoid being partly attached to the acromium, some of the fibres of that muscle lose their point of insertion, and therefore cannot afford due support to the humerus, which sinks down, and consequently a part of the natural fulness and rotundity of the shoulder is lost. In fact, the head of the humerus is not held in its place by ligaments, but principally by the muscles and tendons surrounding the joint. A fracture of the acromion may be known also by the presence of a crepitus; for, when we place one of our fingers on the broken part, or hold the extremity of the acromion between the finger and thumb, and then push up the humerus, or move it freely in various directions, the crepitus will be distinguishable. An interspace or irregularity may likewise be felt between the fragments. The shape or rotundity of the shoulder can be restored by pushing up the humerus; but directly the arm is allowed to descend again, the shoulder resumes the same flattened appearance, which had been noticed previously to the elevation of the limb.

If a fractured acromion be left to itself, it will generally unite either by bone or a ligamentous fibrous substance. Now, when

osseous union takes place under such neglect, the outer fragment is liable to point more downward than it ought, and the shoulder to be considerably weakened; a fact, first pointed out by Cheselden. A fracture of the acromion ought to be treated nearly in the same manner as a broken clavicle. The first indication is to take the weight of the upper extremity off the shoulder, by supporting the fore-arm in a sling, and keeping the elbow well up. Another indication is to prevent all motion of the humerus, which is accomplished by means of a sling and roller. A third is to incline the head of the humerus a little outwards, an object fulfilled with the assistance of a wedge-shaped cushion. Some surgeons prefer keeping the arm raised from the side, in order to relax the deltoid muscle, a method which ought to be adopted if the patient were obliged by circumstances to remain in bed. The acromion sometimes unites by bone; sometimes by ligament. In the museum of Univerity College are two preparations, one of which illustrates the first mode of union; the other, the second.

[Fractures of the acromion process, are not always followed by an osseous union; Delpech was in the habit of confining his patients to their beds, and keeping the arm at a right angle with the trunk. In this way he shortened the distance between the points of origin and insertion of the deltoid, and also took off the weight of the arm, and allowed the fractured surfaces to come in contact.

In order to avoid the confinement, required by this plan of Mr. Delpech, I have been in the habit of advising the use of an angular splint, one side of which was adapted to the side of the body, and rested upon the crista ilii; the other was adapted to the inner surface of the arm and fore-arm, so as to sustain them in a fixed position, at a right angle with the trunk. This same angular splint, meets the indications when we have a fracture at the cervix of the scapula to treat.—Ed.]

When *the lower angle of the scapula is broken off*, it is displaced downwards and forwards by the action of the serratus major anticus. In the treatment, the humerus may be brought forwards across the chest, and the hand confined upon the opposite shoulder; this position of the limb, which has the effect of bringing the fragments nearer together, is adopted abroad; but, in this country, when any part of the body of the scapula is fractured, we merely apply the spica bandage, the roller employed for which, after crossing over the scapula, is carried round the joint, and then over the back of the trunk, to below the opposite axilla, whence it passes in front of the chest to the injured shoulder, which it again encircles. The roller is conveyed in the directions here enumerated, until nearly the whole of it is expended, when it is made to conclude with a horizontal circle round the thorax. Such is the celebrated spica bandage, which is of little or no use; for it fulfils no particular indication, except the trivial one of retaining in its place the soap plaster, occa-

sionally put over the injured part. The sling is here the efficient part of the apparatus.

When the *coracoid process is fractured*, a great deal of mischief is generally done to the soft parts of the shoulder, just below the clavicle; for this fracture can only happen from great and direct violence. Hence the nature of the injury of the bone is often concealed by the great degree of swelling. Hence also much of the treatment consists at first in measures for diminishing the swelling, as venesection, leeches, cold lotions, &c. The coracoid process, when broken off from the rest of the scapula, is liable to be drawn downwards by the short head of the biceps, the coraco-brachialis and pectoralis minor, the muscles connected with it; they ought, therefore, to be relaxed. In one complicated instance, dissected by Mr. South, the coracoid process was broken, about half an inch from its tip, into two unequal pieces, the smaller of which remained connected above with the triangular ligament, and below with the short head of the biceps, which had pulled it down as far as the ligament would allow.* In the treatment, the shoulder should be kept quiet, which is effected by keeping the arm at rest with a sling and roller; for if the arm be motionless, the shoulder will also remain quiet.

Fractures of the neck of the scapula are not common accidents, but they are possible, and liable to be mistaken for dislocations of the humerus downwards, inasmuch as the weight of the limb carries the arm down along with the glenoid cavity of the scapula, and a hollow is felt under the acromion.

However, the difference between the two cases may readily be perceived, by attending to the following circumstances. In a dislocation, there is no crepitus ; we cannot move the humerus about without opposition, as we can when the neck of the scapula is broken; the head of the humerus can be felt either in the axilla, or under the pectoral muscles; the axis of the humerus is changed; and the motions of the arm are stiff and confined. But, in a fracture of the neck of the scapula, we cannot feel the head of the humerus in either of the situations which I have specified; a crepitus may be distinguished when we take hold of the coracoid process, and the humerus is pushed up and moved about; no particular resistance is then made to the motion of the arm; and the proper shape and position of the shoulder and arm are easily restored by pushing the humerus upwards; but, as soon as the support is removed, the deformity returns.

The treatment consists in keeping the head of the humerus inclined outwards, by means of a thick cushion below the axilla; in supporting the elbow effectually with a sling; and in preventing all

---

* J. F. South, in the Med. Chir. Trans. vol. xxii. p. 105.

motion of the humerus by binding it to the side of the chest with a roller.

FRACTURES OF THE HUMERUS

Are distinguished into those which take place higher up than the insertions of the pectoralis major and latissimus dorsi muscles; into those of the middle of the shaft of the bone; and into others nearer the elbow. Instances have been known, in which the fracture was situated precisely in the true neck of the bone: Sir Astley Cooper had an opportunity of dissecting a subject, in which he found the fracture actually placed, as I have mentioned, within the capsular ligament. No bony union had occurred; the fragments being joined together by means of a ligamentous substance.

A fracture through the anatomical neck of the bone, at the tubercles, is a case which has lately been further considered by the same experienced surgeon. He describes the accident as being of frequent occurrence in young persons; as happening more rarely in the old; and still more rarely in the middle age. In children, it arises from a fall on the shoulder, and it has been known to be complicated with a fracture of the clavicle. As the head of the bone remains in the glenoid cavity, the shoulder does not lose its rotundity as in a dislocation. A projection of bone is perceived upon the point of the coracoid process; and when the elbow is raised and brought forwards, this projection is rendered very conspicuous. By drawing down the arm the projection is removed; but it immediately reappears on the extension being discontinued. The motion of the shoulder is painful; and the child can only raise the arm with the other hand; and the elbow is with difficulty raised from the side. After the accident, a great quantity of ossific matter is thrown out from the periosteum and fractured neck of the shaft, but very little from the broken head of the bone. In one of Sir Astley Cooper's preparations, a cup of bone is formed upon the fractured neck, so as to prevent the head from being separated from it.

In a young subject, Sir Astley Cooper recommends treating this case by binding a splint on the front and back part of the arm with a roller; placing a pad in the axilla; and using a clavicular bandage; the hand, but not the elbow, being supported in a sling. As in old persons the injury is more severe, leeches, evaporating lotions, and quietude, are to precede the application of the mechanical means. In the young, passive motion is to be employed in a month; and, in the old, at the expiration of from two months to twenty weeks[*].

When the *fracture* takes place somewhere *between the tubercles*, and *the insertions of the pectoralis major, coraco-brachialis latissimus dorsi, teres major, and deltoid*, the upper fragment has a tendency to

---

[*] Sir Astley Cooper in Guy's Hospital Reports, vol. iv. p. 277.

be drawn outwards by the supra-spinatus, infra-spinatus, and teres minor, and the lower fragment to be pulled inwards by the latissimus dorsi and pectoralis major, and at the same time upwards by the biceps, coraco-brachialis, and long portion of the triceps.

Fractures of the upper part of the humerus should be discriminated from dislocations. In a fracture, as the head of the bone is yet in the glenoid cavity, there is not the hollow under the acromion remarked in a dislocation: however, there may be a little depression, or diminution of the rotundity of the shoulder, in consequence of the lower fragment being sometimes not displaced upwards so as to produce a shortening of the limb, but, on the contrary, drawn a little downward by the weight of the part, so as to put the deltoid on the stretch, and thus, in one respect, a degree of resemblance to a dislocation may be produced. On careful examination, however, the head of the humerus may be felt in the glenoid cavity, and the shaft of the bone does not offer that resistance to being moved about in various directions, which is experienced in a dislocation. In the latter case, the head of the bone may generally be felt either in the axilla, or under the pectoral muscles: in a fracture, there is a crepitus; but, in a dislocation, this symptom is absent.

In the *fracture between the tubercles and the insertions of the above named muscles*, when the elbow is moved upwards, the broken extremity of the lower fragment projects on the inner side of the coracoid process, and it sinks when the support of the elbow is removed. When the arm is rotated at the elbow, the broken end of the main portion of the bone is felt to roll. There is no marked depression under the acromion, or but very little from the deltoid muscle being drawn down. The motion of the shoulder is exceedingly painful; and one or more of the fingers are generally painful, or contracted, from irritation of the axillary plexus. The diagnostic signs are considered by Sir Astley Cooper to be, the lodgment of the head of the bone in the glenoid cavity; its being unaffected by rotation of the elbow; the fractured neck being perceptible under the pectoral muscle; and the surgeon being able to move the arm more freely, than in other fractures of the neck of the bone.*

Mr. Robert W. Smith has made some interesting remarks on a fracture now and then met with, and the symptoms of which may completely perplex a practitioner, not aware of the possibility of its occurrence. The injury of the upper extremity of the humerus is of the following kind:—" A fracture, traversing the upper part of the bicipital groove, detaches the greater tubercle of the humerus; thus annulling the action upon that bone of the supra-spinatus, infra-spinatus, and teres minor. The folds of the axilla, the subsca-

---

* Sir Astley Cooper in Guy's Hospital Reports, vol. iv. p. 281.

pularis, and the anterior portion of the deltoid, then act almost un-opposed, and draw the head of the bone forcibly inwards, against the inner part of the capsular ligament; and if, at the same time, the inner border of the glenoid cavity be broken, the head of the bone passes still further inwards, and beneath the coracoid process, amounting at length to an actual displacement, which is permitted by the increased size of the joint, just as a displacement of the head of the femur will often be the consequence of a fracture of the acetabulum." Mr. Smith considers it not very difficult to distinguish a fracture of the greater tubercle from a luxation of the head of the humerus. "One of its most remarkable and diagnostic features is the great increase in the breadth of the articulation: moreover, the glenoid cavity is not entirely abandoned; the acromion process is not as prominent as in luxation; the displacement is very readily produced. We cannot depress the deltoid muscle, as in disloca-tion; and lastly, the violence which produced the lesion, has been directly applied to the injured part." Mr. Smith sus-pects, that bony union of such a fracture would be difficult to effect.*

Fractures of the middle of the humerus are very common, and easily recognised; for when the fracture is oblique, there is a short-ening of the limb, and not only does displacement happen in this, the longitudinal direction, but there is also an angular deformity, the limb being flexible in the situation of the injury, in consequence of the solution of continuity in the bone. A crepitus will likewise be readily perceived, so that no difficulty can present itself in the diag-nosis.

Fractures situated towards the elbow sometimes extend into the joint, and either the inner or the outer condyle may be detached. A fracture of the external condyle produces pain in the movements of flexion and extension of the elbow; but Sir Astley Cooper deems the crepitus, occasioned by the rotatory motion of the radius, the principal diagnostic symptom. If the portion of the condyle bro-ken off be large, it is drawn a little backwards, and the head of the radius with it; but if the portion be small, this displacement does not occur. By a careless practitioner, an oblique fracture, detach-ing the internal condyle, may be mistaken for a dislocation of the ulna backwards; but the error will not happen if it be recollected that, in such a fracture, there will be crepitus, and that, after we have apparently reduced what may be supposed to be a dislocation, the displacement will immediately return on the limb being left to it-self. But, of all accidents about the elbow, that most likely to be mistaken for a dislocation is a separation of the lower epiphysis of the humerus in a young subject, the olecranon projecting considera-

---

* R. W. Smith in Dublin Journ. of Med. Science, vol. xii. p. 224.

bly backward.   The part is readily restored to its proper shape, but, on being left to itself, the deformity immediately returns.

In the treatment of fractures of the humerus, the principal indications, after the requisite extension, counter-extension, and coaptation, have been performed, are, first, to support the fragments duly in their proper position with respect to each other; secondly, to prevent all motion, not only of the broken bone itself, but also of the ulna and the radius.

When the fracture is situated above the insertion of the pectoralis major and latissimus dorsi, Sir Astley Cooper recommends splints, the clavicular bandage, and the wedge-shaped pad in the axilla, with its broader part upwards; but, says he, " above all, it is necessary to permit the arm to hang by the side unsupported at the elbow, so as to let the weight of the arm be a constant source of extension upon the broken end of the bone." In one case, Mr. Tyrrell failed in keeping the fracture in a state of coaptation, until he had recourse to a rectangular splint, a part of which rested against the side, while the arm, raised to a right angle, reposed upon the other part of it.

When the fracture is situated in the middle third of the humerus, it is usual to apply either two or four splints; some practitioners use four, and others only two; one on the outer part of the arm, and the other on the inner side of it.   A sling is always necessary.   An assistant is to take hold of the elbow and hand, and support the forearm, while the surgeon puts on the apparatus; during which part of the business, the former should make a little extension, so as to bring the ends of the fracture in apposition.

When the fracture takes place more towards the elbow joint, common splints are deficient in one material respect; namely, they cannot control the movements of the radius upon the articular surface of the humerus.   Such splints can operate also but trivially and imperfectly, even in steadying the fragments of a fracture so low down; for only a small part of the apparatus extends below the solution of continuity.   Of late years, therefore, it has been customary in cases of this description to employ an angular splint, one part of which is adapted to the inner side of the arm, and the other part to the palmar side of the fore-arm.   I consider this apparatus far more efficient, and better calculated to fulfil scientifically the chief indications.   The angular splint, put on in the manner I have explained, acts powerfully in keeping the humerus steady, and in preventing all motion of the elbow-joint and bones of the fore-arm.   Simple as the contrivance is, and essential as it is to the successful treatment of fractures near the elbow, it has only been employed a few years.   Of course, the arm is to be put in a sling in this, as well as in other fractures of the humerus.

When the outer condyle is detached, we should relax the muscles arising from it, which is accomplished by placing the hand in

the supine position, with the fingers extended; on the contrary, when the inner condyle is broken off, the muscles, arising from that process, should be relaxed, which is done by placing the hand in the state of pronation, with the fingers bent. If the hand be kept supine, the angular splint, already described, will not fit the limb; and another kind of splint, which is also an angular one, but so contrived as to accommodate itself to the front of the arm, will be useful, with a corresponding one for the posterior part of the limb.

If, when a surgeon is called to a fracture of the humerus near the elbow, he should not happen to be provided with angular splints, I recommend him to use strong thick pasteboard, which, after being softened in water, is to be applied. When dry, it will form an excellent case for the limb, answering in every respect as well as the angular splint.

In the treatment of fractures of the lower end of the humerus, passive motion should begin at the expiration of three weeks in a child, and of four in an adult, in order to prevent anchylosis.

Sometimes the humerus is first dislocated into the axilla, and its head then broken off, which is thrown on the inner side of the inferior costa of the scapula. Sir Astley Cooper has seen many of these cases in the living, and has dissected three in the dead. In one of the latter, the fractured neck of the shaft of the humerus was situated in the glenoid cavity, widely separated from the head of the bone; and the end of the broken bone had formed with the glenoid cavity a new and good articulation, with a capsular ligament over it, partly of new production.

With regard to the diagnosis, the depression of the shoulder is less striking than in simple dislocation into the axilla; the head of the bone can be distinctly felt in the latter situation, but does not roll when the rest of the humerus is rotated; a crepitus may generally be felt, if the elbow be raised outwards, and the arm rotated; the end of the shaft advances towards the coracoid process, and though readily moved back, it easily slips forward again; and, lastly, the violence required for the production of this accident being greater than that causing a simple dislocation, the degree of contusion and the pain and swelling are more considerable. Here extension is only useful in bringing the upper end of the shaft into the glenoid cavity, where a useful joint is formed. The head of the bone is not acted upon by it. A pad is to be placed in the axilla, a clavicular bandage used, and the arm supported in a sling.*

FRACTURES OF THE FORE-ARM

Are remarkably frequent. Fractures of the radius perhaps happen

---

* Sir Astley Cooper in Guy's Hospital Reports, vol. iv. p. 272.

as often as those of any other bone in the body, except the clavi-
cle; and the reason of this is, because it is articulated with the
carpus, and has to receive all the force communicated to the hand
in falling, and indeed on every other occasion. When a person
falls, he stretches out his hand to save himself; this part then comes
violently in contact with the ground, and the force is immediately
communicated from it to the radius, which bends and gives way
generally in its central portion, but sometimes near the wrist, a
fracture of the upper end of the radius rarely or never happening in
this manner. The majority of fractures of the radius take place in
its middle third, or near the wrist; and when the upper part hap-
pens to be broken, the injury is produced by a blow, or some
species of direct violence. Another reason why the radius is
oftener fractured than the ulna is, that the former is situated at the
outer and upper part of the fore-arm, so that it is more exposed to
the action of direct violence than the neighboring bone.

[A fracture at the cervix of the radius, is said never to occur;
such is not the fact. Professor Watts, of the College of Physicians
and Surgeons, of this city, has in his museum a beautiful specimen,
showing a fracture at this point in the radius. It is united by liga-
ment.—Ed.]

When a fracture of the radius is suspected, we should first in-
quire, whether the patient can or cannot perform the movements of
pronation and supination of the hand; for if he can do these well,
then we may be certain that the radius is not broken. Or we may
take hold of the patient's hand and rotate the radius for him, while
the fingers of our left hand are placed upon it. If the bone is
not broken, the upper portion of it will follow the movements
of the hand, as it always naturally does; but if it is broken,
considerable pain will be felt on attempting these motions of
supination and pronation—there will be a crepitus; and the upper frag-
ment will remain motionless. In many instances there is displacement,
the lower portion of the bone being in the prone position, and
the upper in the supine one; and the ends of fracture tending towards
the inter-osseous space. There can be no alteration in the length
of the bone or limb, while the ulna remains perfect, and serves as
a kind of splint.

When *both bones* are *broken*, the nature of the accident is still
more obvious, because there is an angular deformity of the limb,
and a distinct crepitus, as well as a loss of the motions of supina-
tion and pronation.

Fractures of the ulna alone are generally produced by direct
violence, as blows, kicks, &c.; for any force or violence commu-
nicated to the hand has little or no effect upon that bone. This
circumstance enables us at once to understand why, when the ulna
alone is broken, it is generally by direct violence; and why, also,
when both bones are simultaneously broken, it is most commonly

also by direct violence, such as the passage of a heavy body over the arm, or a violent fall, or blow on the injured part.

When the radious is broken, we should bend the elbow, and then make a little extension and counter-extension, taking care to avoid pressing the ends of the fracture into the inner-osseous space. It is a grand point in the treatment to preserve the inter-osseous space perfect; for, if we neglect this indication, the radius and ulna may grow together, and the motions of supination and pronation be for ever lost. Splints for the fore-arm, therefore, should not be jointed longitudinally, but be rather of a flat or trivially excavated shape; and in particular, a tight bandage, which would depress the radius too much against the ulna, ought not on any account to be employed. Two splints are commonly put on; and, after the reduction, either no roller at all should be applied directly to the fore-arm itself, or merely a slack one. Then one of the splints, properly padded or lined with soft materials, is to be laid along the inner part of the fore-arm, from the bend of the elbow nearly to the ends of the fingers, and another along the outside of this part of the limb. It is generally considered best to keep the radius nearly in the mid-state between pronation and supination. Sometimes when the radius is broken near the wrist, and a good deal of swelling is present, we might be inclined to suppose the case a dislocation; but generally there will be no difficulty in making out that the case is a fracture, for (to say nothing of the rarity of such a dislocation) the nature of the injury is generally indicated by a crepitus, except in young subjects, in whom the case is often a mere separation of the epiphysis. We can also constantly feel the styloid process below the solution of continuity. In this case, if displacement occur, the lower fragment is mostly drawn backward by the action of the long supinator and extenso carpi radialis, but, in few instances, forward by the influence of the pronator quadratus. The reason of the greater frequency of the displacement backward is in some measure explained by the patient usually falling directly on the hand at the period of the accident, by which means the fragment is forced backwards. The fragments must be put into the proper position, and splints and a sling employed, due care being taken to prevent the hand from inclining too much downwards.

The olecranon is most liable to be fractured by falls on the elbow and not usually by the action of muscles, as is the case with the knee-pan. It may be broken at its point, or more towards its base. In some instances, when the fracture occurs near its base, and the ligamentous fibres, extending from the olecranon to the coranoid process of the ulna, are not completely ruptured, the upper fragment may not be displaced or retracted; but if those fibres be completely torn, the upper fragment will be drawn upwards by the triceps. The extent of separation between the fragments will also be influenced by the circumstance, whether the elbow be bent or ex-

tended; for, in the latter position, the lower fragment does not contribute to the displacement at all; but, when the arm is bent, the lower fragment recedes, and materially increases the interspace between the fracture.   When the upper fragment is drawn away from the lower one, no crepitus can be perceived, unless the arm be extended, and the upper fragment pressed down; but the nature of the case will always be clear enough, even without this symptom, except when the limb is much swelled.   Indeed, the swelling, consequent to fractures about the elbow, is frequently prodigious, and comes on with surprising rapidity; so that it is an object always to examine the limb well at an early period, before any obscurity has arisen from the enlargement of soft parts.   Whether the patient retains much power of extending the arm, materially depends upon whether the liga mentous fibres, spread over the olecranon from the coranoid process, happen to be torn or not; because if they should be completely ruptured, that power would be exceedingly diminished.

There is a difference of opinion among practitioners, respecting the best mode of treating fractures of the olecranon.   We should naturally suppose that the limb ought to be kept extended, the greatest approximation of the fragments being thus produced; but Désault, the great predecessor of Dupuytren, at the Hôtel Dieu in Paris, objected to this posture of the limb, on the ground that, although the fragments grew together, yet they were separated at their internal edges, and the joint remained permanently weak. Hence he recommended a middle position, between the half-bent and perfectly extended state, or, in other words, a trivially bent position of the elbow.   The same practice is also preferred by a few surgeons of the present day, as being, according to their judgment, less irksome to the patient and more efficient, inasmuch as the cure takes place without any imperfection being left in the action of the joint.   But I do not consider this point as one entirely settled; for several practitioners of the greatest experience, among whom is Sir Astley Cooper, are decidedly of opinion, that the extension should be complete.   Sir Astley Cooper finds, as other surgeons do, that the olecranon generally unites by ligament; and he observes, that if the limb be kept somewhat bent, there will be greater length of the ligamentous substance, and the joint will be a proportionably weaker.   The late Mr. Sheldon was an advocate for complete extension; and, as far as my own experience goes, I have found no reason to follow Desault's advice on this matter. In fact, I have never seen any ill consequences from keeping the arm extended, and mean to follow this method, until its disadvantages have been more clearly proved.   Frequently, in a case of fracture of the olecranon, we cannot apply the bandage, or any splint, until the fourth or sixth day after the accident, and sometimes not till later.   Now this is one example, in which the good general rule

of applying the splints, as soon as possible, to a broken limb, should be dispensed with; our duty is to try to reduce the inflammation and swelling before any apparatus, that makes pressure on the limb, can be advantageously applied. We are called upon, therefore, to employ leeches, cold evaporating lotions, purgatives, and even bleeding from the other arm, if the inflammation and swelling are very considerable. The inflammation having been reduced, we put on a figure of 8 bandage, which will answer pretty well, especially when a well-padded splint is laid along the front of the limb, in order to prevent flexion of the joint. If we choose to adopt the plan of slight flexion, we may put on a splint constructed with a kind of hinge, or joint, exactly in front of the elbow, and furnished with a screw by means of which its degree of flexion can be regulated and fixed.

In *compound fractures of the olecranon*, in consequence of the degree of inflammation and swelling sure to ensue, it is best not to apply any splint or bandage at first; but to lay the limb on a pillow, close the wound, and try to keep down inflammation of the joint with cold evaporating lotions, leeches, venesection, and saline purgative medicines. If matter form, an early opening is to be made. Bad comminuted fractures of the olecranon sometimes occasion a necessity for amputation, as was exemplified in the case of Charles Hussey, under my care in University College Hospital, in November, 1835.

When the *coronoid process* is broken, and the arm extended, the olecranon projects back in such a degree as to create the appearance of a dislocation; but it may be known that this is not the case, because, directly the arm is bent, the olecranon returns to its natural place again; and in addition to this circumstance, a crepitus can be felt. The treatment consists in keeping the fore-arm and elbow at rest in the bent position, and applying a figure of 8 bandage round the joint, after having had recourse to leeches, cold lotions, &c. for three or four days, in the event of the swelling being considerable.

But fractures about the elbow are not always so simple as the cases we have been noticing; they are sometimes very complicated. Thus one preparation in the museum of University College illustrates a case, in which the ulna is broken at the elbow, the posterior fragment being displaced backwards by the action of the triceps; the coronoid process is broken off; the upper head of the radius is also dislocated, from the lesser sigmoid cavity of the ulna, and drawn upwards by the action of the biceps. In this complicated accident, the ulna is broken in two places.

FRACTURES OF THE CARPUS, METACARPUS, AND BONES OF THE FINGERS.

The carpal and metacarpal bones can be broken only by great direct violence, as by gun-shot wounds, the action of machinery on the parts, or the passage of the wheel of a heavy carriage over them. Now, under these circumstances, so much injury is frequently done to the soft parts, that it becomes necessary to amputate without delay. However, if the case will admit of an attempt being made to preserve the limb, or any part of the hand, the main indications will be, to remove all loose splinters of bone which are near the surface, to apply for the first three or four days light superficial dressings and cold lotions, and afterwards emollient fomentations and poultices, till the inflammation has subsided and the sloughs have been detached. If there has not been much bleeding from the part, leeches may be applied to it. The bones of the fingers are seldom fractured, for they can only be broken by direct violence. The treatment is simple, the injured finger merely requiring to be supported with pasteboard, and the hand kept in a sling.

FRACTURES OF THE PELVIS.

The particular shape of the pelvis, the sort of circle or arch which it represents, and the vast strength and thickness of its several bones, are circumstances at once apprising us, that the pelvis can be broken only by great and extraordinary degrees of violence directly applied to it; as by the passage of a heavy waggon over it, or by its being pressed between the wheel of a carriage and a wall or post. From the manner in which these fractures usually happen, it is manifest, that the injury done to the bones is unfortunately not the most serious part of the mischief; the soft parts generally, and often the bladder or colon, being seriously injured. Sometimes the bladder or intestines are ruptured; sometimes blood is extravasated either in the abdomen or the pelvis; and, in other instances, where the rami of the ischium and ossa pubis are broken, spiculæ of the bone may be driven into the bladder or urethra. A preparation in the museum of University College illustrates a case, in which there was a fracture of the ramus of the ischium, and one of the fragments tore the urethra; the consequence was an effusion of urine in the cellular substance of the perineum, and sloughing of all the parts among which the urine passed. Another preparation, in the same collection, was taken from a person, whose rectum was lacerated by a portion of fractured sacrum. In such cases, one frequent consequence is a paralysis of the bladder and lower extremities. In gun-shot fractures of the pelvis, spiculæ of bone may

be forced completely into the bladder, and afterwards become the nuclei of calculous formations, so as to oblige the patient to submit to the operation of lithotomy.

Fractures of the anterior superior spinous process, and of the crista of the ilium, may take place, without much additional mischief; but other fractures of the pelvis are frequently fatal. I have seen two cases, in which the accident arose from the passage of heavy waggons over the pelvis: one of these patients died in a quarter of an hour. There will sometimes be effusion of blood in the abdomen; and, in other instances, the bladder or intestines are ruptured. The fracture sometimes extends through the acetabulum, and then the case is liable to be mistaken for a dislocation of the hip; because the superior fragment is drawn upwards, and the limb consequently shortened, while the trochanter major is thrown a little forward: and thus there will be two symptoms of a dislocation of the hip. However, if the hand be applied to the crysta of the ilium, and the thigh bone be then rotated, there will be no difficulty in making out the accident; for there will be a crepitus, and not that considerable resistance to motion of the femur, so invariably experienced in a dislocation.

With regard to the treatment of fractures of the pelvis, if we except antiphlogistic measures, there is not a great deal to be done. A bandage might be applied round the pelvis; but, as its usefulness is questionable, the best practical surgeons do not have recourse to it. We should bleed the patient freely, to prevent inflammation of the pelvic viscera; and if the bladder or urethra were ruptured or paralytic, a catheter should be passed, to prevent effusion of urine. In the latter case, we should keep the catheter in the passage, lest the urine escape by the lacerated opening into the cellular membrane, whereby great, and sometimes fatal, mischief would be produced. Repose, antiphlogistic measures, and attention to any particular symptoms, which may arise, but especially retention of urine, are the chief objects in the management of fractures of the pelvis.

Some fractures of the pelvis have a favorable termination, the bones uniting, and the patient recovering. One preparation, in the museum of University College, was taken from a person, in whom the sacrum and os innominatum had both been fractured; yet, the broken parts united, so that the patient probably lived long after the injury. The chances of recovery depend, however, on the degree of violence with which the injury is inflicted, and its effects on the viscera; and, if the bladder, bowels, medulla spinalis, and other important organs escape injury, the patient may ultimately get well. Sometimes he dies of peritonitis, of which I have seen instances.

FRACTURES OF THE THIGH BONE

Are divided into three classes, in respect to situation: the first com-

prises those in the upper part, or in the neck, of the bone; the second, such as take place in the middle third of its shaft; and the third, fractures situated in the lower third of the shaft, or towards the condyles. Those in the middle of the shaft are most frequent in persons under a certain age; but in old subjects, fractures of the neck of the bone take place with remarkable frequency.

Fractures of the shaft of the femur may be *simple* or *compound*; they may also be *complicated* with a wound of the femoral artery, which, however, is a rare occurrence. Sir Astley Cooper met with such a case, in which it was necessary to perform amputation. Fractures of the thigh bone may also be *double*. In children, the shaft is frequently broken in the *transverse* direction; but, in other subjects, the fissure is most commonly *oblique*. The fracture may be caused by direct violence, as by the passage of the wheel of a heavy carriage over the limb, the fall of a heavy body upon it, the kick of a horse, and various other kinds of injury; but, on other occasions, the femur is broken by some description of force, which first bends it, and when it has yielded as much as it can, it breaks, generally at some point of its middle third.

What are the symptoms of a fracture of a shaft of the thigh bone?—Supposing the fracture to be oblique, a shortening of the limb is usually noticed, the lower fragment being drawn behind the upper one, and a little inwards; the limb is flexible in the situation of the fracture; the lower fragment, with the knee, leg, and foot, is rotated outwards, all the stronger muscles, acting upon that part of the broken bone, tending to twist it in this direction. Although the lower fragment is commonly drawn upwards and inwards behind the upper one, it is possible for the lower fragment to be displaced in a different manner, and so as to lie in *front* of the upper one; but this occurrence is a deviation from what is ordinarily seen, and is explicable by the particular mode in which the accident has been produced, viz. by the application of direct violence, and the operation of the force upon the posterior part of the limb, so as to propel the lower fragment forwards. Another symptom of a broken thigh is a crepitus, that can be distinctly felt on moving the limb. If the fracture be an oblique one, together with the shortening of the limb, there is a rotation of it outwards, and, what is termed the angular deformity, the axis of one portion of the bone not corresponding to that of the rest of it. The retraction of the lower fragment constantly occasions an increased bulk, or fulness of the upper part of the thigh, because the attachments of several of the muscles are brought nearer together, and their bellies swelled into a preternatural shape. The truth of this observation is well illustrated in the state of the adductor muscle, which, by forming a considerable prominence at the upper and inner part of the thigh, communicates to it a very unnatural shape. That it is the muscles which produce the displacement of the fractures, cannot be doubt-

ed, because, if the muscles of the broken limb were paralytic, there would not be any retraction of the lower fragment, or shortening of the thigh. In a person affected with paralysis, there might be no shortening of the limb at first, or while the muscles were incapable of action; but if the paralytic affection happened to yield before the fracture had united, a retraction of the lower fragment would yet ensue. Indeed, such a case is recorded by Bichat. When the accident took place, all the muscles of the lower extremity were in a paralytic state; and though the fracture was an oblique one, no retraction whatever of the inferior fragment followed. The moxa was applied, and, in a few days, the muscles began to regain their power of action; and in proportion as this improvement was effected, the ends of the fracture acquired a tendency to displacement, not previously evinced, and a considerable retraction of the lower fragment ensued. In transverse fractures of the shaft of the femur, no shortening of the limb may happen, yet the angular deformity and rotation outwards will be observed. The foregoing observations render it manifest, that it is chiefly the lower portion of the broken femur which is displaced; but it would be incorrect to regard the displacement as exclusively affecting only the lower fragment. When the patient is placed on too soft a bed, which yields to the weight of his trunk, the pelvis sinks, and pushes the upper fragment along with it, which thus has a disposition to be propelled over the lower one. Supposing also the fracture to be situated just below the trochanter minor, the psoas and iliac muscles, attached to that process, might act with great effect in displacing the upper fragment in the direction forwards and upwards.

It was principally with reference to fractures of the lower extremity, that Pott recommended the plan of attending to the relaxation of the muscles as the best means of facilitating the reduction, and promoting the maintenance of the fragments in their right place. One would suppose, from several passages in his treatise, that he really imagined it possible completely to relax all the muscles by a certain position of the limb, and this in such a manner as entirely to deprive them of all power of disturbing the ends of the broken bone. No position of the limb, however, will do so much as this eminent surgeon was induced to believe. A certain position may relax those muscles, which have the greatest power of disturbing the fracture; yet the mass of muscular fibres remaining unrelaxed, will always be sufficient to derange the fracture; and consequently position alone, however important and useful it may be, will not accomplish strictly what Mr. Pott represents; it will not effectually deprive the muscles of the power of disturbing the fracture. This truth enables us at once to understand how necessary it is to attend to other means for maintaining the reduction, and especially to avail ourselves of the best mechanical contrivances for this purpose. So correct is the principle which I am now adverting to, that if the particular posi-

tion of the limb, selected for the purpose of relaxing the muscles, were to be incompatible with the employment of the most efficient apparatus, then, the treatment would be erroneous, because, advantageous as position may be in relaxing the most powerful muscles connected with the broken limb, the aid of an efficient apparatus is still more important. From what is stated in my general observations on Fractures, in the first section of this work, even the superior usefulness of relaxing the muscles is now sometimes disputed, and the plan of keeping them in the opposite condition advocated.

Broken thighs are treated on three different plans, each of which is occasionally preferred. In the first, the limb is kept extended, and the patient lies on his back; a position disapproved of by Pott, because it does not relax those muscles which have the greatest power in producing displacement, namely, those which are capable of drawing the lower fragment upwards, inwards, and behind the upper one, or, in other terms, the muscles arising from the pelvis, and inserted either into the femur, the patella, the tibia, or the fibula, and which, making the pelvis their fixed point, and the portion of the limb below the fracture their moveable one, displace the lower fragment in the foregoing direction.

In the extended position, various kinds of long splints are employed. Désault employed three splints; one on the outside of the limb, a second on the inside, and a third on the upper part, or front of the thigh. He was very particular in placing the patient on a firm unyielding bed; for if the pelvis sinks into a hollow of the bedding, this change will inevitably derange the position of the fragments. He began with applying the eighteen, or many-tailed bandage, then a long splint, well padded, on the outer part of the limb; he next put a handkerchief or band on the perineum, or rather on the tuberosity of the ischium, the ends of which handkerchief or band were carried through a fissure in the upper part of the long external splint, and the effect of this was to prevent the splint from slipping upwards. Then the foot was also made steady by passing a handkerchief or bandage through a fissure in the lower part of the splint, which was brought over the foot across the instep, and then fastened to the splint again. Thus the limb was fixed and secured both at the hip and the foot. Other splints, however, were made use of: one at the inner side of the limb, extending from the groin to the foot; and a shorter one, reaching along the front of the thigh from the groin to the kneepan.

Boyer invented another apparatus, which was also intended to be used in the straight position of the limb. His long external splint is furnished with a screw at the lower end, by means of which it can be lengthened or shortened at pleasure. The principle of his apparatus is to keep up permanent extension; but, for the screw to have its full effect, it is necessary that the upper end of the splint

should be securely fastened to the pelvis. For this latter purpose, Boyer put a thigh-strap over the tuberosity of the ischium, much in the same manner as Désault did the handkerchief, or band; but the portion of the thigh-strap below the crista of the ilium, on the outside of the pelvis, had a kind of fob or pocket in it, calculated to receive the upper end of the splint, and thus prevent it from slipping upwards, or moving at all laterally. The limb having been first put up with the many-tailed bandage, the long external splint, lined with soft materials, is applied; the foot is next fixed much in the same way as in Désault's plan, and the inner and upper splints are put on, the extension being kept up by lengthening the outer splint, which is done by turning the screw at the lower part of the splint. In University College Hospital, we adopt the straight position, and employ only the external long splint, which with a handkerchief, rolled up and filled with soft materials, and common rollers, compose the whole of the apparatus. If we ask ourselves, what are the indications to be fulfilled? the answer is, to keep the broken part of the bone steady; to maintain the limb to its proper length; and to hinder it from turning too much either outwards or inwards. Now, for these purposes, something is needed as a fulcrum, to which the limb is to be bound. The splint is converted into this fulcrum by its upper end being fixed to the side of the pelvis with the handkerchief, that passes under the tuberosity of the ischium, and the ends of which are then conveyed up to the fissure in the upper part of of the splint, and there fastened to it, so as to keep it from slipping upwards. When, therefore, the limb has been bandaged, the long splint placed along the outer side of the limb, and the foot and rest of the limb have been secured in the best position to this splint with rollers nearly as far up as the fracture, the next thing is to make as much further extension as may be needed, and then fasten the two ends of the handkerchief to the notch in the upper end of the splint, so as to prevent it, and of course the limb, which is bound to it, from becoming retracted. These are the simple and admirable principles, on which alone fractures of the thigh can be very successfully treated.

The second plan of treating fractures of the shaft of the femur is that recommended by Pott, in which the limb and the pelvis are laid on their external side, with the thigh half bent upon the pelvis, and the leg moderately bent upon the thigh. In this method, two splints are sometimes applied, but generally four. The fracture is reduced by an assistant taking hold of the limb above the broken part of the bone, and performing counter-extension, while the surgeon makes extension from a part of the limb below the situation of the injury. The patient is laid on his side, with the pelvis inclining as much as possible in the same direction. The limb is placed on its outer side, with the thigh half bent upon the pelvis, and the leg bent

in a similar degree upon the thigh itself. Before reducing the frac-
ture, the long splint, with the pad and eighteen-tailed bandage upon
it, should be put under the thigh; the reduction of the fracture is
then to be accomplished, and the tails of the bandage next methodi-
cally laid down, one over the other, beginning with those just above
the knee. The eighteen-tailed bandage, when neatly applied, looks
exceeding well, and is convenient; for it can be opened without
the slightest disturbance of the fracture, or motion of the limb. In
private practice, it is usual to apply, under the bandage, a piece of
brown soap plaster to the integuments in the immediate vicinity of
the fracture. By proceeding in the manner here explained, the other
splints may be applied with the greatest facility. When Pott's
position is adopted, one important thing is to afford due support to
the foot, for which purpose a soft cushion or pillow is generally em-
ployed; and the knee must also be supported by a similar means.
But this treatment of broken thighs in the bent posture, with the
patient on his side, is not exactly consistent with the most scienti-
fic principles. In the first place, one general principle, acknow-
ledged by all the best practical surgeons, is that of keeping all joints
in any way connected with a fractured bone, perfectly motionless;
but here no measures are taken for the fulfilment of this very impor-
tant object. On the contrary, the patient can move every joint
without restraint. The splints do not confine either the hip, the
knee, or the ankle; hence, I should say, that this is an inferior
method of treatment, and I am not surprised that it should be one
which occasions deformity more frequently than any other, and is
losing ground from day to day in the estimation of the profession.
But supposing this position were in some respects the best that
could be selected, yet, as it could not be maintained for any length
of time, it would prove inefficient. In fact, take what pains we
may, the patient will never remain long in the posture specified, but
will always turn on his back, and thus the fracture will become de-
ranged again.

A third plan has been proposed and adopted, which consists in
placing the patient on his back, with the thigh bent on the pelvis,
and the leg bent on the thigh, while the limb is supported in this
position on the *double inclined plane.* The most simple instrument
of this kind merely consists of two boards of the requisite length,
nailed together at an angle, and provided with a foot-piece, and a
few pegs along the margins, to keep the pads from slipping off the
apparatus. Double inclined planes, however, are now brought to
great perfection; and fracture-beds, as they are called, are general-
ly so constructed as to admit of serving the same purpose. Ames-
bury's apparatus, which answers as a double inclined plane, is a very
good one; but, in University College Hospital, whenever I have
adopted this position for a broken thigh, the preference has been

given to M'Intyre's apparatus, which is more simple, and does not require, in addition to the front splint, any lateral ones, unless the thigh be very bulky; or even the eighteen-tailed bandage; a common roller being applied so as to include both the limb and the apparatus on which it lies, and, consequently, admitting of removal without any disturbance of the part. All well made double inclined planes can be fixed at any angle by means of a screw. In Amesbury's apparatus, the thigh part may be lengthened or shortened at the surgeon's option, which is an advantage, the brass part sliding very conveniently in either direction. The foot-piece also admits of being shifted, and its position and length can be adapted to the particularities of every case. If this, or any other double inclined plane, be used, we have no occasion for an under splint, because the surface of the machine itself answers the purpose of one. The ankle is kept steady by means of the leather case or slipper for the foot, M'Intyre's apparatus may be used without any other splint, though when the thigh is very bulky, an anterior splint is useful. The limb, after having been covered with a roller, is laid upon the apparatus, coaptation performed, and then the limb and apparatus together encircled with other rollers from the foot up to the pelvis. Thus the limb will be kept perfectly steady, and all the joints motionless. By means of the thigh-strap and pelvis strap belonging to the apparatus, the pelvis and lower extremity are also rendered, as it were, one piece, only moveable together. The strap is passed round the pelvis, and through the fissure in the upper part of the external splint, near the great trochanter. Amesbury's inclined plane is excellently finished, and the splints of a good shape, light, yet strong. With this apparatus, three splints are intended to be used for a broken thigh, and also the eighteen-tailed bandage. In some hospitals, the treatment of broken thighs on a double inclined plane is preferred to the method of Désault, with all the improvement and simplicity to which it has now been brought. A double inclined plane is always to be well covered with soft materials, especially the projecting part of it under the ham.

FRACTURES OF THE NECK OF THE THIGH BONE,

Are divided, first, into those which happen *within the capsular ligament*, secondly, into those which occur *on the outside of it*, or partly in this situation; and thirdly, into such as extend *though the great trochanter*.

With respect to the symptoms of a fracture within the capsular ligament, the patient will complain of severe pain in the hip; and there will be shortening of the limb. It was once calculated, that shortening might happen to the extent of from one to two inches and a half; but the observations of Boyer, and of Messrs. Earle,

Stanley, and R. W. Smith*, prove, that, unless the capsular ligament be torn, no retraction of the limb in this last degree can happen. The extent of the retraction will also depend on whether or not the reflection of the capsular ligament over the neck of the bone be torn; for, in the event of its not being lacerated, there will be no shortening of the limb at all; neither will there be another usual symptom, namely, eversion of the limb. When the neck of the thigh bone is broken, as all the strong muscles attached to the shaft and trochanters have a tendency to turn the limb outwards, so as to evert the toes and knee, this is a common symptom of the accident; but if the reflection of the capsular ligament over the neck of the femur happen not to be torn, such symptom may be absent. When the limb is much shortened, we may not feel a crepitus; but if we draw the limb downwards, and rotate the foot inwards, the crepitus will then be distinctly felt. When there is displacement, the great trochanter will not form such a prominence at the side of the pelvis as it naturally does; and if there be a shortening of the limb, the same process will be found to be nearer to the crista of the ilium than in the sound state of the limb. Another symptom, accompanying and indeed resulting from the displacement of the outer fragment, is a great fulness of the upper part of the thigh, from the muscles having their attachments brought nearer together.

In a few uncommon examples, the knee and toes are actually turned inwards, instead of outwards; and the explanation given of the fact is, that the fracture takes place sufficiently towards the outside of the great trochanter, to prevent the muscles from acting on the lower fragment so as to turn it outwards, while some fibres of the glutæus medius and minimus, yet continuing attached to the external portion of the trochanter, retain the power of turning it inwards, and consequently the whole limb. This is one explanation that has been suggested; but it is not considered altogether satisfactory by some very good judges. It is alleged, that fractures, entirely within the capsular ligament, are sometimes attended with inversion of the limb, and to such cases the explanation proposed would manifestly not apply. Besides, as Dupuytren has remarked, why should not the great adductor muscle be more than enough to counteract the action of the anterior fibres of the glutæus medius and minimus? At all events, the cause of the occasional inversion of the limb, when the fracture is completely within the capsular ligament, if it be a fact, appears to me not at present accounted for.

When the fracture is on the outside of the capsular ligament, namely, between that ligament and the trochanter major, the retraction of the limb is greater, than in the fracture within the capsular ligament; a point, on which Boyer is corroborated by the observa-

---

* See Dublin Journ. of Med. Science, vol. vi. p. 206.

tions of Messrs. Earle, Stanley, and Smith. This kind of accident is mostly occasioned by the application of great and direct violence; while other fractures, situated within the capsular ligament, are usually produced by slighter degrees of force. The generality of cases, which occur in London, are caused merely by the foot slipping off the curb-stone, or by falls on the hip, not always attended with great violence. The reason why so slight a cause is capable of producing this mischief, is, that, after the age of fifty, the neck of the thigh bone becomes weak and slender, and its shell thinner, and incapable of affording as much resistance to force, calculated to fracture it, as it did in an earlier period of life. It is partly on this account, that fractures of the neck of the thigh bone are so frequent in old people, and partly on account of a change in the direction of the axis of this part of the bone in them; for in consequence of its greater weakness, it bends upwards, and forms a right angle with the pelvis, instead of sloping more or less upwards from the trochanter to the head of the bone. Here another reason is discerned why fractures more easily take place in aged than young subjects; because any force, operating on the trochanter major, will break the cervix of the bone with greater certainty, when the trochanter projects very much, in consequence of the above-mentioned change in the direction of the neck of the bone. In some old subjects, in fact, we find the trochanter absolutely higher than the head of the bone, the neck having yielded thus much to the weight of the body. But the other fracture of the neck of the femur, namely, that which takes place further outwards, or more towards the great trochanter, beyond the external limit of the capsule, is generally produced by great degrees of violence; and is not particularly restricted to old subjects, but presents itself also in young ones. Therefore, when great and direct violence has been concerned, the patient is under fifty, the limb a good deal shortened, and the crepitus readily perceived, there is ground for suspecting that the fracture is on the outside of the capsular ligament, or partly on the outside of it; for sometimes the fracture is oblique, and sometimes longitudinal, and occasionally it is incomplete, the fissure extending only partially through the neck of the bone. In general, we cannot feel a crepitus in fractures within the capsular ligament, unless the limb be brought to its natural length; but, when the fracture is on the outside of the capsular ligament, a crepitus can be felt with facility. If the fracture extend obliquely through the trochanter major, there may be little or no shortening of the limb; for there is such an extent of surface in the fractured part of the bone, and such a direction of the fissure, as are very likely to prevent this kind of displacement. In this case, we perceive a crepitus, but the foot is not so much turned out as in the other example.

When the neck of the femur has been broken, it becomes shortened, being more or less absorbed, and the head of the bone con-

sequently taking a situation, as it were, between the two trochan-
ters.   This circumstance, having been known by those who were
looking out for instances of bony union, after fractures of the neck
of the thigh bone, led to a dispute on the subject; because, in con-
sequence of the discovery, that, under circumstances of disease,
the neck may be shortened, and the head assume a similar position
to that observed after fractures, many examples of what were sup-
posed to be fractures, which had admitted of bony union, were re-
jected on this ground.   Hence, also, various specimens, picked up
in churchyards and other places, and whose histories are unknown,
should not be too readily considered as proofs of the bony union
of a previous fracture.

Fractures of the neck of the thigh bone are more frequent in
women than men, and two reasons may be assigned for this fact;
first, the neck of the femur in women is naturally longer and more
slender than in the other sex; and, secondly, as the pelvis is wider,
the trochanters project in a greater degree, and are consequently
more exposed to external violence.   In this metropolis, fractures of
the neck of the thigh bone happen either from the foot suddenly
slipping off the curb-stone, or from falls on the side of the pelvis.
In Paris, where the pavement is differently arranged, and the curb-
stone is not so common, the accident is usually produced by falls
on the hip.   When the neck of the thigh bone is fractured, and the
fragments are not separated, the reflection of the capsular ligament
from one to the other not being torn, the diagnosis is generally at-
tended with some obscurity, because most of the characteristic
symptoms are absent; for instance, there is neither shortening of
the limb, nor eversion of it.   Yet, the patient cannot raise it from
the surface on which it is deposited—he cannot lift it up from the
bed; he may, perhaps, contrive to bend his leg slightly, but he can-
not raise it up.   Though a degree of obscurity may prevail at first,
the nature of the case will mostly be apparent enough in a few days;
for at this period the reflection of the capsular ligament often gives
way, sometimes in consequence of the patient moving his limb too
much, sometimes in consequence of the surgeon doing the same
thing; but, in whatever way occasioned, it leads to a retraction and
eversion of the limb.

I have already referred to the rare case where the foot and knee
are *inverted*, and to the endeavor to account for it by the fracture
having taken place in such a direction through the trochanter major
as to leave attached to the pelvic fragment the insertions of the obtu-
rator internus, the gemelli and pyriformis, which muscles are natur-
ally concerned in rotating the thigh outwards; while the other, or ex-
ternal fragment, is drawn forwards and inwards by the gluteus medius,
so as to invert the limb.   This explanation has not, however, been
deemed satisfactory by some good judges of the subject.   Suppos-
ing the action of the gluteus medius on the outer fragment to be the

cause of the limb being turned inwards, it is certainly difficult to comprehend why the effect should not be counteracted by the adductor, which is a much more powerful muscle, and always disposed to rotate the femur outwards. Yet, the anomaly must, I believe, depend upon some peculiarity in the direction of the fissure. Other Explanations have been offered, one of which is founded on the well-known fact, that when the neck of the thigh bone is broken, that portion of it which remains connected to the head is sometimes forced into the cancellous structure of the outer fragment, and is immovably wedged in it. Now, if this were to happen in a particular way, it is conceived that the inversion of the limb might be produced. Dupuytren suggested another explanation, which is, that when the neck of the femur is fractured obliquely, if the inner fragment happen to be situated in front of the other fragment, then the limb may be turned outward; but if the inner fragment be behind the other, then the limb may be inclined forwards, and the knee and foot turned inwards. This is a point in surgery still requiring further investigation.

But, one still more interesting question, relative to fractures of the neck of the thigh bone, has been, whether those which are completely within the capsular ligament, and transverse with respect to the neck of the bone, are capable of osseous union. The fact, that bony union is possible in such cases, is now completely established, and almost every museum contains specimens illustrative of it. Sir Astley Cooper possesses a fine example of it, which I have examined more than once at his house. The museum of my friend Mr. Langstaff contains one that is a complete demonstration of such union, and which, with several interesting drawings in the same collection, I have frequently been permitted, through that gentleman's kindness, to show to the surgical class of University College. The particulars of the fracture with bony union are published in one of the volumes of the Medico-Chirurgical Society of London. The bony union is complete in the shell of the bone; the centre of the fissure is united by a fibrous substance; but the osseous consolidation of it is perfect at its circumference. The patient died about two years after the accident.

Another unquestionable instance of perfect union by bone, after a transverse fracture of the neck of the femur, within the capsular ligament, is exhibited in the case of Dr. James, an English physician, who fell from his horse as he was riding near Bordeaux, and fractured the neck of the femur; he recovered from the effects of his accident, but died seven months after it of some visceral disease. On examination, the fracture was found, by Dr. Brulatour, an eminent surgeon of that city, to be united by bone; and it appears from the engraving of the part, that it was a transverse fracture of the neck, entirely within the capsular ligament. The engraving is valuable, not only on account of its showing a perfect

bony union of a fracture within the capsular ligament, but also because it gives us an accurate representation of the diminution in the length of the neck of the bone, arising from absorption. Dr. Brulatour has likewise given a view of the size and shape of the head and neck of the other femur in the natural state. Thus we are enabled to see at once the difference, which has been produced in the length of the neck of the bone, and in the position of its head, with respect to the trochanters; it being, as it were, situated between them, with scarcely any portion of the neck remaining. Dr. Brulatour has also favored us with a section of the head and neck of the femur, which was the subject of the injury. Several drawings, in Mr. Langstaff's museum illustrate the various ways, in which nature attempts the reparation of fractures of the neck of the thigh bone. One drawing exhibits an immense quantity of bony matter, thrown out by the portion of the neck, or the fragment, nearest the trochanter major; together with the thickening of the capsular ligament. Another drawing was made from a case in which anchylosis had taken place : and a third is a view of an oblique fracture of the neck of the femur, in which there would not be much, if any, retraction ; bony union has occurred at the outer part of the fissure, while the rest appears to be united by the fibrous substance. A fourth drawing shows the efforts which nature has made to repair the fracture of the neck of the femur, by throwing out a vast quantity of bony matter. I remember the gentleman very well from whose case the drawing was made : he resided near St. Bartholomew's, and met with the injury by falling from the upper part of his house into the street; he lived several years after the accident, but was quite a cripple. The callus has formed a sort of new acetabulum, which, together with the increased thickness and strength of the upper portion of the capsular ligament, enabled the patient to use the limb in a certain degree. In one preparation, in Mr. Langstaff's museum, the fracture is within the capsular ligament ; and the union, by means of a ligamentous fibrous substance, retains the fragments in such close contact, that Mr. Langtaff is of opinion, that, if the patient had lived long enough, the case would have terminated in bony union. Yet, the process necessary for its accomplishment, is not so easy and sure as that by which the generality of other fractures are united. When the head of the bone is completely detached, doubtless one circumstance unfavorable to bony union is the scanty supply of blood which it receives, and which consists merely of the small quantity conveyed to it through the vessels of the ligamentum teres.* Another circumstance is the

* As the fracture is sometimes united by osseous matter, the supply of blood is, of course, not always inadequate to the purpose. From the valuable observations of Dupuytren, Cruveilhier, and Breschet, on the process by which fractures are united, it appears that the vessels of the surrounding tissues perform an active part in the work

difficulty of maintaining the fragments steadily in apposition ; they are generally disturbed too much, and the proper apparatus is not kept on long enough. In fact, Dupuytren contends, that, in consequence of the disadvantageous condition in which the neck of the thigh bone is placed for bony union, the patient ought to be confined, and the requisite apparatus kept applied for a very long period, that is to say, from a hundred and twenty, to a hundred and forty days. In this country, surgeons rarely persist in maintaining the limb quietly and in a desirable posture for a space of time at all equal to what has now been specified. Mr. Langstaff, who has paid a good deal of attention to this subject, is also led to believe that, if the limb were kept a sufficient length of time without motion, the ligamentous union would generally be converted into an osseous one. The circumstance of the fracture being oblique or transverse, influences very much the facility and chances of bony union; for, if the case be oblique, part of the fissure will extend beyond the external limit of the capsular ligament, and then admit of osseous union with as much ease and certainty as any ordinary fractures.

When transverse fractures of the neck of the femur within the capsule do not unite by bone, they unite by a ligamentous substance; the capsular ligament becomes thickened and strengthened, and ligamentous bands extend from it to both fragments, and sometimes from one fragment to the other. In a few instances, another mode of reparation is established; osseous matter is thrown out by that portion of the fractured neck which is connected with the trochanters, and the callus from this source assumes a shape calculated to support within it the end of the other fragment; in other words, a kind of socket is formed in the outer fragment, which, as well as the other fragment, becomes coated with what is termed the ivory deposit, a very smooth hard substance, by means of which friction between the two fragments is lessened, and motion facilitated; it answers, in fact, the purpose of cartilage.

With regard to the treatment of fractures of the neck of the femur, I may remark that, at one period, several surgeons considered the chance of bony union so hopeless, when the fractures were entirely within the capsule, that they did not deem it worth while to direct the treatment expressly to the attainment of such union, and they merely put the limb for two or three weeks on a double inclined plane, or on pillows or bolsters laid under the ham. Such, in-

---

of reparation. But, as Mr. Mayo has justly noticed, these tissues are excluded by the untorn synovial and capsular membranes from communicating with the fracture. "They are sometimes, indeed, seen to make the ordinary effort towards reparation of the adjacent fracture. Thus a portion of an ossified provisional callus is often met with *external* to the attachment of the capsular membrane to the neck of the femur. But the effort is ineffectual; the callus cannot reach the fracture, whether it remains entirely disunited, or is glued together by an exudation from the ends of the bones." See Outlines of Pathology, p. 9.

deed, is the practice of Sir Astley Cooper, who places a pillow or bolster under the ham, and if the patient be very old, and the fracture attend to with symptoms denoting its situation to be within the capsular ligament, all idea of subjecting the case to very long confinement is renounced. At the end of two or three weeks, the patient is allowed to get up and use crutches. Other surgeons do not pursue this method; and, having greater confidence in the possibility of obtaining bony union, they recommend the confinement to be longer, and the fracture to be more carefully put up. With this view, some of them employ the double inclined plane, and apply the pelvis strap so as to make the pelvis and apparatus, as it were, one piece, between the two parts of which no motion can happen. In France, Dupuytren used to make a double inclined plane with pillows, duly arranged under the limb; but the objection to this plan is, that there is nothing to prevent the patient from changing his position, or the limb from assuming another posture; and if Dupuytren's method has the recommendation of simplicity, it is not a good one in other respects, since it cannot be depended on for keeping the limb steady. In University College Hospital, fractures of the neck of the femur are generally treated with Désault's long splint, applied as already explained. An ingenious treatment was proposed by Hagedorn, the principle of which was to make the sound limb the part on which a long splint might be fixed, to the extremity of which a foot-board for the other limb was attached. Thus the surgeon had a fixed surface on which the foot of the injured limb could be placed and fixed in the most desirable position. In truth, the right principle in the treatment always consists principally in bringing down the limb to its proper length, and regulating the position of the foot; for nothing of importance can be done with splints, except inasmuch as they may serve for regulating the position of the limb, and keeping it steady. Hagedorn's apparatus has a slipper, and, by placing the foot in it, any direction may be given to this part of the limb, considered advantageous. Ingenious as Hagedorn's plan is, it has not been much employed, chiefly because it is found to be very irksome to the patient. In America, Professor Gibson has taken the trouble to modify the apparatus, by carrying the splint as high as the axilla, and applying to the injured limb a splint which extends also as high as the armpit.

[Our author gives us the different modes of treatment of fracture of the neck of the thigh bone within the capsular ligament, and leaves us to exercise our own skill in selecting between them. The great fault I have to find with his writings is, that he seems to have no definite method of his own, or to which he gives preference, as every sound practical man should have.

Sir Astley Cooper, in his Lectures, remarks that in all the examinations he has made, in cases of fracture within the capsular ligament, he has seen but one, in which, after a transverse fracture, long union had taken place. He says, " he does not mean to deny the

possibility of a bony union, or to maintain that it cannot take place;" certainly he does not, when as he admits, he has seen *one* case, where in a transverse fracture within the capsule, there was a union by bone; but he says " it is an *exceedingly* rare circumstance." It *is* rather rare, that the above fracture admits of the osseous restoration, but the treatment Sir Astley recommends, because the union must be ligamentous ex necessitate, would produce such an union in *any other* fracture. It is, in fact, the very treatment to produce a false joint, and defeat the legitimate purpose of the surgeon. He says, " a pillow is to be placed under the limb lengthwise, then a second one is to be rolled up and placed under the first, so as to flex the leg upon the thigh. The patient is to remain in this state for ten days or a fortnight, after which he is allowed to rise and sit in a high chair, in order to prevent much flexion of the limb. In a few days more, he should begin to walk with crutches; and then in a few months he will be able to lay the crutches aside, and walk with the help of a stick, and high heeled shoe". After such treatment as this, no wonder osseous union seldom occurs.

Sir Astley's reasons why a bony union cannot occur, are, First, the difficulty of preventing motion of the part; and this is unquestionably one of the chief obstacles to union; for the parts are so surrounded by powerful muscles, that the slightest movements of the body, even the involuntary motions of coughing and sneezing, tend to destroy the coaptation.

Secondly, the want of apposition, which is involved in the reason just mentioned.

Thirdly, continued pressure is essential, in order that an ossific union may take place; and this it is difficult to accomplish.

Fourthly, there is an effusion of synovia, which by distending the capsule, separates the fractured surfaces, and thus prevents union. All these circumstances are entitled to weight, as reasons why we do not get the desired union, though the chief obstacle in the way of success, is found in the first, the motion, which interrupts the efforts of nature.

But, that which Sir Astley assigns as the principal reason, has in my mind little or no weight; I mean the deficiency of ossific inflammation. The circulation of the general system communicates with the head of the bone, it is true, only by the vessels connected with the ligamentum teres; yet it seems to be forgotten, that the vessels in all parts of the body, have the inherent power of enlarging to meet the exigencies of the case. We see this fact demonstrated, in a most beautiful manner, in ulcers of the cornea; in the mammary and uterine arteries, when these organs are called into action during gestation and lactation; and the same great law is exhibited in all cases, where the large trunks of arteries are ligated, and smaller collateral branches are required to perform extra labor. Now, has it ever been proved by Sir Astley Cooper, or any other person, that the arteries communicating with the head of the femur through the ligamentum teres, form an exception, a *solitary exception*, to that great law? My own conviction is, that the great obstacle to ossific union, is the want of a steady coaptation of the fractured surfaces.

But enough of this disagreement with others. In the first place, there is a difficulty in diagnosticating with absolute certainty, the exact location of the fracture. We have the transverse fracture entirely within the capsular ligament; and we have it also partly within and partly without, and between these there is a difficulty of decision.

Whenever there is any doubt, as to whether the fracture be partly without the capsule, we should *always* proceed with a treatment which shall keep the parts in coaptation, and if the constitution be good, we may expect an osseous union.

When the fracture is diagnosticated to be entirely within the capsule, if the patient be sixty or under, we should *always* aim at a union by bone, unless the general health of the patient forbid the confinement. If the patient be over sixty, and the constitution be good, then give him the *chance* for an osseous union. I have in my museum, at the College of Physicians and Surgeons, a perfect specimen of union by bone, in case of a transverse fracture within the capsule, taken from a female who was sixty-four years of age when the accident occurred.

It often happens, when we have fractures within the capsular ligament, in subjects over sixty, that the bone is so soft and friable as to be crushed into several pieces. In such cases, I should avoid the confined mode of treatment, and follow that recommended by Sir Astley Cooper.

If then, I have a simple fracture, at the neck of the thigh bone within the capsule, if the patient be not too old, and the constitution, be good, I treat my patient with a view to an osseous union: if, in the event, I fail, I have done my duty.

After one of these fractures, I allow the patient to remain in a comfortable position for ten or fifteen days, until the more active inflammation has passed, and then I place him in the tight dressings. A roller is applied from the toes to the hip, in order to support the parts; then a broad cushioned belt is carried around the pelvis, and over the trochanters. I commonly use Desault's splint, as modified by the late Dr. Physick; or the same splint as modified by Prof. Gibson. The fractured limb is brought down to the same length as the well one, and maintained by the above apparatus in a position corresponding with its fellow. The time required for ossific union varies from six weeks to three months.

I have been led to these remarks, mainly because of the unfortunate influence which Sir Astley Cooper's opinions, upon this subject, were exerting upon practice, and upon members of the profession. I hold his opinions upon most surgical subjects, as commanding the highest respect, and as at the head of authority: still I cannot believe that a thing *is so*, simply because Mr. Cooper, or any other man, makes the assertion.

There has been going on, for the last ten years, a most vexatious and malicious law suit in this country, against a highly respectable surgeon, because he treated a patient, a female, forty-three or four years old, for fracture within the capsular ligament, in a manner *not* recommended by Sir Astley Cooper, and succeeded in obtaining an osseous union. In about three months, she was able to walk, both limbs being of the same length. When payment for services was de-

manded, it was refused, upon the ground that there had been no fracture, and that the treatment had been mere sham. The surgeon was sued for mal practice, and Sir Astley Cooper was quoted, to prove that if there had been such a fracture, there *could* have been *no* union by bone, and that the limb would necessarily have been shortened and deformed. The patient died some seven years after the accident; and the bone presented ample evidence of fracture within the capsular ligament, and osseous union: and then, and not till then, the poor surgeon. after having been injured in reputation, and ruined in property by the suit, was permitted to escape the fangs of a most malicious and unrighteous prosecution.—Ed]

When the lower part of the thigh bone is fractured, or when the fissure goes into the knee joint, the extended position of the limb is often preferred, because it keeps the head of the tibia in contact with the condyles of the femur, and thus has a most useful operation in keeping them steady. Were it not for this consideration, we should be inclined to advise the bent position of the limb, in order to relax the gastrocnemius and the popliteus, which have a tendency to draw the lower fragment towards the ham; but Sir Astley Cooper, whose experience and judgment are equally great, found, that more advantage was derived from the effect of the extended position in bringing the head of the tibia in contact with the condyles of the femur, than from the relaxation of the muscles in question. In such a case, lateral splints should be applied, in order to afford due support to the broken part, and keep it motionless. In these cases, a considerable degree of swelling generally comes on, so that for a few days the surgeon is obliged to defer the use of splints, and aim at the reduction of the inflammation by means of leeches, venesection, cold applications, &c.

FRACTURES OF THE PATELLA

Commonly happen in the transverse direction, and are caused by the powerful action of the extensor muscles of the leg. The circumstance most frequently causing the bone to be fractured in this manner, is that of a person making a violent effort to save himself from falling backwards, when he has lost his equilibrium; for then the extensors of the leg act with immense force to keep the femur and the pelvis forwards; and as the knee is always somewhat bent at the moment, only the lower portion of the patella is actually in contact with the condyles of the femur, over which the muscles break it transversely, as already mentioned. However, this is not the only way in which a fracture of the patella may be produced, for sometimes the bone breaks while the leg is perfectly extended. When we hear of cases, in which the thrust of a gorget into the bladder, in lithotomy, made the muscles of the thigh act so violently as to break the knee-pan, we may conclude, that the accident happened when the knee was bent, because the position, in which the

patient is bound for that operation, would make this tolerably certain; but it is alleged, that the patella has been fractured by the violent action of the muscles in epilepsy, even when the limb was in the straight or extended posture. The patella may be broken in the longitudinal, or perpendicular direction, by direct violence. Not long ago, a case occurred in the Hôtel Dieu at Paris, where the patella was fractured both in the longitudinal and transverse directions, the bone being split into nearly equal quarters; the accident was, of course, produced by direct violence, for I scarcely need observe, that such a fracture could not have been the result of the action of the extensor muscles of the leg.

When the patella is fractured, the symptoms vary according to circumstances; in the first place, whether the tendinous expansion covering the bone be lacerated at the same time that the fracture takes place, is a circumstance making some difference; secondly, much will depend upon the degree of laceration of the tendinous covering of the bone. When both these parts are torn through, the upper fragment may be retracted a considerable distance up the thigh, as far, perhaps, as four or five inches; but if they are not lacerated, the fragments will hardly be separated at all. Of course, while the fragments are much apart, we are not able to perceive a crepitus; but, if we extend the leg, so as to relax the extensor muscles, we may push down the upper fragment, and bring it into contact with the lower one, and then a crepitus will be immediately distinguished. When attempts are made by the patient to bear upon the limb, it will be found, that he cannot support the weight of his body upon it; and he falls forward on his knee. If the upper fragment is completely detached from the lower one by rupture of the tendinous expansion covering them, the distance between them may also be increased by bending the knee; so that, in general, when the fracture is transverse, the case is evident enough. But, in a longitudinal fracture, the displacement is not so manifest, and more attention will be requisite to detect the real nature of the accident; yet if we relax the extensors, we may generally feel a crepitus in this case also, and with no great difficulty, notwithstanding there may be considerable swelling, in consequence of the species of violence that has produced the accident, namely, a direct blow, or kick; for longitudinal or perpendicular fractures of the patella, as I have already explained, cannot happen from the action of the extensor muscles of the leg, but always require for their production direct external violence.

The treatment consists in paying attention to two circumstances:— one is to relax the extensor muscles of the leg as much as possible; the other is to bring the upper fragment into contact with the lower one, and keep it so. Now, the first object, namely, the relaxation of the extensor muscles of the leg, requires that their lower attachments should be put as near to their origins as possible. The rec-

tus, therefore, is to be relaxed by bending the thigh on the pelvis, by which the patella and the upper part of the brim of the acetabulum and the anterior inferior spinous process of the ilium, the insertion and origins of this muscle, are brought into as much approximation as can be effected by position. Now this will partly relax the rectus, but not the vasti and cruralis, which require the leg to be extended. For maintaining the limb in this position, the surgeon is to place the leg and thigh on an inclined surface, rising gradually and regularly all the way from the tuberosity of the ischium to the heel; the trunk being also raised on another inclined surface, so as to incline the front of the pelvis towards the thigh. The other circumstance to be attended to, or that of bringing the fragments into apposition, and keeping them so, is fulfilled by pushing the upper fragment down into its proper situation, and applying a roller to the lower part of the thigh, just above the upper fragment. Some surgeons put a few circles of a roller above the patella, and others below the knee, after which the upper and lower ones are laced together with packthread. Some years ago, it was the custom, after the limb and patella had been put into the proper position, to apply a roller a few times round the thigh, above the upper fragment, and then to finish the bandage by passing the same roller round the knee, in the form of a figure of 8; but this figure-of-8 direction of the bandage, though it may look well, is of no real use. Sir Astley Cooper first applies a leather strap to keep the upper fragment near the lower one, and then applies another strap, which passes from the first, down one side of the leg, across the sole to the other side, along which it ascends to the circular strap again.

Dupuytren employs the uniting bandage and a compress, which seem to answer very well; indeed, a case is related by Sanson, which he saw treated by Dupuytren with these simple means, where the union was so strong, that when the patient afterwards met with an accident, in which the extensors of the leg were made to act violently, the united part of the bone did not give way, but the ligamentum patellæ. Putting the limb in a fracture-box is a convenient mode of keeping the leg and thigh steadily in the proper posture. Any of the plans, however, which I have enumerated, may be practised with success; but it should always be remembered, that the maintenance of the limb in the right position is of still greater importance, than any roller or apparatus for confining the upper fragment near the lower one.

Transverse fractures of the patella generally unite by a fibrous or ligamentous substance, and not by bone. There have been instances, however, in which a union has taken place by bone; but they are rare. On the other hand, longitudinal fractures of the patella, occasioned by direct blows, frequently unite by osseous matter. In the museum of University College, is a preparation taken from a coachman, who fell from his coach-box, when his knee came vio-

lently into contact with the pole of the carriage; the consequence was a comminuted fracture of the patella. Osseous union has taken place. Unfortunately, however, the case had an unfavorable termination; for, too much pressure having been employed, inflammation of the knee joint came on, and the man ultimately died. In the same collection is another specimen of a transverse fracture of the patella produced by direct external violence. The apex, which was broken off, is united again by means of bone. Mr. Gulliver has recorded two cases of bony union. The first is that of a sailor, who fell on his knee from the maintop of a brig: the second is that of a soldier, whose patella was fractured by a gun-shot. Mr. Gulliver also broke the patellæ of rabbits and dogs; first by blows, so as not to divide the aponeurosis, which covers it, and, in such cases, the union was osseous; and secondly, he cut the bone and aponeurosis through with cutting forceps, and under such circumstances, no bony union followed. His cunclusions are, that when the aponeurosis is completely divided, as in fractures of the patella from the violent action of the extensors of the leg, bony union is not to be expected; because, in such cases, it is impossible to keep the fragments in accurate contact; and that osseous union is simply the effect of the immovable coaptation of the fragments, the provision for which, in certain fractures from external violence, is the integrity of the aponeurosis in front of the bone.* It sometimes happens, that, after the cure of a fractured patella, the patient meets with an accident, in which the extensor muscles of the leg act with such violence that they lacerate the ligamentous substance, which is the usual bond of union in transverse cases; and then even the skin and synovial membrane may give way, and the knee receive injury of so serious a nature as to call for amputation. Some preparations in the museum of University College prove, that a fracture of the patella may be followed by severe disease of the knee joint;—as inflammation of the synovial membrane, abscesses, and absorption of the cartilages.

FRACTURES OF THE BONES OF THE LEG.

We might suppose, on looking at these bones, and seeing one of them so strong and the other so slender, that the fibula would most frequently be fractured; this is not the case. The tibia, strong as it is, is oftener broken than the fibula, and one reason of this is its superficial and exposed situation in front of the leg. In fact, its anterior surface is merely covered by the integuments. Another reason is, that the tibia receives all the weight of the body when a person leaps, or alights with his foot forcibly on the ground. The

---

* Edinb. Med. and Surgical Journ. Jan. 1837.

fibula is covered to the extent of its two upper thirds by thick muscles, and the rest of it may be said to be very much protected by the tibia itself. Indeed, the peronæi muscles alone are sufficient to guard it from the effects of ordinary degrees of violence directed against the outside of the leg.

When the tibia is broken singly, the injury is generally caused by direct violence, more especially if the fracture happen at any point of the two upper thirds of the bone. The fracture is then usually produced by a blow, a kick, or the passage of a wheel of a heavy carriage over the limb. The lower third of the tibia may be fractured either by direct or indirect violence, or as the result of what the French surgeons call a *contre-coup*. A fracture of the upper third of the tibia is frequently transverse; but one situated in the two lower thirds of the bone is generally oblique. When the tibia is the only bone broken, and the fracture is in the upper third of it, some attention is necessary to discover the nature of the accident, because there is no change in the shape of the limb; for the fibula, being perfect, acts as a splint, so that there can be no shortening of the member, while the extensive surface of a fracture, in this situation, tends equally to prevent both retraction and displacement. However, the slightest inequality of the tibia, may always be detected by passing the finger along the anterior edge or spine of that bone, when, if there be a fracture, some projection or irregularity, at the part where the fracture is situated, will be perceived. On moving the ankle and knee rather freely, we shall also perceive, that, exactly in the place of the solution of continuity, the bone, instead of being firm and unyielding, has a degree of motion in it, or yields when pressed upon. If both bones should happen to be broken, then the case will be evident enough, as a change will be noticed in the shape of the limb, an angular deformity, the heel being drawn more or less backward and upward by the muscles of the calf. We shall also observe a shortening of the limb, and that the foot is twisted either inwards or outwards. Were any other circumstance necessary to convince us of the nature of the accident, we should have such a criterion in the very distinct crepitus, that could be felt without the least difficulty.

When the fracture is situated at any point of the lower two thirds of the tibia, the fissure through the bone will frequently extend obliquely from above downwards and from behind forwards. Hence, the extremity of the upper fragment will be very sharp, and likely to protrude through the skin, making the case a compound fracture. When the fibula is broken, as well as the tibia, the latter bone generally gives way first, and then the weight of the body being transmitted to the fibula, this bone also breaks. Such is the explanation offered by Dupuytren, as that which applies to the majority of cases; but sometimes both bones are fractured at once by direct violence, as happens when the wheel of a heavy carriage passes over the limb.

Although the fibula is, on the whole, less frequently broken than the tibia, still the accident is common enough; so common, indeed, that Dupuytren calculates, that fractures of the lower third of the fibula amount in number to one third of all fractures of the legs. Fractures of the upper two thirds of the fibula are generally caused by direct violence, while those of its lower third are most frequently occasioned by a forcible twist of the foot. The twist most commonly happens in the direction outwards, and, when this is the case, the fibula usually breaks from two to four inches above the external malleolus. When the fibula is broken, in consequence of the foot being twisted outwards, the inner edge of the sole is in contact with the ground, and the upper end of the lower fragment inclines inwards towards the tibia. The fibula may also be broken by the foot being twisted inwards, in which event, the deformity will be different, for the outer edge of the sole will be against the ground; the sole itself will be turned inwards; and the upper end of the lower fragment will be directed outwards, away from the tibia.

The generality of fractures of the leg may be conveniently treated in the slightly flexed position, with the limb supported on M'Intyre's apparatus; or the leg may be placed on Amesbury's or some other double inclined plane, and supported with lateral splints. The bent position is by far the most comfortable to the patient, and it has the advantage of relaxing the powerful muscles of the calf. However, when the fracture is situated high up, near the knee, the limb may be kept in the extended position, which, as Sir Astley Cooper well observes, converts the condyles of the femur into a surface, against which the upper fragment can be steadily maintained.

Fractures of the upper part of the fibula generally unite without any permanent ill consequences, even though they may be neglected, and taken little care of. No doubt, many of them are never detected at all, in consequence of being unattended with displacement. But, fractures of the lower part of the fibula require more caution; for if they are not rightly managed, the patient will sometimes be a cripple for life, the foot remaining distorted outwards, and the individual being obliged to walk on the inner malleolus, instead of on the sole of the foot.

Dupuytren adopts a simple and effectual plan for the treatment of those fractures of the fibula which proceed from a violent twist of the foot outwards. The whole of his apparatus consists of two rollers, a splint about two feet in length, and a pad stuffed with oaten chaff, much thicker at one end than the other. The pad is applied to the inside of the leg, with its thick end downwards, and then the splint is put on, which, by extending beyond the inner edge of the sole, makes a fixed point at a convenient distance from it, against which the foot is kept inclined inwards by means of a roller. The splint is first secured on the part with a few turns of the roller

round the upper part of the leg. If the fibula is broken by a twist of the foot inwards, Dupuytren applies the splint and pad on the outer side of the leg.

Some fractures of the leg have been treated successfully with splints made on the principle of the fracture-box, and the lateral parts of which admit of being let down, or put up, by means of hinges. Assalini's splints are thus constructed. If they are employed, the limb must then be kept in the extended position. Certain compound fractures are very conveniently dressed when such a splint, or a common fracture-box, is employed. In University College Hospital, M'Intyre's apparatus is commonly preferred to others, as being more simple, requiring no additional splint, keeping the limb perfectly steady, and, what is of high importance, allowing a great part of its surface to be uncovered, and the wound, if any be present, dressed, without the slightest disturbance of the fracture. Greenhow's apparatus likewise appears to me a highly meritorious one for the preceding objects; but less simple and more expensive: with it the whole of the leg may be uncovered, and a wound dressed without moving the fracture in the slightest degree.

FRACTURES OF THE OS CALCIS

Is a rare accident; the fracture always occurs behind the junction of this bone with the astragalus. The treatment consists in relaxing the muscles of the calf, and applying splints and bandages for the purpose of preventing motion of the ankle. In the museum of University College is a specimen of a fracture of the os calcis united.

PARTICULAR DISLOCATIONS.

DISLOCATIONS OF THE LOWER JAW.

While the mouth is shut, the lower jaw cannot be dislocated: but when the teeth are separated, and the mouth widely open, the condyles pass forwards on the eminentiæ articulares; and while they are in this position, if there be any spasmodic action of the depressors of the chin, or of the external pterygoid muscle, to bring them a little more forwards, they will slip under the zygomatic processes, and thus a dislocation will be produced. The condyles of the lower jaw can be dislocated in no other direction than that forwards under the zygoma; and the accident may happen either in the manner I have described, or in consequence of some external violence acting upon the body of the bone, at a time when the mouth is open,

In fact, at that period, a very slight force, applied so as to depress the chin, will make the condyles glide under the zygomas; and hence, dentists, if they are rough and careless in their proceedings for the extraction of the teeth, may dislocate the lower jaw.

The dislocation can only take place forwards under the zygoma; and this is true with respect to the two kinds of dislocation to which the lower jaw is liable: one in which both the condyles are displaced, and the other, the particular case where only one of them is dislocated; which is less common. The lower jaw, however, is subject to another kind of accident, attended with a partial displacement of it, namely, the case in which the condyle of one side slips out of the inter-articular cartilage; this is called a *subluxation of the jaw*; the condyle does not quit the capsule, but merely the inter-articular cartilage; the jaw becomes motionless, and the mouth continues slightly open. We meet, then, with three cases, the *dislocation of both condyles*; the *dislocation of one*; and the *subluxation*, or mere displacement of one condyle from the inter-articular cartilage.

The symptoms of a complete dislocation are the following:—In consequence of the position assumed by the bone, when the condyles are thrown forwards out of the glenoid cavities, the mouth must necessarily remain open,—it cannot be closed; for this would be prevented by the coronoid processes touching the cheek bone. The power of speech is of course considerably impaired, the pronunciation of the labial consonants being impossible. After the bone has remained unreduced for some time, it is true, the mouth will become rather less widely open; but still it cannot be closed on account of the mechanical impediment to which I have alluded. The chain is considerably lengthened, the cheeks stretched and flattened, and the lower teeth, if they could be brought up as high as the upper ones, would be much in advance of them. In consequence of the irritation of the parotid gland, there is a profuse secretion of saliva, which is incessantly dribbling out of the mouth. In addition to the preceding symptoms, a depression may be perceived just in front of the meatus auditorious externus, occasioned by the removal of the condyle from its place. When the dislocation is restricted to one side, of course, the depression will be perceptible only in front of the corresponding ear.

When the case is a dislocation of only one condyle, we may notice, especially in thin persons, a slight distortion of the chin or mouth, an inclination of it towards the opposite side; but, in fat subjects, this kind of deformity may be so slight as perhaps not to excite attention. At one time, it was supposed, that an unreduced dislocation of the lower jaw would be fatal: it is certainly a very distressing occurrence; but there is no truth in the foregoing statement, for cases are on record of individuals, who lived many years in this pitiable condition.

In the treatment there are two indications: *to reduce the displaced part or parts of the bone,* and *to keep them reduced.* These indications apply indeed to every dislocation, which has not existed too long to render their fulfilment totally impracticable. The manner of reducing a common and complete dislocation of the lower jaw is very simple. The mouth is already open, so that there is space enough between the teeth to admit of the introduction of the thumbs into the mouth. The surgeon, recollecting the principle explained in my general observations on dislocations, endeavors to make the dislocated bone a lever for reducing its head, or its condyle; he therefore introduces his thumbs into the mouth, and applies them on the molar teeth; in short, they are to serve as the fulcra, on which he is to make the bone move: his fingers are next applied underneath the chin to the body of the bone; he now pushes the condyles with his thumbs downwards and backwards, at the same time that he brings the chin upwards and forwards with the pressure of his fingers; and as soon as the condyles are thus extricated from the zygomas, the temporal and masseter muscles act so quickly and suddenly in pulling them back into the glenoid cavities of the temporal bones, that if the surgeon were not very prompt in moving his thumbs towards the cheeks, out of danger, they would be severely bitten. It is on this account, that some practitioners usually put on a pair of thick gloves, before proceeding to reduce a dislocation of the lower jaw. Indeed, the rapidity is very great with which the bone returns into the articular cavities, when the condyles are extricated from their confinement under the zygomatic processes. Then the *second indication*, or that of keeping the bone reduced, is accomplished by a very simple plan: as there cannot be any displacement of the condyles, while the mouth remains closed, it is usual to apply, directly after the reduction, the four-tailed bandge, in order to keep the mouth in this safe and desirable position. The two front tails of the bandage are brought to the back of the head, and the two posterior ones applied to the forehead. The bandage is worn for about ten days, and the patient is restricted to spoon diet, and directed to avoid conversation. If there be a great deal of swelling, bleeding, and other antiphlogistic measures will be advisable. When only one condyle is displaced, and pressure made with the thumbs on the molar teeth of both sides of the jaw, sometimes we cannot succeed in effecting the reduction; and I therefore recommend Mr. Hey's advice not to be forgotten, which is, to apply the thumb only on the side where the dislocation has taken place, and to let the lever-like movement be directed particularly to the displaced condyle, and not to the other. By attending to this maxim, I lately reduced, without much difficulty, a dislocation of one condyle in a woman brought to my house by my neighbor, Mr. Delisser.

In the *subluxation of the lower jaw,* when the condyle is thrown

out of the inter-articular cartilage, the jaw is rendered motion-
less, and the mouth cannot be entirely shut.   It is an accident that
does not call for the interference of a surgeon, as the condyle us-
ually returns into its place again in a few minutes, without as-
sistance.

When the reduction of a dislocated jaw is attended with extra-
ordinary difficulty, we should have recourse to bleeding and other
means of weakening the muscles.

A person, who has once dislocated his jaw, will always be liable
to the accident again from slight causes; and sometimes merely
laughing, or yawning, will bring it on.

DISLOCATIONS OF THE CLAVICLE

Are much less common than fractures.   The clavicle may be dis-
located either at its sternal extremity, or at its junction with the ac-
romion; but the dislocation of the sternal end is more frequent:
first, because that end of the bone is naturally more moveable;
and, secondly, because its ligaments are considerably weaker, than
those which tie the other extremity of the clavicle to the acromion.
The accident, when it occurs, mostly happens in children and wo-
men, in whom the ligaments are weaker, and the articular cavity
shallower, than in male adults.

In what direction does the *dislocation of the sternal end* of the
clavicle usually take place? It happens in most cases forward; the
dislocation backwards being so rare, that Sir Astley Cooper, with
all his experience, has only met with one example of it, and that
was not produced by external violence, but was the result of great
deformity of the chest and spine, whereby such a change was made
in the direction of the whole trunk, and of the clavicle in particular,
that its sternal end was thrown backwards.   One curious result of
this case was, that the œsophagus was dangerously pressed upon by
the dislocated end of the clavicle, which the surgeon was obliged
to saw off to save the patient's life.   The dislocation of the sternal
end forwards is much more frequent, and may occur in two ways;
either from a fall on the shoulder, or from the application of exter-
nal violence, which, by pushing the acromion suddenly and consid-
erably backwards, gives a disposition to the sternal end of the cla-
vicle to start forwards in the same proportion.   The nature of the
case is obvious, from the superficial and prominent situation of the
bone.   The accident, if complete, is attended with laceration of
all the ligaments and part of the tendinous attachment of the sterno-
mastoid muscle.   The treatment consists in the application of a
wedge-shaped cushion under the axilla, to make the humerus act as
a lever in propelling the shoulder outwards; in the employment of
a bandage and sling to confine the arm in a position, in which the
elbow and fore-arm are duly supported, and held rather backwards,

while the shoulder is inclined a little forwards; and in putting a compress on the sternal end of the clavicle, and keeping it there with the bandage.

The *acromial end of the clavicle* can be dislocated only in one direction, which is upwards. It cannot be dislocated downwards; for the root of the coracoid process of the scapula, and the ligament extending from this process to the acromion, resist a dislocation downwards; but sometimes, by great violence, the scapula itself is driven downwards, and the acromial end of the clavicle then projects upwards. Sir Astley Cooper, in his work on dislocations, gives us a drawing of such a case. Here the ligaments, tying the clavicle and acromion together, are torn, as well as some of the bands of ligaments connecting the clavicle with the coracoid process. The treatment consists in keeping the shoulder inclined outwards, by placing a wedge-shaped cushion below the axilla, and in using the figure-of-8 bandage, with a soft pad in each axilla, to prevent its margins from being chafed. When, by this means, the shoulders are drawn back, the acromion returns into its place. The arm is of course to be kept up with a sling.

My friend, Mr. Morton, of University College, has favored me with the particulars of an unusual dislocation of the sternal extremity of the clavicle; the displacement of it being upwards and inwards.

Etienne Caréron, æt. 39, mason, admitted into the Hospital of La Charité on account of an injury, which was caused by his having been violently squeezed between a wall and a cart, in such a manner that the left shoulder was thurst inwards with great force. On examination, the sternal extremity of the left clavicle was found to have been displaced from its natural situation, and was now placed *above* the upper edge of the sternum, producing a slight deformity in the contour of the lower part of the front of the neck. It seemed, from the description of the accident which was given by the patient, that the force producing the injury had acted in such a direction as to push the sternal extremity of the dislocated bone *upwards*, and *behind* the sternal portion of the sterno-cleido-mastoid muscle. The articulating surface of the internal extremity of the dislocated clavicle lay opposite to that of the clavicle of the sound side, and was supported by the superior border of the sternum. The attachment of the sterno-cleido-mastoid muscle to the first bone of the sternum did not appear to have suffered any laceration. M. Velpeau considered it to be very probable, that the dislocation was in the first place backwards, but that the force continuing to act, the end of the clavicle was afterwards driven upwards, and across the front of the root of the neck, and behind the storno-cleido-mastoid muscle. The dislocation was reduced in the usual manner, and the apparatus of Désault for fractured clavicle employed to retain the end of the bone in its proper place. The bandages used

31*
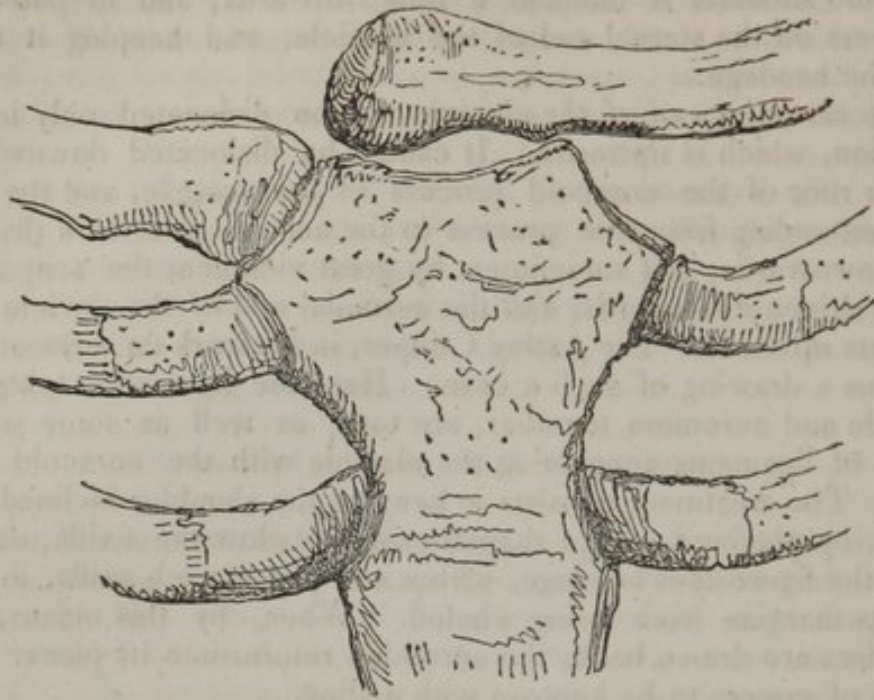
were steeped in a solution of "dextrine," which, when dry, rendered the whole immoveable.

Sept. 6. The apparatus has been reapplied, as the extremity of the clavicle had again become slightly displaced in the same direction as before.

Sept. 15. Doing very well.

DISLOCATIONS OF THE HUMERUS AT THE SHOULDER

Are so common, that it has been rather incorrectly supposed, that they equal in number all other dislocations put together; and when various circumstances relating to the shoulder joint are considered, we must discern several which account for the frequency of these accidents. First, the glenoid cavity is very shallow and small in proportion to the size of the head of the humerus, which, in the perpendicular direction is twice as broad as the articular cavity, and in the transverse direction, not less than three times as wide. Secondly, this joint derives no material strength from ligaments, the capsular ligament being particularly weak and thin below, where there is nothing to resist dislocation, and thick above, where the acromion, coracoid process, and triangular ligament, form insurmountable obstacles to such an accident. Thirdly, we are to remember, that the shoulder joint is capable of motion in every direction, and the muscles surrounding it and attached to the humerus are numerous, the consequence of which disposition is, that the head of the bone must in many positions make considerable pressure against

the capsule. Dislocations of the humerus would, indeed, be more frequent than they are, if the scapula were more fixed; but as this bone is as moveable as the humerus itself, the glenoid cavity accompanies all the movements of the head of the latter bone, and thus forms a very accommodating support to it.

The head of the humerus is subject to *three complete dislocations*, and *one of an incomplete kind*. The most common of the three complete dislocations takes place downwards into the axilla, the head of the bone pressing against the inferior costa of the scapula, and passing into that situation between the long portion of the triceps, and the tendon of the subscapularis, which is sometimes lacerated. In the next most frequent case, the head of the humerus is thrown under the pectoralis major and pectoralis minor muscles, on the sternal side of the coracoid process, so as to lie below the middle of the clavicle. As the pectoralis minor is attached to the coracoid process, the head of the bone must pass under that muscle in order to reach the situation which has been specified. This fact, I believe, is not demonstrated in any preparations in London; but Sir Astley Cooper refers to a specimen, from the appearance of which, it was inferred that the head of the humerus had certainly passed under the pectoralis minor, as well as the pectoralis major. The third complete dislocation is backwards, on the dorsum of the scapula, under the spine of that bone; but this is so rare an accident, that Baron Boyer, in the whole course of his experience, never met with more than two examples of it, one of which was accidentally noticed in the dead subject. Sir Astley Cooper, also, during an experience of more than forty years, has met with but few instances of it. One such case was brought to University Hospital, and reduced by Mr. Morton, late house-surgeon.

In the *incomplete* dislocation, the head of the humerus is thrown forwards on the external side of the coracoid process, and the capsular ligament is lacerated; but the bone does not entirely quit it.

What are the symptoms of a dislocation of the head of the humerus into the arm-pit? *Three symptoms are common to all dislocations of the shoulder:* first, *loss of the rotundity of the shoulder;* secondly, *a hollow under the acromion;* thirdly, *the acromion forms, or seems to form, a greater projection than natural.* In addition to these symptoms, when the head of the humerus is lodged in the axilla, there will be a lengthening of the arm; if we look at the patient from behind, the elbow of the affected limb will plainly seem to be lower than the elbow of the other arm; it will also be inclined a good way from the trunk, and the patient cannot put it close to his side. This latter circumstance is one of the first things about which I usually make inquiry, when called to a supposed dislocation of the shoulder; and if the patient can put his arm close to his side, I then know that there cannot be a dislocation into the axilla.

In such a dislocation, he is also unable to raise his arm to a level with the acromion. In consequence of the limb being lengthened, and the humerus carried downwards, the deltoid is necessarily flattened, and this, not merely on account of the bone quitting its place, but from the fibres of the muscles being put on the stretch. It is, indeed, in consequence of this, that the arm is held out from the side. The long portion of the triceps is also stretched; and one effect of this is, that the fore-arm is always found more or less extended, while the stretched condition of the head of the biceps accounts for the head being thrown into the state of supination. If the arm be raised from the side, we may distinctly feel the head of the humerus in the axilla. In addition to the above symptoms, the functions of the joint are suspended, and, instead of free motion of the arm, there is an extraordinary rigidity of it. The manner, in which the accident commonly happens, is this;—the patient falls while his arm is raised from his side, or, I should rather say, he endeavors to save himself from injury by holding out his arm; the arm comes to the ground in this position, and the resistance of the ground suddenly throws the lower portion of the humerus upwards, and propels its head downwards, which latter movement is at the moment also promoted by the spasmodic and violent action of the pectoralis major and latissimus dorsi muscles. Thus, supposing the arm to be raised from the side at the time of the fall, without too much inclination either backwards or forwards, the dislocation will be into the axilla.

In another *dislocation*, which is tolerably frequent, *where the head of the humerus is thrown under the pectoral muscles*, and on the inner side of the coracoid process, the head of the bone can be felt in its new situation; the axis of the bone is also directed towards this point; not towards the glenoid cavity, but the centre of the clavicle. The elbow is seen to incline more or less backward. The head of the humerus being more wedged in its new situation at the inner side of the coracoid process, than when it lies in the axilla, the limb is still more rigid, and there is less possibility of moving it. The limb is also shortened; whereas, in the luxation downwards, it is lengthened. In addition to these, there will of course be the three common symptoms, namely, a hollow under the acromion, a considerable projection of that process, and a diminution of the rotundity of the shoulder.

The dislocation forwards, under the pectoral muscles and centre of the clavicle, takes place in the following manner: while the arm is inclined somewhat backwards, and separated from the side, the person falls with great force on his elbow, or lower end of the humerus, the head of which is consequently forced upwards and forwards. It does not always pass immediately underneath the clavicle, but undergoes that secondary species of displacement, to which I invited attention in the general observations on dislocations : it is

first thrown under the pectoral muscles, and then the action of the muscles draws it higher and higher, till it is brought close under the centre of the clavicle at the inner side of the coracoid process.

A dislocation backwards can scarcely happen, except when the arm is inclined forwards, across the front of the chest, and it is difficult to imagine how any force can act so as to dislocate the bone, even when the arm is in this position; for any violence, at all likely to be applied, would generally propel the arm against the chest, and this, no doubt, is the reason why the dislocation backwards is uncommon. As the head of the bone is always conspicuous below the spine of the scapula, the diagnosis is not liable to any mistake. In this case, the elbow is not separated from the side, as it is in the more common dislocation into the axilla.

What is the mischief produced when the head of the humerus is dislocated downwards into the axilla? There is sometimes a lasceration of the tendon of the subscapularis; the tendon of the long head of the biceps is also stated to be sometimes broken or displaced; but so far as the dissections of Sir Astley Cooper and Boyer go, it appears that neither of these circumstances has fallen under their notice. One instance, however, is recorded by Mr. Hey, where, in a compound dislocation of the shoulder, an extremely rare case, the head of the humerus protruded through the integuments, and the tendon of the biceps was really torn. Of course, the capsular ligament is lacerated, and there may be a laceration of other tendons and muscles.

Every plan for reducing dislocations of the shoulder ought to combine three principles; viz. extension, counter-extension, and the employment of the shaft of the bone as a lever for moving its head into the glenoid cavity; and also a fourth principle, which is the relaxation of the muscles, so far as this may be practicable, without neglecting the other indications. The manner of making counter-extension is by means of a girth or sheet, applied round the chest, and either held by the assistants, or fixed to some point in the direction opposite that in which we purpose to make extension. A piece of strong linen, with an aperture or slit in it, for the reception of the arm, will serve very conveniently both to fix the chest, and hold back the scapula. Whatever means be exployed for keeping back the shoulder, the pressure is not to be applied to the glenoid cavity, or too near the acromion; for then it would form an obstacle to the return of the bone into its proper situation.

With regard to the manner of making the extension, and the direction in which such extension ought to be made, I may observe, that French surgeons would generally make extension as far as possible from the joint concerned: thus, in a dislocation of the shoulder, they would make it at the wrist: but, in this country, the extending means are most commonly applied to the lower part of the humerus itself; and the reason for this is, that British surgeons fre-

quently prefer keeping the fore-arm bent, by which means the biceps is relaxed. They consider that, as the portion of this muscle attached to the coracoid process must be stretched when the arm is extended, it would in this state tend to hinder the shoulder from being kept properly back; and, on this account, they keep the fore-arm bent, and apply the extension to the lower part of the humerus. In the plan used in France, there is the advantage of a long lever, which, perhaps, fully counterbalances the good derived in our method from the relaxation of the biceps. Before applying the napkin, or cloth, for the purpose of making extension, it is customary to place something immediately round the limb, in order to prevent the skin from being chafed or too much irritated; and in this country, it is usual to apply a piece of wet linen, or a few turns of a flannel roller, for the purpose. We then take a piece of strong calico, or linen, which must be three yards long, and half a yard wide, and fold it longitudinally, till it forms a long extending means, about three inches in width. An ingenious way of applying this is mentioned by the late Mr. Hey, which is rather difficult to describe, though very simple to show: he places the noose first in an elliptical form round the limb; he next takes one of the ends and passes it over to the opposite side through the noose; then he does the same with the other end; and the more this apparatus is pulled, the tighter it becomes. The contrivance is simple and effectual. Another contrivance is what the sailors call the clove-hitch knot, a drawing of which may be seen in Sir Astley Cooper's book. With the cloth, three yards in length, there is, when it is applied, more than a yard left for the assistants to make extension with. When the dislocation is downwards into the axilla, the extension may first be made in the direction of the axis of the bone, that is, downwards and outwards, in order to dislodge its head from the inferior costa of the scapula. When sufficient extension in this direction has been made, the next object is to have recourse to the lever-like movement of the shaft of the bone, and for this purpose, many surgeons place one knee in the axilla, and make a fulcrum of it, and as soon as they see, that the head of the bone has been by these means brought towards the glenoid cavity, the extending power is relaxed, and the muscles draw it into its place. On such principles, the reduction is, in general, easily effected. If the patient be intoxicated, then we are to take advantage of this condition, in which a dislocation may aften be reduced without performing any extension at all; indeed, when the person is faint, or intoxicated, if we place the bone over the back of a chair, or over our knee, the dislocation may often be reduced with little or no extension. I have seen this frequently done on drunken persons; and sometimes the bone will slip into its place on the patient moving the arm himself, while it is suspended over the back of a chair, or the mere weight of the limb will be sufficient to effect the reduction. An

old and not a bad method of reducing a dislocation in the axilla is that, in which the surgeon places his heel in the arm-pit, and makes extension from the hand or wrist. The heel not only fixes the chest, and keeps back the shoulder, but constitutes a fulcrum on which, by the lever-like motion of the limb, the head of the humerus can be directed into the glenoid cavity. It would appear that, in some cases, the connection of the supra-spinatus muscle with the greater tubercle, is the cause of the resistance to the extending power.[*] Here the resistance is most effectually overcome by raising the arm, and relaxing the supra-spinatus. On this subject, Sir Philip Crampton justly remarks, " The success, which not unfrequently attends the method of reduction (first recommended by Mr. White, of Manchester) by drawing the arm directly *upwards*, in a line parallel to the axis of the trunk, is, no doubt, to be attributed chiefly to the relaxation, which it effects, of the supra-spinatus and deltoid muscles. It is probable also, that, in this position of the humerus, the head of the bone is in some measure unlocked from the neck of the scapula, against which it is (when dislocated downwards) strongly compressed by the contraction of the muscles." Mr. Hey particularly recommended White's method for old dislocations. In 1785, a memoir in favor of the same practice was addressed to the Academy of Surgery, by M. Mothe. The consideration of the anatomy and pathology of the dislocation into the axilla led Malgaigne, one of Dupuytren's pupils, to be an advocate for the method, which gained also the approbation of the latter distinguished surgeon. White first described this mode of reduction in a paper, printed in 1764.[†]

When the *dislocation* is *forwards*, under the centre of the clavicle, the elbow is inclined backwards and downwards, and, if we were to attempt to bring the head of the bone direct from its situation, below the clavicle, into the glenoid cavity, we might fracture the coracoid process. This shows the necessity of attending to the principle of first dislodging the bone from the situation in which it has been thrown by the secondary displacement. In this dislocation, the bone is first thrown out of the glenoid cavity under the pectoral muscles, but does not mount up to its situation under the centre of the clavicle till the secondary displacement takes place. This displacement must first be obviated by pulling the bone downwards and backwards in the direction assumed by its axis, as one of the effects of the accident. Now, as soon as the head of the bone has been brought below the coracoid process, we are to incline the elbow more forwards, and bring it closer to the side; thus we shall direct the head of the bone towards the glenoid cavity; at the same

---

[*] Sir Astley Cooper on Dislocations. p. 377.
[†] See Compton's Obs. in Dublin Journ. of Med. and Chemical Science, vol. iii. p. 181.

time we may use a band or napkin, placed under the upper part of the humerus, as a fulcrum; for, in this case, we cannot well get our knee under the axilla, so as to make a fulcrum of it.

It has sometimes been suspected, that all dislocations of the shoulder are first downwards; but a dissection, the particulars of which are given by Sir Philip Crampton, proves, that this is not the case, for the bone was thrown under the pectoral muscle, without the lower portion of the capsular ligament being at all torn.

The other less common dislocation, where the *head of the humerus* is thrown *upon* the *dorsum of the scapula*, is believed by Sir Astley Cooper to differ from other luxations of the shoulder in being the result of muscular action alone. He has recorded one case, in which the displacement of the head of the humerus was produced by the convulsive action of the muscles in an epileptic fit. I remember one case, however, in which this dislocation arose from a violent blow on the front of the shoulder. In the example lately recorded by Sir Astley Cooper, it was found, on dissection, that the tendon of the subscupularis and the capsular ligament had been torn from the smaller tubercle of the humerus, and the bone was consequently drawn back by the action of the infra-spinatus and teres minor. Hence, there was no support given to the head of the bone, when reduced, and, consequently, a return of the displacement ensued. This, however, is an exception to what has usually happened; for, after the bone has been reduced, the reduction has commonly been permanent.

This dislocation is peculiar in not being attended with any elevation of the elbow from the side. The reduction may generally be accomplished by fixing the shoulder, making extension, and then pushing the head of the humerus forwards towards the glenoid cavity. In one case, Sir Astley Cooper bent the elbow at a right angle, and raising the arm, carried it behind the patient's head, so as to bring the hand across the back of the neck to the opposite shoulder. Then forcing the elbow back, and pressing upon the head of the bone, he pushed it under the inferior costa of the scapula, and it instantly returned into the glenoid cavity. This dislocation has also been reduced with the heel in the axilla, and extension made in the direction of the trunk.*

Thus the reduction of dislocations of the humerus is performed on the combined principles of extension, counter-extension, relaxation of the biceps, and the lever-like movement of the shaft of the bone. I might add to these the very important principle of dislodging the head of the humerus from the situation in which it has been thrown by the secondary displacement. When difficulty in effecting the reduction is experienced, we can have recourse to debilitating

---

* See Guy's Hospital Reports, vol. iv. p. 265.

means, such as copious bleeding from a large orifice in the vein, or the administration of tartarised antimony, with the view of bringing on that collapse of the muscular system, which naturally accompanies faintings and nausea. Then, so far as the muscles are concerned, the difficulty of reduction is removed, and the head of the bone, if the case be not an old dislocation, may be readily put into its right place again. Sometimes, in examples of difficulty, the multiplying pulley is used. After the reduction, the next indication is, to prevent the bone from slipping out of the glenoid cavity again. For this purpose a sling is generally sufficient; but, for greater security, if the patient be tipsy and restless, we should confine the humerus to the side with a roller.

It is mostly allowed, that the humerus may be incompletely dislocated, and remain fixed on the outside of the coracoid process, the front of the capsular ligament being torn, but the head of the bone not being thrown out of it. The reality of the accident is sometimes disputed. I have not seen any decided example of it in my own practice; but Sir Astley Cooper's observations leave, I think, no doubt about its possibility; and in his work is a plate, representing the state of the parts, as found on dissecting the shoulder after such an accident. Should it be met with, the reduction ought to be effected on the same principles as are observed when the head of the bone is thrown to the inner side of that process; and after the reduction, a compress is to be applied in front of the head of the humerus, just on the outside of the coracoid process, supported by the spica bandage. In one instance, recorded by Mr. South, the coracoid process was broken.*

[There is another form of luxation at the humero-brachial articulation, which I do not recollect to have seen mentioned by any author, and which came under my observation in July, 1836. The head of the brachian was thrown *under* the scapula. The patient was a young man, aged twenty-two, an operative in a woollen mill. While he was attempting to shift the position of a belt, his hand was caught between the belt and the drum. and carried round, strongly pronating it, and, as it were, twisting the bone from its socket.

The head of the bone could be felt under the scapula, and the arm and fore-arm lay obliquely across the chest, with the back of the hand turned towards the body, and the palm looking outward. The rotundity of the shoulder was gone.

To reduce this luxation, the arm and fore-arm were brought down to the side of the body, and the limb twisted into its natural position; in consequence of which the head of the bone was brought into the axilla; from which position it was restored in the ordinary way to the glenoid cavity.—Ed.]

* See Med. Chir. Trans. vol. xxii.

DISLOCATIONS OF THE ELBOW.

The *displacement of both bones of the fore-arm forwards* cannot take place without a fracture of the olecranon, which process of the ulna forms a mechanical impediment to such an accident; indeed, it is an accident of great rarity. In the Museum of University College is a preparation, in which the olecranon was fractured, and also the coronoid process; and the radius and ulna were dislocated, but not both of them forwards, for the ulna was thrown backwards.

A boy, in attempting to leap over a post near my house, fell down and dislocated his elbow; it was a dislocation of the ulna backwards and of the radius forwards. I had not the slightest difficulty in reducing the case, which terminated favorably. The most common *dislocation* of the elbow, is that in which *both bones* are thrown *backwards*, either with or without a fracture of the coronoid process.

When the coronoid process is not fractured, it passes into the fossa at the back of the humerus, in which the olecranon is naturally situated. On this account the arm cannot be completely extended; the olecranon forms a remarkable projection behind the arm; and the distance between the point of the olecranon and the internal condyle is conspicuously increased; the humerus itself also forms a projection in front of the upper part of the bones of the fore-arm; and the radius is thrown on the outside of, and above, the external condyle. It is of great use, in these dislocations, to attend precisely to the relative positions of the point of the olecranon, and the external and internal condyles; for, sometimes the swelling is so great as to prevent us from making out the case satisfactorily, unless we avail ourselves of these beacons. In the dislocation of the ulna backwards, the distance between the olecranon and the internal condyle is remarkably increased; these points may always be felt in the fattest persons, and however great the swelling.

In the dislocation of the ulna backwards, there is a laceration of the capsular ligament, and of the internal lateral ligament, and generally, also, of the annular ligament of the radius, which is closely connected to the external lateral ligament. In consequence of the lower head of the humerus being thrust forwards, the brachialis anticus is liable to be torn; but the tendon of the biceps generally escapes, and is tightly applied round the lower articular surface of the humerus. However, if the dislocation has been caused by excessive violence, that tendon may be torn, and even other mischief done; for example, the brachial artery may be ruptured, the median nerve torn, and the veins at the bend of the elbow burst. In the ninth number of Cruveilhier's great work on Pathological Anatomy, some notice is taken of a case, where such complications occurred in a lady, who fell from her horse with prodigious force.

The mode of reducing this dislocation is simple:—The surgeon may apply his knee to the bend of the arm, and, taking hold of the wrist, bend the elbow over his knee with the advantage of a considerable lever; the coronoid process will then quit the fossa at the back of the humerus intended for the olecranon, and, by continuing the movement of flexion a little further, he will find the bone return into its right situation. Now, if the coronary or annular ligament of the radius be torn, this bone will slip out of its place again, unless means be taken to prevent it. With this view, we should apply a compress over the head of the radius, to press it down towards the lesser sigmoid cavity of the ulna; and we should prevent the radius from moving by means of splints, one on the outside, and another on the inside of the fore-arm. If a case of this description were to remain unreduced, which sometimes happens, nature makes great efforts to repair the mischief; and it is to be observed, that the dislocation is complete, the articular surfaces not being at all in contact with each other. Sometimes, indeed, a surprising attempt is made to form a new socket for the humerus. In the plates of Cruveilhier's celebrated work, a representation of such a dislocation, and of the efforts made by nature to repair the mischief, is given; a considerable quantity of bony matter has been thrown out to form a socket for the humerus. These plates also show the changes which take place in the shape of the bones, when their functions have been destroyed by remaining long unreduced. In the instance here exhibited, a very limited degree of motion remained; and nature had done all in her power to produce a new articular cavity.

Sometimes the dislocation takes place in another way, the *ulna* being *thrown backwards*, and the *radius forwards;* the former bone assuming the position described in the last dislocation. The case is reduced nearly in the same way as the foregoing; but we are to make some extension, for otherwise we could not bend the elbow with the radius in front of the humerus; and after the requisite degree of extension has been made, the bones will return to their proper situations on bending the elbow over the knee.

In other instances, we find a dislocation of the radius alone; the upper head of which bone quits the lesser sigmoid cavity of the ulna, and is thrown on the outside of the external condyle, and sometimes behind it. The nature of the accident is sufficiently obvious; for the head of the radius is thrown on the outer part of the arm. I have seen three or four examples of this case, and there are many instances of it on record. There is an engraving of one such case, which was dissected by Cruveilhier; the dislocation had not been reduced, and nature had formed a sort of fibrous capsule for the reception of the head of the radius, which capsule Cruveilhier thinks was derived either from the remains of the annular or of the external lateral ligament. The same plate also illustrates the change,

which takes place in the articular surface of a bone that has been long out of its place. For the reduction of this dislocation, the best plan is to make extension of the arm, and to limit the extension as much as possible to the radius; thus we can draw the displaced bone into its proper situation. Now, the head of the radius will be apt to slip out of its place again, unless means be taken to prevent it; we must, therefore, hinder all motion of the radius with splints, and support the head of it with a compress. This tendency of the head of the radius to quit the lesser sigmoid cavity after the reduction, is owing to the annular and oblique ligaments being torn. A child was once brought to me at the Bloomsbury Dispensary, with this dislocation; the accident had occurred seven weeks before I saw the case, and nothing would avail in keeping the head of the radius in its place: we applied splints for three or four weeks, but at the end of this time, the bone glided into, and out of, the articular cavity as readily as ever.

The most common *lateral dislocation* is *where the ulna is forced outwards* into the place of the radius, which is propelled off the articular surface of the humerus altogether. In this state of the bones, there is no suitable cavity behind the humerus for the reception of the olecranon in the extended condition of the fore-arm. The consequence is, that complete extension cannot take place: neither can flexion be well performed. The case is sufficiently manifest from the extraordinary projection formed by the inner condyle on one side, and by the radius on the other. Extension and counter-extension are to be made, and the ulna and radius reduced by lateral pressure.

Dislocation of the lower end of the ulna from the sigmoid cavity of the radius takes place mostly from a forcible pronation of the hand, the ulna being then thrown back, and the hand fixed in the position of pronation. There is a possibility, however, of the displacement occurring in the other direction, or of the ulna being thrown forwards and the hand supine. Here extension is to be made, and the displaced bone pressed in the direction required to bring it into the proper position again: then a splint is to be applied to prevent the radius from moving.

DISLOCATIONS OF THE WRIST.

A gentleman once asked me if it were true that the wrist was never dislocated? To which I answered, that it was not possible for me to agree in that doctrine, because I had seen a case, in which the lower end of the ulna protruded through the skin. However, his question related to the possibility of a dislocation of the radio-carpal articulation. Various anatomical reasons are assigned by Dupuytren, why the radius should always rather break, than be dislocated from the carpus; and he distinctly declares it as his be-

lief, that there is not, in all the records of surgery, an unequivocal specimen of such a dislocation. He had sometimes been called to cases, supposed at first to be true dislocations of the wrist, but which afterwards proved to be only fractures of the radious near that articulation. One or two instances of such mistakes, verified by dissection, are brought forward, in which practitioners of eminence had been deceived. Hence the Baron is led to conclude, that a dislocation of the wrist is scarcely a possible event, and that the accidents, reputed to be such, were in reality fractures of the radius close to the joint, with more or less displacement of the hand. It cannot be doubted, I think, that this is generally the fact: but it would be making a bold assertion to say, that such a dislocation never happens. Great as Dupuytren's experience is, it is merely a drop in that great ocean of experience, to the rich treasures of which the surgeons of every age have successively contributed. Instead of representing a dislocation of the radius from the carpus as impossible, it would, I believe, be more correct to say, that the accident is exceedingly rare. In Sir Astley Cooper's work, there is a drawing of a dislocation of the carpus backwards, which, no doubt, is particularly uncommon; for when a person falls on his hand while it is extended, the force would almost always sooner break the radius than dislocate it towards the palm; but if the hand were in the state of flexion, so that the back of the hand received the force, then a dislocation might perhaps be a more likely event. Cruveilhier had an opportunity of dissecting such a dislocation, as he believed it to be, in which the radius and ulna had been thrown on the back of the hand, and the state of the parts is represented in one of his plates; the patient, he conceives, had fallen on the back of the hand with considerable force. Yet Dupuytren and Cruveilhier took different views of this preparation, so that further investigations are desirable. In Cruveilhier's book, we also find an engraving from a case, in which the radius had been dislocated by the contraction of a burn. Sir Astley Cooper also speaks of a boy, who fell on the palm of his hand, and whose carpus was driven backwards. I am not therefore disposed to consider Dupuytren's doctrine as completely established; in fact, it is difficult to restrict the effects of the external violence on the joints, considering the infinite variety of circumstances by which they may be modified and influenced.

[During Sept. 1844, I was called to see a boy aged twelve, who had just fallen and injured his wrist. Dr. F. U. Johnston and myself examined the case, and found it to be a well marked case of luxation backward, so as to rest upon the lower part of the radius. It was a clear case of luxation uncomplicated by fracture, and certainly disproving the dogma of Dupuytren.—ED.]

If we were to meet with a dislocation of the radio-carpal articulation, it would be easy of reduction, as dislocations of gingly-

moid joints usually are; the extension and counter-extension need only be made in a degree sufficient to diminish the friction between the articulating surfaces, and then pressure is to be made on the displaced bones in the direction calculated to bring them into their right situation again. Extension and counter-extension would be necessary, if the dislocation of the carpus were forwards, and splints would be required; for otherwise the movements of the hand might bring on a return of the dislocation, and prevent the speedy union of the ligaments.

DISLOCATIONS OF THE BONES OF THE CARPUS FROM ONE ANOTHER.

The bones of the carpus are not very liable to be dislocated from one another: however, there is one in the second phalanx, which is occasionally thrown out of its place,—I mean the os magnum. This bone is received into a deep cavity formed by the scaphoid and lunar bones, and when the hand is violently bent, it will sometimes start out of this cavity, and form a considerable projection at the back of the wrist. The reduction is occasionally difficult; but, if the bone be left unreduced, there will not be much inconvenience,—there will only be a slight weakness of the wrist. Thus, in one instance, which was attended by Sir Astley Cooper, the inconvenience, resulting from the non-reduction of the dislocation, was, that the young lady, who was the subject of it, could not practise music—she could not play on the piano-forte. The case will be evident from the situation of the bone, and its projection beyond the other bones of the carpus. The accident chiefly occurs in children and females, from the greater weakness of their ligaments, and also from the cavity of the scaphoid and lunar bones being more shallow in them than in male adults. In reducing this dislocation, we are to bring the hand into the extended position, and then press firmly on the projecting bone with our thumbs. The common plan of palliating this dislocation, when it cannot be reduced, is to apply a compress and bandage over it, or straps of adhesive plaster.

The *metacarpal bones* can hardly be separated from one another except by great and direct violence; and so closely are they tied together and to the carpus, that scarcely any thing, except gunshot violence, the bursting of a fowling-piece, or pistol, or the fall of some ponderous body on the hand, can dislocate them. However, the metacarpal bone of the thumb is more frequently dislocated than any other; and, from its having motion in every direction, it seems capable of being dislocated in four directions, namely, inwards, outwards, forwards, or backwards; but experience proves, that it is ordinarily dislocated only forwards or backwards. When a person falls on the radial edge of his hand, and the thumb is car-

ried violently inwards, the head of the metacarpal bone will be thrown on the back of the trapezium. In other instances, the displacement is in the opposite direction, and the head of the metacarpal bone of the thumb is then thrown between the metacarpal bone of the fore-finger and the inside of the trapezium. The reduction is easy: the principle is to make counter-extension from the wrist, and extension from the thumb, and to press the bone in the proper direction.

DISLOCATIONS OF THE THUMB

Are sometimes difficult to reduce, especially those of the first phalanx from the metacarpal bone. There are some persons, however, who have the ligaments of this joint so loose, that at their option they cannot only dislocate the first phalanx by the action of the flexor muscles, but even replace it again by the action of the extensors. In such instances of spontaneous dislocation and reduction, the ligaments are preternaturally loose. Sometimes this may be the result of the disease, or the neglect of a dislocation, where the bone had been reduced, but not well supported in its place.

In the common dislocation of the thumb, the head of the first phalanx is thrown on the back of the head of the metacarpal bone, so that the first phalanx projects backward, while the head of the metacarpal bone inclines towards the palm, the thumb remains without the possibility of being straightened, and the second phalanx is fixed in the bent position. It is from there being no laceration of the lateral ligaments that the reduction is so difficult; for the wedge-shaped head of the first phalanx glides with its narrow part through the aperture between the lateral ligaments, and brings the broad part within them. Thus, the first phalanx is completely and firmly wedged between the lateral ligaments, which must therefore be considered as forming the principal impediment to the reduction. The muscles of the part also being strong, form some resistance to the reduction, especially as the surface for the application of the extending means is very limited. From these various causes, there is occasionally so much difficulty in the reduction, that, in a case in St. George's Hospital, about fifty years ago, extension was made with such force, that the thumb was pulled off. The case is alluded to by Mr. Hey, of Leeds, in his Practical Observations on Surgery. Some time ago, a young man came to my house with this dislocation. He was sent to me by Mr. Hughes, of Holborn, who had tried in vain to reduce it. Wishing Mr. Hughes to be present at the reduction, I desired him to call upon me in the afternoon, that we might try our skill together; but, in the meantime, the patient happened to meet with a relation who was a surgeon, and who reduced it for him. I inquired how this gentleman succeeded, and was told that he fixed a piece of tape round the thumb, and secur-

ed it with the *clove-hitch* knot, which is one in familiar use amongst sailors; he then fastened a common street-door key to the tape, and, of course, was thus enabled to make extension with considerable force, and with success. In fact, I had been thinking of trying a very similar method. Sir Astley Cooper, in his work on Dislocations, explains his plan of reduction. He first puts round the thumb a piece of soft wet leather, to prevent the skin from being injured, and then applies tape over it, which he secures by the clove-hitch knot. The knot proposed by Mr. Hey would also answer. The sailor's knot differs from Mr. Hey's chiefly in there being two circles, or nooses, made instead of one. Sometimes Mr. Hey succeeded without making any extension at all, merely by pressing the head of the first phalanx towards the metacarpal bone. Indeed, it is easy to understand, that if the broad part of the bone were confined behind the lateral ligaments, the more powerful the extension, the greater would be the difficulty of effecting the reduction.

[Luxations at the metacarpo-phalangeal articulation of the thumb, are often extremely difficult to reduce. The anatomy of the parts is such as to render the reduction almost impossible, when direct extension and counter-extension are made, as is usually advised, and as is directed by our author, Sir A. Cooper, and most other writers. I have seen two patients, within the last year, who had this luxation, both of whom came from the country, after every attempt to effect a reduction there had failed. I succeeded in reducing one without any difficulty, but the other having been luxated sixteen days when I saw it, the case was much more difficult, and I could not succeed in restoring the parts, without dividing one of the lateral ligaments.

When the phalanx is luxated backward, the extremity of one bone hooks as it were upon the other, and the lateral ligaments are so attached, that the more force we exert, the more firmly they hook and bind. To overcome this difficulty, some advise to divide the ligaments, others to cut off the head of the metacarpal bone. In order to reduce the bone, I turn it back so as to make a right angle with the first metacarpus, and then slide the luxated extremity forward, until its surface reaches the head of the bone, from which it was displaced, and then I suddenly flex it toward the palm of the hand, and the natural position is restored.—Ed.]

Sir Astley Cooper particularly recommends the first phalanx to be flexed before the extension is made.

When the reduction of the first phalanx of the thumb cannot be effected by ordinary modes, it has been proposed to divide one of the lateral ligaments with a couching needle. The most experienced surgeons, however, object to this practice, on account of the frequency with which tetanus follows injuries of the tendinous and ligamentous tissues about the thumb. Sir Astley Cooper thinks it far more prudent even to let the dislocation remain unreduced, than occasion the risk of so frightful and unmanageable a disease as traumatic tetanus. Other surgons recommend cutting off the head

of the metacarpal bone with a small saw, or a pair of cutting pliers, which is perhaps better than dividing one of the ligaments.

Sometimes the dislocation is in the other direction, and the metacarpal bone is at the back of the first phalanx; then there is no difficulty in the reduction.

The *second phalanx* is sometimes dislocated backwards; and, in compound cases of this description, Sir Astley Cooper recommends cutting off the articular surface of the first phalanx. After the reduction of either of the above-mentioned dislocations, the joint must be supported with pasteboard and tape. After a fortnight, we are to begin to employ passive motion.

The phalanges of the fingers are most frequently dislocated backwards; moderate extension soon replaces them.

Compound dislocations of the thumb frequently lead to tetanus,— so frequently, indeed, that some surgeons have thought it advisable to amputate in all such cases, rather than attempt reduction; but, in this counsel, I am not disposed to agree; for, from the observations which I have delivered on the subject of traumatic tetanus, it appears, that amputation is a very uncertain means either of preventing, or curing, this disorder.

DISLOCATIONS OF THE VERTEBRÆ.

The dorsal and lumbar vertebræ have such extensive articular processes, while their bodies are so large, their ligaments so strong and numerous, and the motion between any two of them so trivial, that they hardly can be dislocated; and, indeed, Sir Astley Cooper states, that he has never seen a dislocation of the dorsal or lumbar vertebræ unaccompanied by a fracture of one or more of their bodies, or of the oblique or articular processes. He has never seen it happen from a simple laceration of the intervertebral substance. Generally, there is a fracture of the articular processes, and of one or more of the bodies of the vertebræ, with dislocation of the articular process of one vertebræ from that of the next. A dislocation from laceration of the intervertebral substance alone, may be deemed impossible in the lower part of the spine. But, in the upper part of the vertebral column, there may be a dislocation of the vertebræ unaccompanied by a fracture, because the articular surfaces of the bodies of the cervical vertebræ are less extensive, and the spinous and articular processes less oblique. At St. Bartholomew's Hospital, there is a preparation in which a portion of the intervertebral substance is lacerated, between the fifth and sixth cervical vertebræ, with a partial separation of those bones from one another, and a dislocation of the articular processes on both sides. There is another instance in the museum of the same hospital, of partial fracture of the two bodies of the lower cervical vertebræ, accompanied with dislocation of the articular processes. But the case,

in which there was dislocation and no fracture of the articular or ob-
lique processes is sufficient to prove, that there may be dislocation of
the upper vertebræ without any kind of fracture. By the favor of
a gentleman, who was attending my lectures, I was once enabled
to show the Surgical Class of University College a specimen of
complete dislocation of the middle of the cervical vertebræ, with-
out fracture. The person, from whom it was taken, was killed
instantaneously by coming in contact with the top of a gateway, as
he was sitting on an omnibus, which was going with great speed.

In one of the last volumes of the Medico-Chirurgical Transac-
tions, a case is recorded, in which the body of one of the dorsal
vertebræ was fractured, and, at the same time, there was a disloca-
tion of one of the articular processes of that bone from the corres-
ponding articular process of the first lumbar vertebra, without frac-
ture of them.

If we are to believe the statements of Desault, and others, dislo-
cations of the articular processes of certain portions of the spine
have occasionally been reduced.

DISLOCATIONS OF THE HEAD.

There is no case on record, in which the os occipitis has been sud-
denly dislocated from the atlas by external violence, so firmly are
they connected together. But there may be dislocations of the os
occipitis from the atlas in consequence of disease. Now, this kind
of displacement generally arises from a scrofulous caries of the joint,
or of the atlas itself. There are also cases on record, in which ex-
ostoses from the occipital bone, or from the atlas or from the pe-
trous portion of the temporal bone, led to displacement of the atlas.
Here, of course, the space for the medulla spinalis is diminished.
yet it is not rendered sufficiently narrow to produce fatal consequen-
ces. If the patient live long enough under these circumstances, an-
chylosis of the atlas to the os occipitis may follow, the anchylosis
sometimes extending to the dentata, and even to the vertebræ be-
low it. There are several specimens in the museum of University
College, in which this sort of bony consolidation is illustrated. The
symptoms of scrofulous disease of the upper cervical vertebræ,
leading to displacement of them, were first accurately described by
Professor Rust of Vienna, and a good account of them was subse-
quently drawn up by Mr. Lawrence, and inserted in the Medico-
Chirurgical Transactions. Most of the patients are young subjects.
I have witnessed several cases within the last three or four years,
and they were all in young persons, two of whom were girls. At
the Bloomsbury Dispensary, a boy was under my care two or
three years with this disease, which at length terminated in anchy-
losis.

The symptoms are, great pain on moving the neck or turning the

head; after a time, more or less difficulty in swallowing is felt; if pressure be made on the part, the patient experiences great agony; the voice is hoarse, and there is oppression of the breathing; but the most characteristic symptom, when the patient is not lying down, is, that he is almost always found supporting his head with both hands placed under the lower jaw, either because motion of the head gives him pain, or because the support of it gives him relief. After some time, the patient generally becomes afflicted with vertigo, or is attacked by convulsions, which suddenly carry him off, or he lingers for a considerable period, and dies hectic. Before the fatal termination, a crepitus may sometimes be felt.

The treatment is conducted on the same principles as that of other scrofulous diseases of the bones and joints, that is, if there be pain and inflammation, we apply leeches, and if the affection partake of a more chronic character, we make an issue, or apply the moxa, a blister, or a seton, to keep up a discharge from the neighboring parts, and excite counter-irritation, whereby the morbid process in the bones may be arrested.

Dislocations between the atlas and the vertebra dentata.—The rotatory motion of the head is performed by the atlas moving on the dentata, or rather by the former bone and the os occipitis revolving on the latter. Now, when this motion is carried beyond a certain point, a dislocation is the consequence. Here, then, a dislocation may be produced by external violence; and, in fact, many cases on record prove the possibility of such a dislocation. If the ligament, which ties the processus dentatus to the edge of the foramen magnum, receive a violent twist, by a forcible turn of the head to the right, the left side of the dentata may be carried in front of the corresponding articular process of the atlas, while the right side of the dentata is forced behind the corresponding articular surface of the atlas. When the processus dentatus is dislocated from the space between the transverse ligament and the fore-part of the atlas, it will press upon the medulla oblongata and spinal cord, and produce immediate death. In general, there is not a rupture of the transverse ligament, but the processus dentatus slips under it. Sometimes, however, the dislocation of the processus dentatus backwards is preceded by a rupture of the transverse ligament: but this can take place only in two ways,—first, from a fall with great force on the occiput, as happened in a case recorded by Boyer; and, secondly, from a violent fall on the chin, as mentioned by Sir Charles Bell. In Children, the processus dentatus is particularly weak, and therefore liable to be broken; indeed, in any subject, in whom it is more slender than usual, it may be broken, and then the lower portion of it, passing under the transverse ligament, will make fatal pressure on the spinal marrow. In consequence of this process not being fully developed in children, and the ligaments being weaker in them than in adults, the common trick of lifting them up by the chin and

occiput ought to be discontinued, for it has led, in many instances, to a sudden displacement of the processus dentatus, and instant death. A fracture of the atlas, with displacement of the processus dentatus, and fatal pressure on the spinal cord, is recorded by Sir Astley Cooper. But one of the most curious and interesting examples of a fracture and displacement of the atlas is related by Mr. Benjamin Phillips. The man, who met with the accident by a fall from a hayrick, lived forty-seven weeks after the injury, and then died of hydrothorax. Until the last week of his life, he was able to walk to the water-closet. On dissection, the condyles of the occiput were found yet to rest upon the articulating surfaces of the atlas; but, so much of the latter bone, as includes the surfaces by which it is articulated with the occiput and with the axis, had been violently separated from the posterior portion of its ring, and carried downwards and forwards, until it arrived upon the same plane as, but anterior to, the axis, to the body and transverse processes of which it became attached by perfect bony union, while the posterior fragment had suffered no displacement. The atlas, under these circumstances, presented two spinal foramina, and four transverse, but no odontoid process passed through the anterior spinal foramen; and to the circumstance of its having been fractured, instead of the transverse ligament giving way, Mr. Phillips ascribes the escape of the man from immediate death.*

As dislocations of the atlas from the second vertebra may be set down as inevitably fatal, it is unnecessary to say any thing about their treatment. We do hear, it is true, of dislocations of the head being rectified; but these are not the description of cases now under consideration, but merely examples of the displacement of one of the articular processes of the cervical vertebræ, erroneously called a dislocation of the head. A cure of such displacement is possible, and Desault actually succeeded in reducing an accident of this kind, by fixing the shoulders, and inclining the spine in the direction, opposite to that in which it was thrown.

DISLOCATIONS OF THE RIBS.

The ribs cannot well be dislocated at their vertebral extremities; but a separation of the ribs from their cartilages sometimes takes place, and then they are generally displaced outwards. In Sir Charles Bell's Surgical Reports are the particulars of an interesting case, in which most of the ribs were dislocated in this manner, in consequence of the person being pressed between a post and a waggon. Dislocation of a single rib is sometimes met with. The proper treatment consists in the application of a long piece of pasteboard wetted, so as to fit the part accurately, and over this a

---

* See Med. Chir. Trans. vol. xx. p. 78, &c.

broad roller should be applied, or a piece of linen, which is to be laced. When the pasteboard becomes dry, it forms an exact case for the part, and fits so closely as to prevent all motion of the end of the rib. Here it is also necessary to bleed the patient freely, as there is a chance of inflammation of the chest, and even of the abdomen; for the violence, producing such a dislocation, is always great; and, when a person is jammed between a wall or a post and a wagon, the contusion of parts is frequently not restricted to the chest.

DISLOCATIONS OF THE HIP.

At this joint, the femur is liable to at least four dislocations. Those, recognised by all surgeons, are the following:—In the *first*, the head of the femur is thrown upon the dorsum of the ilium, above the acetabulum and a little behind it, and under the glutæus minimus muscle, with the trochanter forwards: this is by far the most common direction in which the head of the femur is dislocated. The *next* in order of frequency, is where the head of the thigh bone is thrown into the obturator foramen, or upon the obturator externus muscle, and the obturator ligament. In the *third* dislocation, the head of the femur is thrown inwards and upwards upon the horizontal branch of the os pubis. The *fourth* is where the head of the bone is thrown backwards into the sacro-ischiatic foramen, and is lodged on the pyriformis muscle. In the *fifth* case, which is exceedingly rare, the head of the femur takes a lower position, namely, behind the tuberosity of the ischium downwards and backwards. Such a dislocation, however rare, is possible; and even those who doubt the possibility of it, caution us, when we are reducing a dislocation on the obturator foramen, not to incline the limb too forward, lest the head of the bone should slip into that very position. Sir Astley Cooper, who never met with such a case, cautions us against making extension, for the reduction of the dislocation into the obturator foramen, with the limb raised too much in front of the axis of the body. An instance of dislocation downwards and backwards, was recorded by Mr. Keate. In this instance, the lodgment of the head of the femur behind the tuberosity of the ischium arose from a secondary displacement. A gentleman fell into a ditch, with his horse upon him; he lay under the animal for some time; his thigh-bone was dislocated, and the head of it was found to have been forced secondarily behind the tuberosity of the ischium. However, many surgeons only admit the possibility of four dislocations of the thigh, and Delpech is one of them.

Except where the capsular ligament is much relaxed by the effects of disease, there must always be, in dislocations of the thigh-bone, a laceration of the capsular ligament. There are instances recorded of persons who could dislocate the thigh-bone spontaneously,

and afterwards replace it again without assistance. A gentleman, who attended my lectures, informed me of a person so circumstanced, and related some of the particulars to me. I suppose that, in such cases, there must be an unusual relaxation of the synovial membrane, a rupture of the ligamentum teres, and perhaps an imperfect state of the acetabulum. But such examples are rare: Sir Astley Cooper mentions one instance; I have heard of other cases, but I never saw one myself. In most dislocations of the hip, the ligamentum teres is ruptured: now, we should suppose, from a mere anatomical consideration of the joint, that the head of the femur might be dislocated on the obturator foramen, without any rupture of the ligamentum teres; for as that ligament is fixed to the anterior inferior part of the acetabulum, it seems to be capable of allowing the head of the bone to pass out of the socket on that side; but it is a disputed point, whether a dislocation can take place here without a rupture of this ligament. Sir Astley Cooper states, that a dislocation downwards and forwards, or into the obturator foramen, cannot take place unless the ligamentum teres be ruptured, and he details one or two dissections, which corroborate this assertion. On the other hand, Delpech asserts, that the ligament is not always ruptured; but, I believe, this can only be the case, when some of the brim of the acetabulum is broken off. Sir Astley Cooper is of opinion, that the ligamentum teres is always ruptured in this dislocation, because the accident cannot occur to a living person, except when his limb is in a state of abduction; and that, in such position, the ligamentum teres is on the stretch, and therefore, if the force applied go so far as to dislocate the joint, the ligamentum teres must first give way.

With regard to the symptoms of a *dislocation upon the dorsum of the ilium,* as the head of the bone is carried upwards, there must be a shortening of the limb; and as it is also thrown backwards, and the trochanter forwards, there must be an inversion of the limb; the knees and toes will be turned inwards; the great toe considerably, so as to be placed on the instep of the opposite foot; the prominence of the trochanter will be diminished, which necessarily happens, because the neck of the thigh-bone takes the direction of the side of the ilium: the trochanter is also nearer than natural to the crista of the ilium. The head of the bone can be felt on the dorsum ilii. The symptoms, then, are, a shortening of the limb; an inversion of the foot and knee; and the change in the position of the trochanter, namely, its proximity to the crista of the ilium being increased, and its own prominence diminished. The limb cannot be separated further from the opposite one, but it may be slightly bent.

This dislocation can only happen when the patient has the inferior extremity in front of the axis of the body, with the foot inclined inwards. While he is in this position, if any great force act on

the foot or knee, it will tend to throw the head of the femur out of the acetabulum upon the dorsum of the ilium. Surgeons have been much perplexed to know why, in this case, the toe should always be inclined inwards; they inquire why the head of the femur should always be thrown backwards, and the trochanter forwards. In this country no explanation has been offered of the fact, or none that has been admitted as a good one. In France, what has been considered there as a satisfactory explanation of the fact, has been offered, and is the following:—The lower and inner part of the capsular ligament, not being lacerated, keeps the great trochanter forward and the head of the bone is therefore always directed backward. Whether this explanation be admissible or not, it is difficult to say; but, in France, surgeons not only account for the position of the femur in this dislocation, but in all the others, in the same manner, namely, by the consideration of the way, in which the remains of the lacerated capsular ligament act upon the great trochanter.

The dislocation upon the dorsum of the ilium, being attended with a shortening of the limb, might be mistaken for a fracture of the upper part of the femur; but the discrimination between the two cases is easy, when it is recollected that, in ninety-nine cases out of a hundred, the toes are everted in the fracture, while, in the dislocation upon the dorsum of the ilium, they are always turned inward. Another difference is, that the limb is altogether less moveable, or more rigid, in the dislocation than in the fracture. Then, in a fracture, even if it be one of the neck of the femur, we may, on drawing the limb downwards, feel a crepitus, and, on discontinuing the extension, the shortening of the limb will immediately recur.

The next most frequent *dislocation* of the head of the femur is that in which it is thrown *upon the obturator foramen*, or rather on the obturator externus muscle, and obturator ligament. Here one particular symptom is always noticed, viz. the body is inclined forward by the tension of the psoas magnus and iliacus internus muscles; the limb is lengthened from two to four inches; and in the state of abduction, with the knee and foot widely separated from those of the opposite limb. The buttock is flattened in consequence of the glutæi being drawn downwards, and stretched; and the prominence of the great trochanter is lessened in this, as well as in all other dislocations of the hip. The head of the femur is always plainly perceptible in its new situation, and the trochanter is separated further than natural from the crista of the ilium. With respect to the position of the foot in this dislocation, contradictory statements prevail. Sir Astley Cooper describes the position of the foot as being very little to be depended upon, and as sometimes but trivially altered, though frequently turned a little inwards. On the contrary, Delpech states, that the foot is generally turned outwards. The trochanter should always be particularly attended to in this, and, indeed, in all dislocations of the femur. Its sit-

uation and position, with respect to the crista of the ilium, is a point to be strictly considered; and, in this dislocation, the distance between the two parts is increased.

In the *dislocation, where the head of the bone is thrown upon the horizontal branch of the pubes*, the limb is shortened and turned outwards, and the head of the femur is felt, forming a distinct prominence below Poupart's ligament, and to the outer side of the femoral vessels. This is the only *common* dislocation of the hip, always attended with considerable eversion of the limb; for the example of luxation behind the tuberosity of the ischium, which is said to present the same symptom, is exceedingly rare.

In the *dislocation backwards into the ischiatic notch*, the limb is turned inwards, but not in so great a degree as in the dislocation upon the dorsum of the ilium; there is also a slight shortening of the limb, for the natural position of the ischiatic notch is a little higher than that of the acetabulum. There is likewise a diminution in the projection of the trochanter, and the head of the bone in thin persons may be felt in its unnatural situation, on rotating the thigh inwards.

The particular direction, which the head of the bone takes in each variety of dislocation, is determined by the position of the limb at the moment when the force operates that occasions the displacement. Thus, there cannot be a dislocation into the sacro-ischiatic notch, unless the lower extremity be, at the moment of the accident, elevated in front of the axis of the body, or the body bent forwards over the thigh.

In reducing dislocations of the femur, three grand or leading principles must constantly be attended to; namely, *counter-extension, extension*, and *the employment of the shaft of the bone as a lever for reducing its head.* These are the principles which are of the greatest consequence; for we cannot fulfil the principle of relaxing the muscles in these cases, because the bone is actually fixed in a particular position. But, though we cannot avail ourselves of the principle of relaxing the most powerful muscles by *position*, it is in our power, when great difficulty is encountered, to weaken them in another way, that is, by bleeding the patient. We may also find it necessary, in some instances, to reduce the force of the muscular system by giving nauseating doses of tartarised antimony, by which means a temporary weakness and collapse will be produced, during which we are enabled to overcome with facility the slight resistance of the muscles.

Counter-extension is performed by fixing the pelvis, which is done by means of a girth passed between the scrotum and the upper part of the dislocated thigh, and fixed to a point directly opposite that towards which the extension is to be made. Extension is generally made in this country at the lower part of the femur; but abroad, the lower part of the limb, or the ankle, is preferred for

this purpose, and thus a longer lever is gained. The length of the lever is indeed of great advantage, and hence, I am not surprised, that many foreign surgeons should adopt this method of making the extension. The pelvis being fixed in the manner I have mentioned, by means of a girth or table-cloth, we are next to apply the extending means. Now, in whatever situation we make extension, we should adopt some contrivance to prevent the skin from being chafed; therefore, if we make extension with a sheet, we must apply, underneath it, a wet roller ; if a pulley is used, there is an ap paratus for the purpose, frequently lined with flannel.

When the dislocation is upon the dorsum of the ilium, the direction of the extension ought to be obliquely across the other knee and of course the counter-extension should be made towards some point precisely in the opposite direction. It is usual, in reducing the dislocation upon the dorsum of the ilium, for the patient to be placed on his back, either on the floor, or on a four-post bedstead. Then, if it be the right femur that is dislocated, extension must be made in a direction obliquely across the left knee, with the pulley attached to the left post at the foot of the bed; while the counter-extending means are applied to the pelvis, as already described, namely, between the scrotum and the dislocated thigh, and fastened to a point precisely opposite to that towards which the extension is to be made. Now, as the pulley is fixed high, in this instance, the counter-extension girth must be fixed lower down than the edge of the bedstead. As soon as the extension has been carried far enough for the apparatus to be tense, and the patient to feel the effect of the power employed, we should not go on increasing the force at random, but proceed cautiously and slowly, lest mischief should result. It is best, as soon as the muscles are put on the stretch, to wait a little, and let them gradually fatigue themselves, until their power of resistance is lessened. In short, the principle is, not to relax the extending power, but to keep it up until the head of the femur has descended near the acetabulum; but directly it is low enough for the lever-like movement to operate efficiently, the extension ought not to be increased. We are now to put in practice the principle of making the shaft of the bone a lever for the reduction of its own head, which is accomplished by taking hold of the lower part of the limb, and rotating it outwards. The head of the bone is thus inclined directly towards the acetabulum by the lever-like movement of the limb. But supposing great difficulty were to be experienced in effecting the reduction in this way, we should then apply a napkin, or band, to the thigh below the groin, and draw the upper part of the femur outwards with it, at the moment that the limb is suddenly rotated outwards, and the foot carried a little across the other. The napkin acts as a fulcrum for the lever-like movement, and the reduction is readily affected. When

the brim of the acetabulum is very high, and the patient particularly strong, immense difficulty may be encountered in the reduction, unless the band be applied round the thigh. The principles upon which this dislocation of the thigh-bone is reduced are therefore simple; they are only three, namely, counter-extension, extension, and the employment of the shaft of the bone as a lever for reducing its head; the latter being performed by rotating the limb outwards, and inclining the ankle inwards, as soon as the extension has been carried far enough. This latter manœuvre will bring the head of the bone towards the acetabulum; but if unusual difficulty is experienced, a band should be applied round the upper part of the thigh, in order that this portion of the femur may be drawn outwards. Such a band is in fact a fulcrum to assist in the execution of the lever-like movement of the limb. By these means, the dislocation, if not of too long a standing, may always be reduced.

I come now to the reduction of the next most frequent form of dislocation of the femur; that in which the head of the bone is thrown upon the obturator foramen. Here the limb is in the state of abduction, and, consequently, if extension were made in the direction in which the limb is thrown, without taking some precautions to prevent the pelvis from being drawn to one side, this would inevitably happen. Therefore, the common means of fixing the pelvis will not be sufficient; it will be necessary to put a girth or napkin round the pelvis, to counteract the tendency, which the extension would have to carry it too far sideways. In the reduction of this dislocation, then, two means are made use of for the counter-extension, which, without them, could not be conveniently fulfilled. The reduction of the dislocation on the obturator foramen is a simple proceeding; in fact, as soon as the head of the bone is dislodged from its situation, it will generally return of itself into its right place, on inclining the ankle inwards. But if we cannot succeed by this plan, then we are to have recourse to the band round the thigh, in order to draw the upper part of the femur outwards, and thus a fulcrum is obtained to promote the effect of the movement of the lower part of the limb inwards. There is one caution, however, to be observed in reducing a dislocation upon the obturator foramen, which is, to be careful, that, while we are making extension, the limb does not incline forward too much, and the head of the bone slip backward behind the tuberosity of the ischium, and thus constitute another form of dislocation, which is sometimes considered to be irreducible, though I am not aware of the facts upon which this view is founded.

In the *dislocation into the sacro-ischiatic notch*, the direction of the extension should be across the middle of the opposite thigh. The patient is most conveniently placed on the uninjured side of his body. This is a more difficult dislocation to reduce, than that

upon the dorsum of the ilium. Hence, we generally find it necessary to apply the band round the upper part of the thigh, as a fulcrum, or rather as a means of raising the head of the bone over the brim of the acetabulum. At the period of attempting this, we should also give the lower part of the limb a twist outwards, by which movement the head of the bone will be inclined towards the acetabulum, with all the force of a long and considerable lever.

In the *dislocation on the horizontal branch of the os pubis*, the patient is also to be placed on his side; the pelvis is to be fixed with the common apparatus, and a band applied round the upper part of the thigh for the purpose of raising the head of the bone over the brim of the acetabulum. The direction of the extension ought to be in a line rather behind the axis of the body, and, as soon as the head of the bone has been drawn low enough for the lever-like movement to be put in practice, then the extension should cease, or, at all events, not be increased. The usual means are now to be put in force for completing the reduction, namely, the lever-like movement of the limb, and the use of the band round the upper part of the thigh as a fulcrum. In short, all dislocations of the thigh are reduced on the same principles; and whoever understands these well and scientifically, can never be at a loss. Relaxation of the muscles cannot be accomplished by position, though it may be so by the effect of bleeding and nauseating doses of tartarised antimony. In many cases, indeed, and especially in those of long standing, such means become important auxiliaries, without which there would be no chance of success.

A *dislocation downwards and backwards*, in which the head of the thigh-bone is absolutely thrown behind the tuberosity of the ischium, was seen by Mr. Keate, the patient being a gentleman, whose horse fell with him into a ditch. It appears that the animal lay upon him for some time—for five or ten minutes—during which he continued struggling to liberate himself from his painful situation as well as he could. From the particulars, it seems that the original dislocation was upon the obturator foramen, but by a secondary displacement, which occurred during the patient's struggles, the head of the bone was thrown behind the tuberosity of the ischium, the very situation from which Sir Astley Cooper considers that the reduction would have been impracticable. However, in this case, the reduction was attended with no very great difficulty; the bone was first replaced upon the obturator foramen, and afterwards, by pursuing the plans proper for reduction of the dislocation on the obturator foramen, the head of the bone was replaced. In this instance, there was abduction of the limb, and the head of the bone could be plainly felt behind the tuberosity of the ischium; the toes were also turned considerably outwards. If there be no mistake in the account, the case proves, in the first place, the possibility of such a dislocation; and secondly, so far from its being irreme-

diable, that there is no great difficulty in effecting the reduction. We also find an enumeration of the symptoms, namely, a lengthening and an abduction of the limb, eversion of the toes, and the being able to feel the head of the bone in its unnatural situation.

[A case very similar to the above, occurred under my observation some years since. The patient, Mr. E., aged about thirty-five, was a caulker, by occupation, and the accident happened while he was at work under the bottom of a canal-boat, July 20th, 1831. The boat was raised upon props, three and a half feet long. He was standing bent forward very much, and with his feet far astride. Between his feet there was lying a piece of round timber a foot in diameter. While at work in this position, the props gave way, the boat came down, killing one of the workmen, and forcing the patient down by the side of the timber over which he was standing, in such a manner that the left thigh was placed between it and the bottom of the boat. On being extricated from this situation, the left limb was found standing at a right angle with the trunk, the toes were turned a little inward, the natural form of the nate lost, and the head of the bone distinctly felt in rotation, in the perineum, behind the scrotum, and near the bulb of the urethra.

Reduction was effected without much difficulty, and the patient soon recovered the use of his joint.—Ed.]

DISLOCATIONS OF THE PATELLA.

The patella is liable to three dislocations: first, outwards on the external condyle; secondly, inwards on the internal condyle; and lastly, upwards, with rupture of the ligamentum patellæ. There are also some other modes of displacement; for occasionally the patella is simply twisted with the inner edge forwards and the external one backwards, so as to form a considerable projection on the front of the knee; and sometimes it is thrown on the external condyle and twisted round.

[Dr. John Watson of this city, reports a case, in the N. Y. Journal of Medicine, for Oct. 1839, in which the patella was twisted upon its axis, in precisely the contrary direction to that mentioned above; that is, the anterior surface looked inward, and the external edge looked forward.—Ed.]

But the most frequent form of displacement of the patella is, where it is thrown flat upon the external condyle. This dislocation is most commonly seen in persons, whose knees are considerably inclined inwards. In persons of this conformation, we may readily conceive, how the action of the extensors of the leg will draw the bone outwards. When persons are knock-knee'd as it is called, and the ligament of the patella particularly loose, this dislocation is very apt to take place, the action of the extensors of the leg being often sufficient to produce it, without the aid of external violence. Sir Astley Cooper relates the case of a young girl brought up to tumbling, in whom the ligaments of

the knee-joint and patella were so loose, in each limb, that both patellæ slipped to the outer side of the external condyle of the femur, whenever the extensors acted. The dislocation inwards, however, is generally produced by external violence, or a blow on the external edge of the patella, by which it is driven inwards. Both these dislocations are reduced on the same principles, namely, by relaxation of the extensors of the leg, and then pressing the displaced bone outwards or inwards, according to the direction of the displacement. There is generally no great difficulty in effecting the reduction. However, instances are known in which considerable difficulty was experienced; and such a case was met with by Mr. G. Young, who found, however, that by placing the patient's foot against his own shoulder, and pressing on the patella with both hands, while the limb was in this position, the reduction became very practicable, though the ordinary method failed. Owing to the looseness of the ligaments in certain individuals, and an extraordinary obliquity of the articular surface of the lower end of the femur, it is sometimes difficult to maintain the reduction after it has been accomplished, and then it becomes necessary to apply a roller over the patella, in the figure of 8 manner, in order to keep it in its place. If there were much swelling, the roller should not be applied until the inflammation had been lessened with cold lotions, purgatives, leeches, &c.

When the dislocation takes place upwards, in consequence of a rupture of the ligamentum patellæ, there is generally a great deal of swelling about the joint, for this dislocation can only be produced by great and direct violence, or extraordinary efforts of the extensor muscles, by which the synovial membrane is torn, and a severe degree of inflammation commonly follows. Here also the principle of relaxing the extensors of the leg should be observed, by placing the limb on an oblique plane, extending from the tuberosity of the ischium to the heel. We cannot apply a bandage at first; but after three or four days, when the inflammation and swelling are diminished, a roller should be put round the lower part of the thigh, so as to confine the patella as near as possible to the tibia. After about three weeks, it is advisable to have recourse to passive motion of the joint; that is, a person must be directed to bend and extend it a little every day, for the purpose of preventing anchylosis.

In one of the volumes of the London Medical Gazette is a case, in which the patella was not only thrown outwards upon the external condyle, but twisted, so that the front surface of the bone was turned backwards, and its posterior surface forwards; but such an accident is far less common, than the simple dislocation outwards.

DISLOCATIONS OF THE KNEE.

The knee-joint does not derive much strength from the conforma-

tion of the bones, but is rendered immensely strong by the number, the strength, and the arrangement of its ligaments; so strong, indeed, that its dislocations are rare; no other joint equally exposed to external violence being so seldom dislocated. However, dislocations of the knee-joint may take place, and in four directions. The head of the tibia may be displaced *inwards* or *outwards*; but when the dislocation is in either of these directions, it is always incomplete, and the accident is exceedingly rare. Lateral dislocations of the knee-joint are more uncommon than those in which the head of the tibia is thrown either backwards or forwards. There was a case in Guy's Hospital, where the *tibia* was *dislocated backwards* and the *condyles of the femur forwards*, and such pressure made on the popliteal artery by the displaced tibia, that the pulsation of the anterior tibial artery at the instep was stopped. All dislocations of the knee are exceedingly rare, yet we occasionally read of them; and perhaps, in the course of twenty years, there may be one case brought into a large hospital. There can be no difficulty in recognising them; for the projection of the tibia and femur will render them sufficiently obvious. When the tibia is dislocated forwards, there is generally some laceration of the gastrocnemius and popliteus muscles. Sir Astley Cooper met with a case of incomplete dislocation of the knee-joint, in which the *external condyle was thrown off the head of the tibia forwards*, and *the internal condyle backwards*; and in this case, he found, that there was no laceration of the crucial ligaments; but if the tibia were completely dislocated backwards, then the crucial and lateral ligaments, and the above muscles might be lacerated.

The principles of reduction consist in bending the knee, so as to relax the strong muscles of the calf; and, while the femur is fixed, in making extension and pressing the head of the tibia in the proper direction.

Dislocation of the condyles of the femur from the semilunar cartilages.—Sometimes the ligamentous bands, which fix the semilunar cartilages in their natural situation, become more elongated and relaxed than usual; and this is particularly liable to be the case, when there is a collection of fluid in the joint; and under these circumstances, if the person, in walking, happens to bring his foot in contact with any obstacle, one or both condyles of the femur may be dislocated off the corresponding semilunar cartilage or cartilages; the result is, that the patient cannot straighten his leg; and a sudden attack of severe pain in the joint is felt. The plan adopted by Mr. Hey, consists in forcibly extending the limb, and then bending it as far as possible; this plan I have tried with success. In some cases, however, it will not answer, and then other plans may be tried. One of these consists in bending the thigh, and twisting the leg suddenly outwards; this has occasionally had the desired effect. Sir Astley Cooper mentions a patient, who

could never get the condyles replaced upon the similunar cartilages, unless he followed this plan; he used to put himself on the floor, and then, by bending his thigh, and twisting his leg outwards, he was always able to accomplish the reduction and procure instant relief. When once this accident has happened, it will be liable to recur ever afterwards; hence it is frequently prudent for the patient to wear a laced knee-cap, so as to keep the knee steady and duly supported.

DISLOCATION OF THE FIBULA.

The upper head of the fibula is rarely dislocated by external violence: I have never seen a case thus produced; but a dislocation of the upper head of the fibula is occasionally met with in consequence of disease, and then it is thrown backwards. This, however, is not a common case. The treatment consists in the employment of such remedies as are calculated to stop the morbid process going on in the joint, which is generally of a scrofulous nature; we are to blister the part, and when we have stopped the further progress of the disease, we should perhaps employ compression to fix the head of the fibula in its proper place.

DISLOCATION OF THE ANKLE JOINT.

The ankle joint is frequently dislocated. The tibia may be dislocated off the astragulus in four directions. The most frequent case is that where the tibia is dislocated inwards, the tarsus being forced outwards; in this accident there is a fracture of the fibula about two inches and a half or three inches above the malleolus externus, or the lower end of the bone, its most slender part. There is a considerable projection of the malleolus internus, rendering the integuments over it exceedingly tense; the broken part of the fibula inclines inwards towards the tibia; and the position of the foot is altered, its outer edge inclining upwards, while its inner edge is turned downwards, so as to come in contact with the ground. When the accident is caused by a person jumping from a great height, that portion of the tibia which is bound by ligament to the fibula is split off, and remains connected to the broken part of the latter bone, the ligament binding the fibula to the tibia in this situation being so strong, that it does not give way.

There are two methods of treating this dislocation, though the plans of reduction approved of by all surgeons are the same; namely, we are to relax the strong muscles of the calf; this is an invariable principle; and then by making the requisite counter-extension, and practising extension from the end of the foot, the tibia may be easily replaced. But, whether the legs should remain in the bent position, or should be kept extended, after the reduction has been

effected, seems to be a point, on which some of the most experi-
enced surgeons differ.   Sir Astley Cooper is an advocate for the
straight position of the leg, and for the application of lateral splints,
each having a foot-piece attached to it, in order to prevent the foot
from moving to either side.   On the contrary, Baron Dupuy-
tren adopts another plan: the foot being displaced outwards, he
first applies a thick wedge-shaped cushion at the lower part of the
inside of the leg, with the thick end downwards, and over that he
applies a long splint; the wedge-shaped cushion is to fill up the
space between the inner edge of the sole and the splint, which must
extend some way beyond the foot.   Having secured the splint with
a roller above, he next applies a bandage below in the form of the
figure of 8, and thus draws the foot inwards towards the splint,
which serves as a convenient fixed point.

In the other lateral dislocation of the ankle, the tibia is thrown
off the astragalus, in the direction outwards.   This is a rarer acci-
dent than the former; in fact, it cannot happen without the applica-
tion of immense force; and, when it does take place, there is gene-
rally a fracture of the malleolus internus, or else an oblique fracture
of the lower end of the tibia extending into the joint.   Sometimes
the astragalus is also fractured, and the fibula is broken into several
pieces.   The deltoid ligament is unbroken; but the outer part of the
capsular ligament is torn.   When the fibula breaks, the external
lateral ligament remains entire;   but, if the fibula is not broken, then
the external lateral ligament is ruptured.*   A violent twist of the
foot inwards may produce the accident.   The position of the foot
is the reverse of what it is in the foregoing case; for it is the outer
edge of the foot that comes in contact with the ground, while the
inner edge is thrown inwards and upwards; and the malleolus ex-
ternus forms an extraordinary projection.   The reduction is effect-
ed on the same principles as in the dislocation of the tibia inwards,
and therefore comprises relaxation of the strong muscles of the calf,
counter-extension and extension.   Sir Astley Cooper adopts the
same method of treatment in this as in the dislocation of the tibia
from the astragalus inwards: he puts the leg in the extended posi-
tion, and applies lateral splints with foot-pieces.   Baron Dupuytren
also adopts the plan which I have mentioned, as his practice in the
dislocation of the tibia inwards, but he puts the wedge-shaped pad
and the long splint on the outside of the leg; for here the object
is to bind the foot in this direction.

In the third dislocation of the ankle joint, the lower head of the
tibia is thrown off the astragalus forwards upon the os naviculare;
and there is a lengthening of the heel and a shortening of the foot.
The dislocation may be either complete or incomplete; the tibia
may be thrown either off the astragalus altogether, or only partially,

---

* See Sir Astley Cooper's Treatise on Dislocations, ed. 4, p. 236.

half of it resting upon that bone, and half upon the os naviculare. In the latter case, the shortening of the foot may be inconsiderable and scarcely noticed by a careless practitioner.

A dislocation of the tibia off the astragalus backwards, with elongation of the foot and shortening of the heel, must be very uncommon; for Sir Astley Cooper gives no instance of it in his valuable work, and Baron Dupuytren never met with an example of it.

DISLOCATION OF THE ASTRAGALUS.

Another more interesting kind of *dislocation* is that of the *astragalus* itself forwards from the os naviculare and os calcis, so as to form a considerable projection on the instep. This is not a very common accident, but it sometimes happens. I have seen no less than three examples of it. The dislocation may be either complete or incomplete. The reduction is sometimes exceedingly difficult; and when it cannot be effected, the accident is a serious one; for the patient is never afterwards able to put his heel to the ground, and his ankle remains permanently stiff. I remember being called in to a lady who had met with this accident two or three weeks before I saw her. Reduction was quite impossible; she was a fat woman, and the injury was attended with so much swelling at first, that the surgeon who saw her directly after the occurrence of the accident, could not make out the case. I perceived that it was a dislocation of the astragalus; and reduction being impracticable, she remains lame, with a stiff instep.

In consequence of this dislocation being sometimes irreducible, even under the most skilful treatment, it has been proposed, when reduction cannot be effected, to remove the astragalus altogether. This has sometimes been done; and when it is a case of compound dislocation of the ankle joint, accompanied by displacement of the astragalus, it may be the best practice to cut away the latter bone; but, in simple dislocations, I think, this proceeding would not be justifiable. Of course, in all cases, we should first try to reduce the bone. The plan of reduction is to relax the muscles of the calf, extend the foot as much as possible, and then press the bone into its place. Cases are recorded, in which the skin covering the displaced bone, inflamed and sloughed, and the bone became exposed. In such a case Sir Astley Cooper divided the ligamentous connections of the astragalus, and removed it: there was not so much weakness of the joint produced as might have been expected, and in eleven months the gentleman, who was the subject of the accident, was able to perform his duties as a cavalry officer, which implies a considerable power of using the joint.

Mr. Benjamin Phillips favored me with the particulars of an accident, in which the astragalus was dislocated backwards, and lay under the tendo Achillis. Another instance has been lately pub-

lished, in which the astragalus was completely dislocated, without any change in its relations to the tibia and fibula.*

* See Dublin Journ. of Med. Science, vol. xiv. p. 235. The patient was Mr. Richard Carmichael, the justly eminent surgeon of Dublin.

END OF SECTION II.

THE

FIRST LINES

OF THE

PRACTICE OF SURGERY.

SECTION III.

OPERATIONS.*

The following general maxims, in relation to operative surgery, deserve attention:—

1st. Before undertaking any capital operation for the cure of a disease in one situation, we ought to consider whether the patient has any incurable organic affection about him elsewhere ; and if he has, we should decline to operate. What is the good of amputating a limb for a diseased joint, when the patient is dying of tubercular phthisis ? Where the wisdom of performing an operation for the cure of an external aneurism, when the patient's doom is already sealed by the existence of an internal one ? At all events, nothing but the immediate destruction of the patient, if an operation were not performed, would be a vindication for it under such circumstances. Even, with respect to some minor operations, it is a rule not to perform even them, when the patient is afflicted with any incurable internal disease. Thus, a fistula in ano is not to be cut, a pile is not to be extirpated, if the patient is known to labor under disease of the liver or lungs.

2d. An operation is rarely advisable, unless the whole of the diseased parts can be removed. When, however, a tumor is not of a malignant character, and only produces inconvenience by its size, or particular situation, the partial extirpation of it will some-

---

* Those for Herniæ and various Diseases of the Eye, and some other operations, have been already described.

times relieve the patient. The truth of this observation is often exemplified in operations on the tonsils, in the state of chronic enlargement and obstructing the communication between the mouth and the pharynx. When a true exostosis cannot be entirely taken away, the partial removal of it will sometimes afford great relief by diminishing its size, and obviating the ill consequences of its pressure on the neighboring organs. I have known the same practice extended to bronchoceles, which, by their pressure, were causing obstruction of the breathing, and of the return of blood from the head.

3d. Before resorting to an operation, we should maturely consider, whether there is any chance of cure by milder means; and, if the circumstances of the case afford time for a trial of them, this ought undoubtedly to be made.

4th. Some diseases, for which desperate operations are occasionally undertaken, are known to admit, in a few instances, of a natural cure. Here the surgeon of proper moral feelings, before determining to operate, will consider well, whether the patient has the best chance of life from such an operation, or from the possibility of a spontaneous cure.

5th. Operations should not be rashly performed with an entire disregard of the state of the patient's general health. We should inquire into his previous habits and modes of life, and the present state of his constitution; whether he be plethoric; of a phlogistic diathesis; of a very nervous irritable fibre; one, who has already suffered from erysipelas; or who has any symptoms, justifying the suspicion of the existence of a serious, or incurable, visceral affection.

6th. When the time permits, we should bring the patient's constitution into as favorable a condition as possible for the operation by means of medicine, diet, and regimen. In particular, the weak should, if possible, be supported and strengthened; and the robust and plethoric, who are always predisposed to inflammation, be restricted for a few days to low diet, and have the bowels emptied; and, where little blood is likely to be lost in the operation, and the operation sure to fail if inflammation follow it, the performance of venesection may be prudent. The truth of this remark is illustrated in the treatment of cataracts. As highly sensitive hysterical, and nervous subjects, not only frequently have violent constitutional disturbance after operations, but sometimes die very suddenly, immediately or shortly after their completion, we should avoid, if possible, operating on such individuals; or, if an operation must be done on them, we should apprize their friends of the uncertainty of the result, and administer a cordial, with a dose of laudanum, a little while before the operation commences.

7th. Another rule is to let every instrument, and every article likely to be required, be in readiness and perfect order before the

operation is begun: instruments of the best construction; ligatures; forceps; tenaculums; sponges; warm and cold water, towels, bandages, &c. &c.

8th. The patient should not be informed of the necessity of his submitting to an operation long before the period of its performance. The shorter the interval, between the communication of the painful intelligence to him and the performance of the indispensable measure, the better; because the mind, brooding on the expected suffering, too frequently causes an aggravation of the disease, and a most unfavorable derangement of the general health.

9th. Patients, about to undergo operations, should not have any opportunity of seeing the knives, saws, and other formidable instruments arranged for the occasion. The principles of humanity would dictate this precaution, were it not suggested by the obvious advantage, in a surgical point of view, of having the patient as free as possible either from agitation or depression, while the operator is executing perhaps a tedious, a delicate, or a very difficult task.

10th. Every operation that is well performed, whatever may be the time taken up in its completion, is done quickly enough.

11th. In the ligature of arteries, the removal of tumors, dead bone, or extraneous bodies, it is advantageous to make a free division of the skin; without which, every other step in the operation will be seriously retarded, and the patient suffer on the whole infinitely greater pain, than if a proper external incision had been made at once.

OPERATION OF TREPHINING.

The trephine is frequently applied to various bones of the body; but, when we speak of the operation of trephining, we usually signify that which consists in sawing out a portion of the skull, as is practised in order to enable the surgeon to raise a part of it producing dangerous pressure on the brain; to discharge collections of matter or blood, which have the same effect; to extract a ball, or other foreign body lodged under the skull; to remove a sequestrum, extending through both tables; or to extirpate tumors growing from the surface of the dura mater.

Every part of the cranium cannot be trephined with equal safety. However, the mere presence of a suture ought not to deter the surgeon from making the perforation in any place which seems advantageous. I believe, also, that the fears, respecting wounds of the longitudinal sinus, have been vastly exaggerated; and that, if the situation of a depressed fracture, or extravasation, demanded the removal of a piece of the skull directly over this vessel, the operation would be justifiable. The longitudinal sinus has often been wounded by spiculæ of the cranium, and sometimes it has been punctured with a lancet, in order to bleed the patient; yet the hemorrhage was

easily stopped with a small compress of lint.*   But, though I feel
warranted in making this statement concerning the longitudinal sinus,
I am not acquainted with any facts, showing that hemorrhage from
the lateral sinuses would not prove more serious.   These latter are
much larger; and as they occupy the deep transverse furrows in the
inner surface of the os occipitis, a trephine applied over them would
be likely to wound them.†   Velpeau lays it down as a maxim, de-
duced from various facts on record, that the trephine may be ap-
plied over the sinuses as well as to most other parts of the cranium;
but though he has no fear of the bleeding, because hemorrhage from
a large vein may always be commanded by moderate pressure, he
allows that a wound of the sinus exposes the patient to two dangers;
viz. inflammation of the wounded vessel, and the entrance of air into
it.‡

Authors generally interdict the application of the trephine to the
anterior inferior angle of the parietal bone, on account of the
trunk of the spinous artery of the dura mater being situated in a
groove on the inner surface of that part of the skull.   For my own
part, I should never be afraid of trephining here; for, if the above
vessel were wounded, a little lint introduced into its orifice, would
immediately stop the bleeding; or we might imitate Larrey, and
touch the mouth of the vessel with a heated probe.

It is a maxim to avoid trephining any part from which a complete
circle of bone cannot be sawn, without hurting the dura mater.
The inequalities on some parts of the inner table of the skull, make
attention to this rule necessary.   Thus, the centre of the forehead
is rather an inconvenient place for the trephine, because, when the
spine of the os frontis is prominent, it cannot be sawn, without the
dura mater being wounded by the teeth of the saw.   At all events,
if the surgeon were to apply the trephine to this part, he should
complete the separation of the bone with an elevator, instead of

---

* Cases in Surgery, by J. Warner, p. 8. edit. 4.; Marchetti, Obs. 4. Sharp's
Operat. p. 144. edit. 3; Pott's Chirurg. Works, vol. i. p. 156—159. edit. by Earle.
1808.   Even so far back as the torcular Herophili in a child, a wound of the sinus by
the spicula of bone, though the blood at first spirted out to the distance of two feet,
and extinguished a candle, did not afterwards give any trouble from hemorrhage,
which did not return when a dossil of lint had been held a little while on the wound.
See Velpeau, De l'Opération du Trépan, p. 129.   This case, be it observed, was in
a child, and of course the sinus of less diameter than in an adult.   In Hargraves's
Operative Surgery, however, it is stated, on the authority of Mr. Read, that hemor-
rhage from the termination of the longitudinal sinus, may always be stopped by very
moderate pressure.

† Janson contrived to trephine over the lateral sinus without wounding it, and thus
succeeded in extracting a ball from the cerebellum.   See Compte Rendu, de l'Hôtel-
Dieu de Lyon, p. 47. 1822.   I should not imagine, as M. Velpeau does, that it would
generally be easy to apply the trephine without wounding the sinus, unless blood or
matter lay between it and the inner table.

‡ De l'Opération du Trépan, p. 132.

making any dangerous attempt to saw entirely through the project-
ing spine.

Surgical writers caution us not to trephine over the frontal sinuses,
and, not without reason; for, if the perforation be continued in the
direction in which it begins, the inner table will be sawn entirely
through on one side of the circle, before the other is at all divided.
However, the outer table may be first removed with a large trephine,
and the inner table then perforated with a smaller one, placed even-
ly and perpendicularly on the posterior surface of the sinus.*

The trephine cannot be applied lower down on the forehead, than
half an inch above the superciliary ridge of the os frontis, without
risk of injuring the orbit. If requisite, it may be applied to the
squamous portion of the temporal bone; for wounds of the temporal
muscles, are not at present so much dreaded as they were by our
ancestors. The unevenness of the os occipitis, the course of the
longitudinal and lateral sinuses, and the way in which a part of this
bone is covered by muscles, have made surgeons fearful of apply-
ing the trephine to it. However, there are two small spaces on
each side of the groove for the longitudinal sinus, where a trephine
may be safely applied.† The operation may even be done below
the transverse ridge, near the foramen magnum, as a division of
the attachments of the splenius and complexus would not be dan-
gerous, while unrelieved pressure on the cerebellum would certain-
ly be fatal.‡

When the bone is already sufficiently exposed by a wound, the
operation may commence at once; but otherwise, it is first requisite
to make room for the application of the trephine by an incision of a
crucial form, or shaped like the letter T or V. None of the scalp
should ever be removed. The incision should be made directly
down to the bone; but, in fractures, attended with separation of the
edges of the fissure, or with comminution, the danger of pressing
too hard with the knife is obvious.

It would be dangerous to apply the trephine to depressed por-
tions of the skull. The perforation is always to be made on that
side of the fracture, where the elevator can be most conveniently
introduced beneath the depressed bone for the purpose of raising
it. In cases of extravasation, the perforation ought to be made at
the place where there are traces of violence done to the scalp, un-
less particular considerations exist against the blood being effused
under that part of the cranium, as noticed in the remarks on Injuries
of the Head, in the second section of this work.

When the scalp has been divided, and loose splinters of the cra-

---

* C. Bell's Operative Surgery, vol. i. p. 439.

† See Warner's Cases. p. 18. ed. 4.

‡ Faivre, Anc. Journ. de Méd. t. lxviii.; Caisergue, as quoted by Velpeau. De
l'Opération du Trépan, p. 139; A. Copland Hutchinson, in Med. Chir. Trans. vol. ii.
p. 104.

nium are found under it, they ought to be taken away with the forceps or finger; for they can only be regarded as extraneous bodies, the continuance of which may be productive of dangerous irritation. Depressed pieces of the skull, causing bad symptoms, are sometimes completely detached, and admit of removal in the same manner.

In every instance of fracture with depression, unattended with motives for believing that the pressure on the brain arises partly from extravasation, provided such depressed fracture can be raised with a pair of forceps, or an elevator, without applying the trephine, the latter operation may be dispensed with.

When a depressed fracture is exposed, the bone may sometimes be raised to its proper level with an elevator; and then no necessity exists for sawing away any portion of the cranium, unless blood, extravasated beneath it, render such proceeding advisable. The point of the elevator is to be put under the edge of the depressed piece of bone, and a fulcrum for the instrument obtained on the margin of the adjoining portion of the cranium. In other instances, the fracture may be so shaped, that the depressed portion of bone can be cut across with one of Hey's saws at the part connecting it to the rest of the skull, and thus be easily removed, there being then no occasion to take away with the trephine any other portion of the cranium. Thus, supposing a depressed fracture to represent two sides of a triangle, a simple and straight division of the bone through the base of this triangle, with one of Hey's saws, will enable the surgeon at once to remove the broken and depressed piece of bone.

The instruments required in the operation are, a scalpel for the division of the scalp, three trephines with crowns of various diameters, and sliding centre pins, capable of being securely fixed with a screw when drawn out to the proper extent. One of the most common defects of modern trephines is, the liability of the centre-pin to slip back as soon as pressure is made on the instrument, which is thus rendered useless. Every case of trephining instruments should also contain an elevator, a pair of forceps, calculated to remove the bone when sufficiently loosened by the trephine; Hey's saws, with the teeth in straight and semicircular rows; a small brush, with which the teeth of the saw are to be now and then cleaned in the progress of the operation; and a lenticular knife, with which any irregularities of bone, at the margin of the opening made with the trephine, are to be removed. The plan of scraping away the pericranium from the part of the scull on which the trephine is about to be applied, is now condemned, as more likely to detach that membrane to a pernicious extent, than really to facilitate the action of the trephine.

The operation of trephining is divisible into four stages; first, that in which the bone is exposed; secondly that in which it is sawn; thirdly, that in which it is taken away; and fourthly, that

in which other measures are pursued, in order to fulfil the object in view.

On the first, I have but little more to say. When the squamous portion of the temporal bone is to be exposed, the incisions are usually made in the form of the letter V, with the apex directed towards the zygoma, so that their direction may correspond in some degree to that of the fibres of the temporal muscle. The flap is then raised from the point upwards. Generally, the bleeding from branches of the temporal or occipital artery, caused by dividing the scalp, should be allowed to continue a little while, as having a beneficial effect in checking further effusion of blood in the head, or inflammation; but, if the hemorrhage be profuse, and the pulse considerably reduced, ligatures will be necessary.

The removal of a portion of the cranium with the trephine is performed as follows: the centre-pin of the instrument, having been made to project moderately beyond the level of its teeth, and securely fixed by turning the screw, is to be applied to the central point of the circle of bone, which it is judged advisable to remove. The circumstances, which should guide us in choosing the place for the trephine in examples of pressure on the brain from blood or matter, accumulated on the surface of the dura mater, have been explained in the foregoing section of this work. (See Injuries of the Head.) When the case is a depressed fracture, the centre-pin, the use of which is to steady the trephine, until the teeth have formed a groove, is to be placed on an unyielding part of the cranium, with the crown in a situation, where the perforation will enable the surgeon to elevate, or remove altogether, the depressed portion of bone. As soon as the centre-pin has been fixed in the bone, the sdrgeon turns the crown alternately to the right and left by the prone and supine movements of his hand, observing to make steady, but moderate, pressure with the instrument, until a sufficient groove is formed. The centre pin, which is no longer of any use, and whose projection would soon injure the dura mater, is now to be withdrawn, and the action of the trephine more cautiously continued by semicircular movements of it, made alternately to the right and left. The sawing may go on briskly at first; but we are not to depend upon our being able to distinguish the arrival of the teeth of the instrument in the diploe, as a criterion of the external table having been divided, and of the necessity of now proceeding with greater circumspection and slowness. At all events, it is only in the middle period of life, that the texture of the cranium is likely to afford a difference of sensation and sound on the division of the external table being completed. Whether the arrival of the instrument in the diploe can be perceived or not, it should be worked with great caution after the groove is of a certain depth, its movements being executed with briskness in the direction of the teeth, but with little or no pressure. In this stage of the operation, the

groove is to be frequently examined with a tooth-pick, the flat end
of a probe, or a small thin piece of steel for the purpose, usually
contained in every case of trephining instruments. If the perfora-
tion is found to be complete in any portion of the circular groove,
the action of the trephine is then to be strictly limited to the parts,
where the division of the inner table has not yet been carried far
enough. This is done by inclining the instrument, as it works, to
the undivided portion of the circle.

The cranium having been sawn to a sufficient depth, the next
business consists in removing the circular portion of bone. In the
previous stage of the operation, the surgeon will be likely to injure
the dura mater, if he aim at dividing very completely the inner ta-
ble at every point with the trephine; and therefore, as soon as the
piece of bone seems loose, it is safer to remove it with an elevator,
or a pair of forceps, and to break its slight remaining connections
to the rest of the cranium, than run any risk of lacerating the dura
mater with the teeth of the saw. Any irregularities at the edge of
the perforation, likely to irritate the same membrane, are then to
be removed with the lenticular knife.

If the case be one of pressure on the brain, from blood extrava-
sated on the dura mater, the surgeon will now have to consider,
whether the first opening made will suffice for the removal of such
blood; if not, another, or even a third perforation, may be necessa-
ry. The same occasion for additional perforations will not so often
present itself when purulent matter is lodged under the inner table,
as it always escapes more readily than blood, and is generally less
diffused.

When there is a depressed fracture, an elevator is to be intro-
duced under the part of the bone which is below its proper level;
and a fulcrum having been obtained either on the edge of the ad-
joining portion of the cranium, or on the fore finger of the surgeon's
left hand, the depressed fragment is to be raised. Frequently it
is advisable to remove it entirely, which as I have already explained,
can often be readily done with one of Hey's saws, and then all oc-
casion for the removal of bone with the trephine is obviated. If
the case be what is termed a *punctured* or *stellated fracture*, the
whole of the depressed piece of the skull may generally be included
within the circle of the trephine, and thus be easily removed.

In compound fracture with the depression, *unattended*, however,
with symptoms of pressure on the brain, the bone may be raised to
its proper level with an elevator; but, according to the principles
inculcated in my remarks on Injuries of the Head, trephining would
not always be advisable.

After the operation, the flaps of the scalp should be laid down,
and light simple dressings applied. For the prevention or cure of
inflammation, bleeding, the application of cold evaporating lotions
to the scalp, and the exhibition of calomel, tartarised antimony, and
saline purgative medicines will frequently be necessary.

When, on the exposure of the dura mater, blood or other fluid seems confined under it, and the membrane presents a dark-colored, livid, or yellowish color, and a tense prominent appearance, it should be cautiously punctured. In one instance, where matter was suspected to be more deeply lodged, Dupuytren introduced a bistoury more than an inch into the substance of the brain, and discharged the abscess.

In very young subjects, the opening made with the trephine is sometimes gradually, but only in part, repaired by osseous matter. In the museum of University College is the skull of a person, who had been extensively trephined forty years before he died; and, in this example, nature has filled up almost the whole of the deficiency with osseous matter. Repair to this extent demands a great deal of time. In persons who have lived ten, twenty, or fifty years after loss of portions of the cranium, the slow restoration of the bone appears to have been progressive for the whole period. In fifty years, a trephine hole is nearly closed by the shelving growth of bone from the margin towards the centre.*

EXTIRPATION OF THE EYE.

Cancer, medullary tumors, and melanosis, are the three diseases sometimes occasioning the necessity for the operation, for which the patient should be prepared by regulation of his diet and the exhibition of aperient medicines, so as to lessen the risk of inflammation, and of the extension of it to the brain and its membranes.

The patient should be placed in the recumbent position, with his head properly raised on a pillow, and held by an assistant. When the extension of the disease to the eyelids makes their removal necessary, the mode of operating differs from that which is adopted when those parts are to be preserved: in the first case, two semilunar incisions are to be made, the upper one corresponding to the line of the superciliary ridge of the os frontis, and the lower to the inferior border of the orbit, so as to detach the eyelids and allow them to be taken away with the rest of the disease. If, however, they should be merely adherent to the diseased eyeball, and not themselves affected with malignant disease, they should never be cut away, but only separated from their connection with the globe of the eye.

First stage.—Supposing the state of the eyelids will admit of their being saved, the first step consists in making an incision at least an inch in length through their external commissure, in the direction towards the temple. The eyelids are then to be turned back, so as to uncover, as it were, the base of the orbit, both above and below the front of the diseased eyeball.

---

* See Mayo's Outlines of Human Pathology, p. 8. 8vo. Lond. 1835.

Second stage.—In this, the conjunctiva is to be cut through at its reflexion over the globe from the eyelids; and this should be done very completely at every point of the circumference of the orbit: indeed, some operators aim at more than this in the second stage of the operation, and introducing the knife at the greater angle, with its edge turned downwards, they carry it close to the os ethmoides nearly to the optic foramen, and then convey it in a semicircular direction across the whole extent of the lower half of the orbit, thus dividing the inferior oblique muscle, the conjunctiva at its reflexion, and some fat and cellular tissue. Next, the knife is introduced again at the nasal extremity of the wound, with the edge turned upwards; the superior oblique muscle or trochlearis is cut through; and, if possible, the lachrymal gland separated, as the incision is passing along the roof of the orbit. These two cuts are to be semilunar, and to meet at their extremities.

Third stage.—As the roof of the orbit is naturally thin, and sometimes is rendered still thinner by long-continued pressure, the knife, if used incautiously, might penetrate to the brain. To avoid this risk, in the division of the parts at the upper part of the orbit, the eye should be drawn downwards with a ligature, or tenaculum, passed through the diseased mass. The eyeball is now only retained by a kind of pedicle, composed of the four recti muscles and optic nerve, which are to be divided either with a pair of curved scissors or a curved bistoury. As the external side of the orbit slants from without inwards, while the internal goes directly backwards, this step of the operation is most easily accomplished by introducing the instrument at the external side, as recommended by Desault and Lawrence. The surface of the orbit should now be carefully examined with the finger; and if the lachrymal gland, or any portion of the disease has been left behind, it should be removed.

The bleeding from the ophthalmic artery is profuse, but generally ceases of itself. If it should continue in an alarming degree, a dossil of lint should be held and pressed upon the vessel for a little time, after which there will be no further hemorrhage. Filling the orbit with sponge, lint, &c. is objectionable, as producing irritation and inflammation; effects highly perilous, as Mr. Lawrence justly observes, in consequence of the direct connection between the sheath of the optic nerve, the periorbita, and the dura mater, and the immediate contiguity of the brain. The commissure of the eyelids is to be united with a suture; and soft rag, dipped in water, laid over the part.

REMOVAL OF THE SUPERIOR MAXILLARY BONE.

The superior maxillary bone is liable to several diseases, which begin either in the mucous membrane of the antrum, in the bony parietes of this cavity, or in the fangs or sockets of the teeth.

Sometimes the mucous membrane inflames, and, becoming thickened, blocks up the opening, naturally establishing a communication between the antrum and the nasal fossæ: the result is an accumulation of the mucus in the antrum, a case which, as well as abscesses, has been already described in the foregoing section of this work. On other occasions, the lining of the antrum secretes a concrete substance, presenting the characters of adipocere. From the interior of the antrum, polypi, fibro-cartilaginous, medullary, and vascular erectile tumors*, may grow; or its bony parietes may be the seat of caries, necrosis, and exostosis.

The operation of removing the superior maxillary bone is sometimes rendered advisable by the growth of a fibro-cartilaginous tumor within it, or of a medullary tumor, when this is entirely restricted to the antrum, and the patient's general health good. According to Mr. Syme, medullary tumors are more frequent in the upper jaw bone, than fibrous ones; and as their removal from any part of the body is often followed by a return of the disease in the part, or its development elsewhere, a guarded prognosis should be delivered respecting the success of the operation. The removal of the upper jaw for fibrous or fibro-cartilaginous tumors, on the other hand, has generally been followed by a permanent cure.

The methods of operating are various; but, whichever is selected, the patient is to be placed on a firm seat, with his head supported on an assistant's breast, who is to employ his hands in steadying the head, and, if necessary, in compressing the trunk of the facial artery.

M. Gensoul, principal surgeon of the Hôtel Dieu, at Lyons, claims the merit of having first extended to operations on the superior maxillary bone the approved principle in surgery, that amputation should always be performed in the sound parts, and not in the diseased.† This principle led him not to be content with taking away a part of the diseased bone, as he contends had been done by all his predecessors, inclusive of Dupuytren, but induced him to aim at the removal of the whole of it. M. Gensoul was further encouraged to perform this operation by considering attentively the anatomy of the face. He saw that the superior maxillary bone was only firmly fixed to the other bones of the head at three points:—

1. At its nasal or ascending process, and the junction of its or-

---

* See Lettre Chir. sur quelques Maladies du Sinus Maxillaire, par Th. Gensoul, p. 33. In the case here referred to, no return of the disease had taken place five years after the operation. " For erectile tumor, occupying the maxillary sinus (Mr. Liston observes), the ligature of the common carotid of the corresponding side, would be the proper practice." Practical Surgery, p. 267.

† Lettre Chirurgicale sur quelques Maladies graves du Sinus Maxillaire et de l'Os Maxillaire Inférieur. Paris. 8vo. 1833. p. 4. &c. When M. Gensoul was lately in this country, I had the pleasure of becoming acquainted with him, and of receiving from him this interesting publication.

ɒitar plate with the os unguis and os planum of the ethmoid bone.

2. At the orbitar margin of the malar, as far as the speno-maxillary fissure; or, as Mr. Guthrie clearly explains, the superior maxillary bone on the outside, is " attached firmly to the malar bone by its malar process, orbitary edge, and plate, as far back as the speno maxillary sinus; but as in general the os malæ should be more or less removed, its ascending orbitar process, forming the outer edge of the orbit, should be well considered."*

3. At the junction of the two superior maxillary bones, and that of the two palate bones.

4. The fourth point of connection, which is through the medium of the ascending portion of the palate bone and the pterygoid process of the spenoid, readily gives way on depressing the superior maxillary bone towards the mouth.

M. Gensoul reflected, that no large vessel would necessarily be wounded; that the trunk of the internal maxillary artery might be easily avoided; and that, if it were injured, it might be tied, after the bone had been removed.† In the event, however, of the hemorrhage being profuse during the operation, he conceived, that it might be commanded by pressing the common carotid against the spine. As for nerves, he calculated that the superior maxillary was the only trunk of importance exposed to injury; and had he not seen that it admitted of being cut through, he would have renounced the idea of operating, rather than tear that nerve away.

Gensoul's Method.—A vertical incision is made from the great angle of the eye to the upper lip, which is cut through opposite the canine tooth. From the middle of this first incision, or rather from the point of it on a level with the base of the nose, a second incision is made to within four lines of the lobe of the ear. A third incision is next carried from a point, five or six lines on the temporal side of the external angular process of the os frontis, down to the termination of the second wound. The prolongation of it much lower down over the masseter would divide the parotid duct, and perhaps occasion a salivary fistula. The two flaps are then reflected; one upwards, the other downwards. The superior maxillary bone being thus exposed, the angular process of the malar bone is detached from the external angular process of the frontal bone, by means of a sharp chisel and mallet, and the division thus extended into the spheno-maxillary fissure. The zygomatic process of the malar bone is next divided; and the superior maxillary bone being thus loosened on its outer side, a broadish chisel is applied below

---

* See Lond. Med. Gaz. for 1835, p. 316.

† In one of Gensoul's operations, the pterygoid branch of the internal maxillary was wounded; and so it was in Mr. Guthrie's operation, which was performed in the manner advised by the former surgeon. In one example, in University College Hospital, the trunk of the internal maxillary bled; but was secured with the utmost faɔility.

the internal angle of the eye, and the lower part of the os unguis and orbitar plate of the ethmoid bone are divided. The ascending process of the superior maxillary bone is now to be detached from the corresponding os nasi with the same instruments. The surgeon then divides with a bistoury all the soft parts connecting the upper jaw to the ala of the nose; and after extracting one of the incisor teeth, severs the two superior maxillary bones from one another at their symphisis below the nostrils with a sharp chisel. Lastly, in order to detach the superior maxillary bone from the connexion which it has with the pterygoid processes of the sphenoid through the palate bone, and to break some connections which it may yet retain to the ethmoid bone backwards, the chisel is plunged oblique-ly into the tumor from the orbit, so as to cut through the superior maxillary nerve, which ought never to be lacerated; and the instru-ment is then passed deeply enough to serve as a lever for depress-ing the tumor into the mouth. This having been accomplished, all that remains to be done is, with a pair of curved scissors, or a scal-pel, to cut through the attachments of the palate bone to the soft palate.

Any vessels, requiring ligatures, are now to be tied; and the flaps laid down, but not united with the twisted suture, till an hour or two have elapsed, within which period the force of the circula-tion will have revived, and it will be seen whether any other vessels need ligatures. In this country, instead of employing the chisel and mallet, surgeons generally use Hey's saws, and a pair of pliers with long powerful handles.* The division of the malar bone, in the first instance, is preferred by M. Gensoul, because productive of no material bleeding, and of none that falls into the throat.

Second, or Mr. Liston's Method.—Supposing the malar bone to be involved, incisions must be made, so as to expose freely the tumor and bones where it is proposed to cut them. One of the central incisors is first to be extracted. The point of the bistoury is entered over the external angular process, and the incision is car-ried down through the cheek to the corner of the mouth. A sec-ond incision is made along the zygoma, so as to meet the first. Then the knife is pushed through the integument to the nasal pro-cess of the superior maxillary bone, the cartilage of the ala of the nose is detached from the bone, and the lip is divided in the mesial line. The flap thus formed is quickly dissected up, and held by an assistant. The attachments of the soft parts to the floor of the orbit, the inferior oblique muscle, the infra-orbital nerve, &c. are cut, and the contents of the cavity supported and protected with a narrow bent copper spatula. With the cutting bone-forceps, the

* Messrs. Weiss have invented cutting bone-forceps, the construction of whose handles multiplies the power of the blades on a different principle from that of the length of the former parts.

zygoma, the junction of the malar and frontal bones at the transverse facial suture, and the nasal process of the superior maxilla, are cut in succession. Then a notch being made with a small saw in the alveolar process, the cutting forceps are placed with one blade in the nostril, and the other in the mouth, and the palatine arch clipped through. The tumor is now shaken so as to loosen its connexions, and the remaining attachments divided with the knife, as the swelling is turned down. The velum palati is to be carefully preserved, and, if possible, the palatine arch of the palate bone. During these latter proceedings, the assistant, if required, is to compress the trunk of the carotid. " Perhaps," observes Mr. Liston, " no vessel may require ligature; the branches of the internal maxillary are elongated, and torn from the tumor in bringing it down; in fact, if the mass is large, there is no possibility of reaching them with the knife." The void is then filled with lint, and the edges of the wound brought together with the interrupted or twisted suture, but no dressings are to be applied. In twenty-four hours some of the sutures may be taken out, and replaced by narrow strips of plaster. At the end of forty-eight hours, the other stitches are cut, and the pins withdrawn. When the opening in the palate has become as much diminished, as it is likely to be by nature, a plate of metal, or of sea-horse bone, may be adapted to it.*

If the malar bone should not require to be taken away, its connexion with the upper maxilla is to be divided with one of Hey's saws, and, of course, the incision along the zygoma would be unnecessary.

Third Method, or that of Professor Regnoli.†—With an ordinary convex-edged bistoury an incision is made over the middle of the swelling beginning near the external angle of the eye, and extending obliquely downwards and inwards to the commissure of the lips. If the facial artery be compressed as it ascends over the base of the jaw, this first wound will occasion but little hemorrhage. The soft parts on each side of the incision are then to be detached from the surface of the tumor, the lateral cartilage and ala of the nose being included in the internal flap, while the external comprehends all parts situated between the line of the first incision and the junction of the superior maxillary bone with the zygoma. By means of a strong knife, which is struck with a hammer, the surgeon divides in succession the base of the nasal process, the lower border of the orbit, the superior maxillary canal and nerve, the junction of the zygoma with the malar bone, the connexion of this with the superior maxillary bone, and then the alveolar process. The use of the bistoury is now resumed, and the

---

* See Liston's Practical Surgery, p. 264. 8vo. Lond. 1837.

† Sulla Esterpazione della Quasi Totalita dell' Osso Mascellare Superiore Sinistro. Pisa, 1832. When Professor Regnoli was in England, about two years ago, he was so obliging as to present to me this and several other publications.

membrane of the palate divided with it as far back as the velum pendulum palati; after which the strong scalpel is driven with the hammer between the two middle incisor teeth, in the direction of the middle line, as far back as the palate bones. The remaining slight connections of the superior maxillary bone are then easily overcome by moving it alternately upwards and downwards, and by means of a few touches of a curved bistoury. The bleeding is suppressed with ligatures, or, if necessary, the actual cautery and the sides of the wound are brought together with the twisted suture. As Professor Regnoli makes only one incision through the cheek, there is less disfigurement of the face after this operation, than after the other methods.

If a great deal of pain and inflammation were to follow any of the above-described operations, the patient ought to be freely bled, and put under antiphlogistic treatment. Erysipelas is one of the consequences most to be apprehended.

That Mr. Liston's plan of operating is, in every respect, the most eligible, is a fact that admits of no question.

REMOVAL OF THE LOWER JAW BONE, OR OF PART OF IT.

Cancer of the lip, extending its ravages to the body of the inferior maxillary bone is specified as one case requiring the excision of more or less of the latter part; but, I believe, the opportunity of operating under these circumstances, with a prospect of benefiting the patient, will seldom present itself, because, when the disease has attained this degree, the absorbent glands under the jaw and in the neck will commonly be implicated. However, if these glands were free from disease, and especially if, with this condition, the gums and alveolary process were the only parts manifestly invaded, in addition to the lip and soft parts near it, the excision of the diseased portion of bone, together with the cancerous affection of the other textures would be an advisable measure. A patient in this state was referred to me by the late Dr. Blicke, of Walthamstowe: I recommended the operation, but believe that it was never submitted to.

Sometimes the necessity for removing a portion of the lower jaw is occasioned by an epulis assuming a malignant character, and involving the alveoli or even a greater extent of the bone. Tumors, originating in the sockets of the teeth, and presenting an indurated fungous texture, with a tendency to bleed, may also make it necessary to take away a part of the bone. But the diseases, for which the most considerable portions, and even the whole of the lower jaw, have been sometimes taken away, are certain fibrous tumors, commencing in the cancellous structure of the bone; and others of a medullary character, beginning in the same situation. At the present day, however, when medullary sarcoma is regarded as an affection rarely limited to one part, and often followed by a relapse, most surgeons would decline to operate, if the disease were known

beforehand to be of this unfavorable description. At the same time, it would not be difficult to find instances of the removal of part of the lower jaw for medullary tumors, where the patients afterwards continued free from the disease. As for tumors of a fibrous structure, expanding the bone, and destroying its texture, they are cases where the operation generally frees the patient permanently from the grievances under which he is laboring. A disease of this kind will sometimes produce a tumor, reaching from the molar teeth of one side to the ramus of the opposite side of the jaw, pushing back the base of the tongue, and throwing out a fungus, wherever ulceration of it is excited by the pressure of the teeth of the upper jaw. A sanious, excessively fetid discharge takes place. The lower jaw is of thrice its natural size, and even greater, the fibrous mass occupying very deeply its more or less disorganised texture, and at the same time filling the aperture of the mouth, protruding beyond it, and sometimes keeping the mouth as widely open as the articulation of the lower jaw will allow. The cheek or cheeks may also become enormously distended, by other projecting portions of the disease. The introduction of food into the mouth, perhaps, can only be effected by drawing one of the commissures of the lips towards the ear; and, together with all these grievances, there is profuse ptyalism, while respiration, mastication, and the pronunciation of words, are all seriously interrupted.

Whether the disease be a medullary, or a fibrous tumor, or an osteosarcoma, it cannot be destroyed without a surgical operation, which varies according to the situation and the extent of the swelling. The prospect of a radical cure in the first of these examples is much less favorable than where the structure of the tumor is fibrous. In all the following operations, the patient is to sit on a firm chair, with the head thrown back, and supported on the breast of an assistant, who can also compress, if necessary, the facial arteries as they ascend, in front of the insertion of the masseter muscles, or push them backward, by which means wounding them may sometimes be avoided in removing a central portion of the body of the lower jaw bone. The places, where the bone is to be sawn through, should always be determined beforehand, and the teeth in those situations removed on the day preceding the operation.

First Operation.—When the *disease is confined* to the *alveolary process,* a perpendicular division of the gum with the knife, and a similar perpendicular division of the alveolary process with a small saw, are to be made on each side of the disease. Then the diseased portion of bone may be broken off with a strong pair of forceps, or divded with a pair of cross-cutting forceps, as recommended by Mr. Liston. The bleeding, which is copious, is to be stopped by pressing lint on the part, and, if necessary, dipping the lint previously in the tinctura ferri sesquichloridi.

Second Operation.—*Removal of the middle part of the body of*

the bone.—Two methods are usually described. In one, particularly recommended where the integuments are healthy, a perpendicular incision is made through the centre of the lower lip, and carried down through the skin as low as the os hyoides. In order that this first perpendicular cut may be skilfully made, an assistant takes hold of the left portion of the lip, while the surgeon fixes the right between the index and middle fingers of his left hand, and, with the bistoury in his right, makes the incision through the lip and the integuments down to the os hyoides. The right facial artery being now pressed back by the assistant, who supports the head, the point of the knife is to be introduced just in front of the vessel, and a transverse cut made forwards along the base of the jaw, till it meets the first perpendicular incision. The same proceeding is next followed on the left side. The four flaps, resulting from the three incisions, are then to be detached and raised from the bone, which, according to Dupuytren, may thus be sawn as far back as the angle on either side, without injury of the facial artery. As the detachment of genio-hyoid, and genio-hyo-glossi muscles, is apt to be followed by retraction of the tongue into the pharynx, and a sudden interruption of respiration, perhaps it is best not to divide their insertions until the bone has been sawn through on each side. Or, if they are to be first divided, the displacement of the tongue into the pharynx must be guarded against by passing a ligature through the anterior part of the frænum.

The bone is to be partly divided with a metacarpal saw, or one of Hey's saws, at a point beyond the limit of the disease on each side, and the division completed with one stroke of a pair of cutting forceps, the handles of which should be long, so as to give the operator power. In using the metacarpal saw, he will obtain more room for its action by placing himself behind the patient; but, when Hey's saw is employed, this direction is not of any importance.

The central portion of the bone having been thus sawn through on each side of the disease, is now to be drawn forwards and depressed by an assistant, while the surgeon cuts through the membrane of the mouth and other soft parts behind the chin, with the knife kept close to the attachments of the muscles in that situation. At the instant when the genio-glossi are divided, some surgeons recommend the apex of the tongue to be taken hold of with the intervention of a piece of rag, in order to prevent this organ from being so forcibly retracted by the glosso-pharyngei muscles, so as to close the glottis and bring on the risk of suffocation.* A ligature, passed through the frænum, is a surer plan.

---

* With respect to the improvement of this operation, it seems to me, that with the advantage of the transverse wound, it is unnecessary to extend the perpendicular incision so low down as the os hyoides. If, on the division of the genio-hyo-glossi, the tongue were to be forcibly drawn back by the glosso-pharyngei, and the glottis closed

Dupuytren's first Method.—An assistant supports the head on his breast, and compresses the facial arteries against the rami of the bone. The surgeon, standing in front of the patient, takes hold of the right side of the lower lip with the left hand, while an assistant does the same to the left side, so that the part may be tense. An incision is then made through the centre of the lip, and extended perpendicularly nearly down to the os hyoides. The two flaps are reflected to the right and left; and the bone, having been completely denuded, and fixed, is sawn through on each side with a hand-saw, at the distance from the symphysis prescribed by the extent of the disease. This part of the operation would be more conveniently accomplished by making a groove with one of Hey's saws, and then completing the division with a strong pair of cutting forceps. The central portion of the bone, having been thus detached from the rest of it, is to be pressed downwards and forwards; and then the lining of the mouth, and the muscles connected with the posterior part of the body of the bone, and to the mylohyoid line, can be readily separated from their attachments with the knife kept close to the bone. On cutting through the origin of the genioglossi muscles, means must be taken to prevent the tongue from being powerfully retracted by the glosso-pharyngei, so as to close the glottis and bring on a stoppage of respiration. By proceeding in the above manner, Dupuytren was able to saw through the bone on each side within an inch of the angle, and to remove a diseased mass weighing a pound and a half.*

A third Method of removing the central part of the bone, applicable to cases in which the integuments are so diseased as not to admit of preservation.—An incision is to commence on each side of the jaw, at such a distance from the symphysis as will insure the removal of the whole of the diseased mass. These incisions are to be carried down to the os hyoides, where they meet at an angle. The soft parts are then to be dissected back from the bone on each side, and the rest of the operation completed according to directions already given. The sides of the wound are next to be brought as near one another as circumstances will admit; and, if the loss of skin is not too considerable, they may be put in apposition and united with the twisted suture.

Fourth Operation, applicable to cases in which the disease occupies a considerable extent, including part of the ramus of the jaw.—Such teeth, as would interfere with the division of the bone, are to be previously extracted. The *first* or *anterior* incision passes from the vicinity of the commissure of the lips, to a little below the *base* of the jaw.

---

so as to threaten instantaneous suffocation, tracheotomy should be done without the least delay,—the measure successfully resorted to by Lallemand, whose patient had fallen senseless on the floor.

* See Leçons Orales de Clinique Chirurgicale, par M. le Baron Dupuytren, t. iv. p. 640.

The exact points, however, where both the *first* and *second incisions* ought to begin, will depend upon the state of the disease in the directions forward and backward. Sometimes, when a suspicion is entertained that it may be necessary to take away the condyle, it is right to let the *second incision* commence as far back as a point in front of, and a little above, the lobe of the ear, and to continue it down to the angle of the jaw along the posterior edge of the ramus.

The *third* or *horizontal incision* may run from the termination of the second incision, along the base of the jaw, so as to join the first at its inferior extremity. The facial artery is now to be secured. If it has been necessary to make the second incision far back, no sooner has the flap been raised, than a portion of the parotid gland, lying under a prolongation of the cervical fascia, is exposed, and, with the parotid duct itself crossing the masseter, should be left uninjured. The masseter having been separated from the outside of the ramus, the next thing is to convey the knife close along the inside of the bone, so as to cut through the membrane of the mouth, and attachments of the muscles in that situation. In detaching the mylo-hyoideus from the oblique ridge below the molar teeth, and the internal pterygoid muscle from the inside of the ramus of the jaw, the knife is to pass close to the bone, in order to avoid injuring the lingual branch of the fifth pair of nerves.

A perpendicular groove is now to be made, with Hey's saw, in the outer surface of that part of the body of the jaw which it is intended to divide, and the division is to be completed with a strong pair of cutting forceps. The ramus is then to be partly divided with Hey's saw, but, instead of exposing the lingual branch of the fifth pair of nerves to injury by sawing too deeply, I recommend the anterior part of the bone to be pressed outward, whereby the ramus will be easily broken off at the groove. If any difficulty be experienced, the groove should be made deeper with Hey's saw, or the cutting forceps cautiously applied.

It appears to me that, in this operation, the division of the lip can hardly ever be needed, and, as leading to disfigurement, should be avoided. As Mr. Liston directs, the incision may terminate in the mesial line, about an inch from the free edge of the lip. His plan is to make a semilunar incision along the base of the jaw, the horns of the incision pointing upwards, and passing over the spaces which were occupied by the extracted teeth.

Fifth Operation, or that required when the bone is to be removed at the articulation.—Here particular care must be taken to begin the posterior incision in front of, and a little above, the lobe of the ear, in order that it may reach over the articulation. A good method is that of commencing the wound at the point just above the articulation, and carrying it first downward to the angle, and then horizontally towards the chin, were it is to ascend again: thus

having a semilunar shape, as practised by Mr. Liston*, and Pro-
fessor Regnoli, of Pisa.† The main difference of this operation
from that, in which only a portion of the ramus is removed, con-
sists in the proceedings necessary for the disarticulation of the con-
dyle. The anterior division of the jaw having been accomplished
according to directions already given, the end of it is to be forcibly
depressed, so as to bring the coronoid process below the zygoma,
and to enable the surgeon to cut through the attachment of the
temporal muscle. The bone then becomes much more moveable,
and can be used as a lever for pressing the condyle against the an-
terior and external part of the capsular ligament. This is to be
opened at its fore part, the external lateral ligament descending
downwards and backwards from the root of the zygoma to the neck
of the condyle divided, and the condyle itself then twisted out.‡
The latter part is then to be completely detached by passing a blunt-
pointed narrow-curved bistoury cautiously round the joint, so as to
divide the rest of the capsule, the internal lateral ligament, and the
external pterygoid muscle. By cutting the parts in the manner here
directed, all risk of wounding the internal maxillary artery, whose
course is a little lower down, almost in contact with the inside of
the neck of the bone will be avoided. Neither will the lingual
branch of the fifth nerve be injured, if, in detaching the internal
pterygoid muscle, the edge of the knife be kept as closely as possi-
ble to the inner surface of the ramus. If, after the first division of
the jaw, the bone were found to be so weakened by disease as not
to admit of being used as a lever, it might be necessary to divide
the ramus, and then to take hold of the end of the bone and depress
it with a strong pair of forceps, while the temporal muscle is de-
tached from the coronoid process.§ The same mode of proceed-
ing would be called for, were the surgeon, after the removal of a
portion of the body and ramus, to find that the extent of the disease
rendered disarticulation advisable.

The arteries wounded, and often requiring ligatures, after opera-
tions of the preceding description, are the facial and labial, but
more frequently the submental, and necessarily some branches of the
temporal and lingual arteries. When the bleeding is profuse, and
comes from numerous points, Mr. Liston prefers passing a liga-
ture under the common trunk of the internal maxillary and temporal
arteries, at the point where it emerges from beneath the digastric

---

* " An incision is made from the condyloid process, down the posterior border of
the ramus, and along the lower margin of the bone, and terminates above the point of
the chin, in the mesial line, at about an inch from the free edge of the lip." See
Liston's Practical Surgery, p. 270.

† Intorno l'Amputatione di Quasi la Meta della Mascella Inferiore, p. 13. Pisa,
1834.

‡ Liston's Elements of Surgery, p. 228, part 2d.

§ See Hargrave's Operative Surgery, p. 180.

muscle to tying all the branches which pour out blood. With regard to tying the common carotid artery, as a preliminary measure in the operation of removing any part of the lower jaw, it is completely superfluous. Were it on any occasion necessary to check the flow of blood through the carotid, it might be done by pressing the artery against the transverse processes of the cervical vertebræ with an assistant's fingers or thumb.*

Amongst the accidental consequences of the operation of removing part of the lower jaw, I may mention, 1. Secondary hemorrhage. 2. Severe inflammation about the face, neck, and throat. 3. Inflammation of the glottis, and effusion of serum under its lining; a case in which the patient sometimes can be saved only by making an opening into the respiratory tube. 4. A difficulty of deglutition, from the division of the attachment of the genio-glossi muscles.† 5. Erysipelas. 6. Tetanus.

BRONCHOTOMY,

Or, the operation of cutting into the air tubes, is termed *tracheotomy*, when the opening is made in the trachea; but *laryngotomy*, when the incision is made in the larynx.

The following are some of the circumstances calling for the performance of one or the other of these operations:—

1. Foreign bodies which have accidentally fallen down the glottis into the trachea, as a cherry-stone, a bean, a small coin, a bead, an acorn, &c. In such cases, provided no doubt exist about the presence of the foreign body in the respiratory tube, the operation ought to be done without delay, and this notwithstanding there may be now and then a remission of the symptoms. A patient, mentioned by M. Louis, seemed so well that he was considered out of danger, yet he died in three weeks; and another, who lived several years with a louis d'or in one of the bronchi, was destroyed by it in the end. The practitioner should remember, that a temporary cessation of the difficulty of breathing, cough, and general disturbance of the system, arising from the foreign body, is usual, and he should not suffer himself to be deceived by it. On the other hand, let him not resort to the operation, unless there be sufficient evidence of the foreign body having really descended through the glottis, and that it has not been coughed up again. The movements of the foreign body in the air-passage frequently cause a kind of rattling, which may be heard. In cases of doubt, the stethoscope should be employed.

---

* See Liston's Elements, part 2d. p. 229.—G. Regnoli, Intorno l'Amputatione di Quasi la Meta della Mascella Inferiore Brevi Cenni, pp. 13. & 20. 8vo. Pisa, 1824.
† Dupuytren, Leçons Orales, tom. iv. p. 653.

2. Polypi, fibrous tumors, and other organised growths in the larynx, causing dangerous interruption of the breathing.

3. Foreign bodies in the pharynx or œsophagus, occasioning by their pressure a perilous impediment to respiration, and not admitting of being immediately either extracted or pushed down into the stomach.

4. An urgent interruption of respiration from a chronic thickening of the membranous lining of the larynx, and a consequent diminution in the diameter of the glottis.

5. The same urgent state, resulting from acute inflammation of the same part. This case, however, much less frequently requires an operation, because the disease in its early stage generally yields to bleeding, mercury, and other efficient means, and, in its advanced stage, mostly proves fatal, whether the trachea be opened or not; not only this tube being blocked up with fibrine, but the bronchi themselves similarly obstructed, and the lungs participating in the effects of the inflammation. At the same time, it deserves attention, that, even with these facts admitted, the performance of the operation is sometimes vindicable, as being the only means of enabling the patient to breathe, and gain a little time for the further trial of remedies calculated to subdue the disease; provided there be reason to believe that the inflammation has not descended beyond the first division of the bronchi, in which case the operation would be useless. M. Bretonneau is an advocate for opening the trachea freely, and, besides placing rather a wide cannula in the wound, to promote the escape of the layers of fibrine from the trachea, he introduces calomel, either in a dry or moistened state, into that organ, for the purpose of expediting the absorption of the fibrinous deposit. Several cases are recorded, in which M. Bretonneau adopted this practice successfully. Velpeau refers to a case under M. Trousseau, who, after performing tracheotomy, and putting a cannula into the wound, introduced into the bronchi twenty drops of a solution of ℥ j. of nitrate of silver in ℥ j. of distilled water, every six hours, for three days and a half. Twenty drops of a tepid decoction of marshmallows were introduced every hour, and the cannula withdrawn and cleaned three times a day. The child, aged six years, continued for four days to void considerable portions of fibrine through the tube. On the tenth day, the air began to pass very well through the larynx, and, by the twenty-fifth, the wound in the trachea had healed.* The value of the practices here alluded to, I leave to the judgment of the physician, and merely advert to them as connected with the present subject.

6. Various cases, in which suffocation is urgently threatened by the mechanical pressure of swellings on the larynx or trachea,

---

* Nouveaux Elémens de Méd. Opératoire, tom. ii. p. 202.

provided such pressure cannot be immediately removed, as it often may be by discharging the contents of abscesses. In this last manner, I saved a child under Dr. Campbell, of Camden Town, which was on the point of suffocation from the pressure of a collection of matter formed around the thyroid gland.

7. For the purpose of inflating the lungs in some examples of suspended animation, like that resulting from hanging; for the plan is at present nearly abandoned with reference to cases of drowning. It appears, also, to promise no success, where life is suddenly extinguished by the azotic principle of certain gases.*

8. Disease of the larynx from syphilis; threatening suffocation.

9. Dangerous obstruction of respiration from the effects of inflammation of the lining of the glottis, excited by swallowing boiling water.†

10. Complete interruption of respiration by retraction of the tongue into the pharynx, occasionally taking place on the division of the attachment of the genio-glossi muscles in the removal of the body of the lower jaw.

In performing *tracheotomy*, the surgeon should recollect the relative anatomy of the trachea; especially its having the œsophagus behind it; its inclination rather to the right side of the neck; its being covered, first, by the common integuments,—secondly, by the cervical fascia,—thirdly, by the transverse slip of the thyroid gland, connecting the two lobes of this body, near the cricoid cartilage; and lower down by a plexus of veins, some lymphatic glands, and the middle thyroid artery, when it exists,—fourthly, by the sterno-hyoid and sterno-thyroid muscles, which lie towards its side. The inferior laryngeal nerves are behind it, and the common carotid at its outer side. Occasionally it is crossed by one of the inferior thyroid arteries, which then passes from one side of the neck to the other. In children, the arteria innominata generally lies over the front of the trachea, till the latter tube is completely out of the chest, so that the right carotid artery then quits the innominata very high up, and may be easily wounded in the operation. Velpeau has known the left carotid come from the right side, and cross the trachea to reach its usual situation.‡ Mr. A. Burns has a cast, showing an in-

---

* Enlargements of the tonsils and tongue can never require tracheotomy or laryngotomy, as diseased tonsils can be removed, and the enormous swelling of the tongue from inflammation may be quickly reduced by making two or three free incisions along its dorsum.

† Dr. Burgess, in Dublin Hospital Reports, vol. xxxi. p. 379.—Hargrave's Operative Surgery, p. 328. In University College Hospital, tracheotomy has been performed in several instances of this kind; but, generally, without success. One or two children under me recovered under the free use of calomel.

‡ Nouveaux Elémens de Méd Opératoire, tom. ii. p. 209. For a description of some anomalies of the arteries in this part of the body, the reader is referred to Tiedemann's Tabulæ Arteriarum; but a more complete account of the varieties in the origins and course of arteries, I hope, will soon be laid before the public by my friend and colleague Mr. Quain, whose collection of preparations, illustrative of this subject, so interesting to the practical surgeon, is, I believe, the best in England.

stance of the right carotid crossing the treachea, two inches and a quarter, above the top of the sternum.*

The trachea, which is superficial above, becomes more and more deeply situated below, where the front of it is sometimes more than an inch from the integuments. So very moveable is it likewise, that, if care be not taken, the surgeon, as he is attempting to cut into it, may push it towards the side of the neck, and the knife injure the common carotid artery.

TRACHEOTOMY.

The head is to be kept backward, with pillows placed under the scapulæ. The surgeon is to be on the patient's right side, in order that he may with his left hand feel the larynx, and with his right more conveniently make the incision from above downwards in the mesial line of the neck. The precise situation of the cricoid cartilage having been ascertained, an incision is to be made through the integuments and superficial fascia, from just below the transverse slip of the thyroid gland downwards to the extent of at least two inches and a half, or to a point a little above the first bone of the sternum. In children, the wound should not extend so far down. The operator is then to cut between the two sets of sterno-hyoid and thyroid muscles, till he comes to the deep cervical fascia, which is next to be freely divided, and the front of the trachea itself exposed. The sterno-thyroid muscles are then to be pushed a little aside, and the trachea is to be prevented, by the pressure of the surgeon's left forefinger, from suddenly shifting its place, while he cautiously makes an opening in the trachea towards the lower end of the external wound, with a sharp-pointed scalpel, with its edge turned upwards, and the point directed by the nail of the same finger. Frequently, when respiration is carried on with difficulty, and the patient struggles, the completion of the latter object is attended with more difficulty than the inexperienced might expect; so rapid and convulsive, as it were, are the motions of the trachea. In a child, indeed, the difficulty of the operation is great, not merely from these causes, but the struggles of so young a subject, the depth of the trachea from the fat in the neck, and the small diameter of the trachea itself. Hence the plan, now usually followed, of drawing forward the trachea of a child with a tenaculum, in order to make an incision in it, as originally suggested by Dr. James Murray, and particularly recommended by Mr. Carmichael, I consider a great improvement of this operation. A puncture, or small incision, having been made in the tube, it is to be enlarged to the requisite extent by cutting from below upwards, either with the same scalpel,

---

* See Dublin Journ. of Med. Science, vol. iv. p. 111.

or a curved probe-pointed bistoury. The knife must not be carried to the right or left, in order to avoid the risk of wounding the carotid artery; and never too near the first bone of the sternum, a deviation from which rule might endanger the left subclavian vein, and, in children, even the arteria innominata.

If the bleeding from the plexus of thyroid veins were to be copious, some of them might require ligatures, previously to the trachea being opened, because the blood would otherwise insinuate itself into that tube, and seriously increase the patient's distress. In general, however, the venous hemorrhage will soon stop of itself, and the surgeon can then safely proceed to open the trachea. However, if the case admitted of no delay, either the veins must be tied, or, what seems preferable, the trachea opened at once, and the patient directly afterwards placed on his side. Were there a middle inferior thyroid artery ascending over the front of the trachea, it would almost certainly be divided; and, in this event, it should be immediately tied.

Whether tracheotomy be performed to enable the patient to breathe, or for the extraction of foreign bodies, it is advisable to make rather a free opening in it; because, in the first class of cases, the cannula* introduced into the trachea should be of ample diameter; and, in the second, nothing will so materially facilitate the passage of the extraneous substance outward as an incision of proper extent. Frequently, when the sides of the wound are separated, the foreign body is propelled out with the breath, and, if this does not happen, instruments must be gently introduced, and the attempt made to extract it: here a free opening is absolutely indispensable. In many examples, the foreign body will be found not towards the bronchi, but the larynx. If not easily detected, the surgeon should not irritate the lining of the tube too much by the repeated introduction of the forceps: various cases prove, that the foreign body will often be discharged spontaneously after a little while.

LARYNGOTOMY.

The patient's head having been thrown back to render the po-

---

* The ingenious cannula, described by Mr. Wood in the Med. Chirg. Trans., deserves attention; and so do those of M. Bretonneau. Every surgical practitioner should have a set of three tracheotomy tubes of different sizes: they should be curved, and furnished with rings, and a rim around their outer end. It is important that they should gradually increase in breadth from the extremity, which is introduced into the trachea to the rim, because, with this conical shape, they are adapted to fill and distend the incision in the trachea, so as to hinder blood, &c. from entering the trachea. In the infirmary of the Fleet Prison, I lately lost a patient, on whom I performed tracheotomy, from not being able at the moment to procure any but a cannula of wrong construction. Mr. Lawrence, instead of the use of a cannula, is in favor of removing a slip of the edge of the wound in the trachea; but this is objected to by Velpeau, as likely to cause, after the opening is finally healed, an irremediable diminution in the diameter of the trachea. Elém de. Méd. Opératoire, tom ii. p. 214.

mum Adami prominent, an incision is to be made through the skin and superficial fascia, beginning over the thyroid cartilage, and extending down to the inferior border of the cricoid cartilage, or a little lower. While the edges of this wound are held apart, the surgeon proceeds to make an incision in the same direction, precisely in the interval between the two sets of sterno-thyroid and crico-thyroid muscles. The crico-thyroid membrane will thus be exposed. The surgeon is now to try whether he can feel the pulsation of the small artery, sometimes named the crico-thyroid, and, if he can, the opening in the membrane should be made above or below it in a perpendicular direction, with the edge turned away from the vessel. In most cases, however, the cut should be directed towards the cricoid cartilage, because the small artery, referred to, generally runs along the lower edge of the thyroid cartilage.

When the purpose of the operation is merely to let a tube be introduced to enable the patient to breathe, a transverse incision in the crico-thyroid membrane will suffice; but when the removal of a foreign body from the larynx is the object, the incision should be made according to the foregoing description, and its edges be separated to let the extraneous substance escape with the breath, or be removed with the forceps.

Writers, who give the preference to laryngotomy, offer the following considerations in its favor: the only parts cut are the skin, cellular tissue, cervical fascia, and crico-thyroid membrane; the little risk of hemorrhage,—a few small veins, and the crico-thyroid artery, being the only vessels exposed to the knife; and the greater facility with which the larynx is fixed, than the trachea, which is also more deeply situated.

As to the question, which operation is most suited to the objects in view, Bichat endeavors to prove, that laryngotomy always answers as well as, and sometimes better than, tracheotomy. If the design were merely to make an opening for the air, one situation, he argues, would do as well as the other; but if the extraction of a foreign body from the rima-glottidis, or ventricles of the larynx, were required, laryngotomy would be the most advantageous.

While Ferrand was surgeon of the Hôtel Dieu, a man was brought to it with urgent symptoms of suffocation, caused by a stone that had fallen into the glottis. Tracheotomy was performed, but merely a little blood and mucus was discharged. The patient died, and, on examination, a triangular stone was found, two angles of which were lodged in the ventricles of the larynx, while the other projected at the glottis. In this example, laryngotomy would have saved the man's life. When a foreign body in the trachea is loose, it is mostly at the upper part of it; but, if it happen to be fixed, and lower down, the advocates for laryngotomy assert, that it may even then be readily extracted, by extending the cut through

the cricoid cartilage, and using a pair of curved forceps. Notwithstanding these arguments, tracheotomy is usually preferred for the extraction of foreign bodies, and, as I think, justly, because laryngotomy will not give the advantage of the free and well-placed opening obtained by tracheotomy.

Whatever differences of opinion may be entertained, respecting the advantages of laryngotomy for foreign bodies in the larynx, none can exist about the preference which should be given to tracheotomy where respiration is dangerously obstructed by the pressure of some kinds of tumors on the trachea; by that of a large foreign body in the œsophagus; or by the swelling sometimes following severe wounds of the throat. I also agree with Flajani, in disapproving of laryngotomy in croup, because the wound should be made away from the principal seat of inflammation.*

Surgeons should remember, that in old persons the cartilages of the larynx are frequently ossified, and difficulty would then be experienced in dividing them; and also, that the thyroid cartilage cannot be slit open in any person without risk of injuring the chordæ vocales.

PARACENTESIS THORACIS,

Or, the operation of making an opening into an chest, for the purpose of discharging blood, pus, a serous or sero-purulent fluid, or air, confined in the cavity of the pleura, cannot frequently be undertaken with much prospect of benefit.

Whether *blood* be *effused* from an intercostal artery, or from more deeply seated vessels; whether the bleeding arise from a wound, or a spontaneous rupture of vessels; and whether it be arterial or venous; the cessation of the hemorrhage can only be brought about through the formation of coagula, and pressure. But if, instead of remaining confined in the chest, the blood passes out through an opening in the parietes of the chest, coagula will be less likely to form, and the hemorrhage in all probability only terminate with the death of the patient. Hence, instead of dilating wounds of the chest, as the old surgeons sometimes did, the moderns make it a rule to close them. If the quantity of effused blood be moderate, it is usually absorbed; and if very copious, the stoppage of the internal hemorrhage can only be accomplished on the principles above explained, assisted by antiphlogistic treatment. It is manifest, then, that the making of any incision or puncture into the chest can never be advisable for a recent extravasation of blood occasioned by a penetrating wound. At a later period, however, when the vessels have had time to become obliterated, if nature should not

---

* Flajani, Collezioni d'Osservazioni e Riflessioni di Chirurgia, t. iii. p. 241.

prove competent of herself to remove the effused blood, and the symptoms caused by its presence were urgent, it might then be necessary, and only under such circumstances, to make an opening for its discharge.*

With regard to a *collection of pus* in the chest, or the case termed *empyema*, paracentesis often fails to be of service, because in general the empyema is not the principal, nor the original, disease. If the cause were a tuberculated lung, combined with vomica, or any other incurable organic disease of the lung; or any serious disease of the pleura, still going on; the making of an opening into the chest would only hasten the patient's death. On the contrary, if the suppuration were the consequence of simple inflammation of the lungs, the operation, as M. Velpeau observes, might be proper, if there were nothing in the general condition of the patient prohibitory of it.

As for a *collection of serous fluid*, this is another case in which an opening has sometimes been made, though mostly without success, because hydrothorax is rarely the sole or original disease. It is also remarked by Velpeau, that, in this disease, when the fluid has been discharged, the lung is incapable of expanding, and the whole sac of the pleura becomes filled with air. Still, if it were not certain, that hydrothorax depended upon some incurable organic disease, and the quantity of fluid dangerously obstructed the breathing, the performance of paracentesis would be justified by the results of certain cases on record.

Collections of air within the pleura may arise from wounds of the air-cells, from decomposition of fluids, as is conjectured, or, from the simple exhalation of gas from the capillary vessels. Although cases of this description may be attended with circumstances vindicating the puncture of the pleura, the result is generally only temporary relief, because pneumo-thorax is usually combined with organic disease in the chest, effusion of blood, or empyema. If the air in the pleura were in moderate quantity, and the cause a wound of the air-cells, were the patient to live a day or two, the breach in the lungs would be closed by the adhesive inflammation; no more air would escape from it; and what had been already effused in the pleura would gradually be absorbed.

Whether the effusion in the chest be a serous fluid, or pus, the case will present certain symptoms common both to hydrothorax and empyema; especially short and difficult respiration, the lungs of the effected side being compressed by the collection of surrounding fluid. In both cases, also, expiration is even more difficult than inspiration, on account of the weight of the fluid, which strongly opposes the elevation of the diaphragm. Sometimes, when the patient

---

* A. L. F. Velpeau, Nouveaux Elémens de Méd. Opératoire, tom. ii. p. 250.

moves in bed, he distinctly feels the undulation. If the fluid be contained in only one cavity of the chest, he cannot lie on the opposite side, because the fluid compresses the other lung. The ribs on the affected side are more arched than is natural, because the fluid resists their depression. When no symptoms of suppuration have occurred, the case may be suspected to be hydrothorax. The face, the integuments of the chest, and lower extremities, are frequently œdematous, and sometimes also the arm on the side affected, especially when the quantity of fluid is copious. Sometimes dropsy of the chest is joined with the same general affection of the whole body. All these symptoms, however, may indicate empyema, when preceded by the usual signs of inflammation and suppuration in the chest. When symptoms of acute peripneumony have taken place, and when rigors have occurred at the termination of the inflammatory fever, just before the commencement of the above kind of symptoms, it is rational to infer that the case is empyema. I remember a man in St. Bartholomew's Hospital, whose heart was pushed completely to the right side of the chest, by an abscess in the left bag of the pleura. The preceding inflammation in the chest, the occurrence of rigors, the great difficulty of breathing, and the palpitation of the heart, quite on the right side of the sternum, made the nature of the case sufficiently evident. When the left cavity of the chest was opened after death, an enormous collection of matter was discovered. Of late, the writings of Avenbrugger, Corvisart, Laennec, and Piorry, have thrown great light on the mode of ascertaining, not only the presence of fluids in the chest, but their precise situation. For obtaining correct information on these points, the stethoscope and percussion should be resorted to. The most eligible place for the operation is between the fifth and sixth, or the sixth and seventh true ribs, at the point just in front of the indigitations of the serratus magnus, or midway between the anterior and lateral parts of the chest. In France, paracentesis thoracis is usually performed between the third and fourth ribs on the left side, and between the fourth and fifth on the right. An apprehension of wounding the liver and diaphragm by operating lower down is the chief reason for this practice. The French aim at making the incision at the junction of the posterior third with the two anterior thirds of the pectoral region. Here the opening can be made just in front of the latissimus dorsi, between the indigitations of the serratus magnus, and those of the external oblique muscle; and here the intercostal artery is still in the subcostal groove, not having yet divided into two branches.

An incision, two inches and a half long, should be made through the integuments, which are first to be drawn to one side, if it be intended to close the wound immediately after the operation. The intercostal muscles are next to be cautiously divided, and, as soon as the pleura costalis is exposed, a small puncture is to be carefully

made in it. In dividing the intercostal muscles the edge of the knife should be kept close to the upper edge of the lower rib, in order to avoid all risk of wounding the intercostal artery, which runs for some way in the groove in the lower edge of the upper rib.

In emphysema, a small puncture will suffice; in hydrothorax it may be somewhat larger; and, in empyema, the matter must have an opening of sufficient size to allow the fluid to escape freely through a cannula, which, both in this disease and hydrothorax, may be furnished with a stopper, which is to be withdrawn as often as it is deemed advisable to give issue to the fluid in the pleura.

REMOVAL OF A DISEASED BREAST, AND TUMORS IN GENERAL.

The manner of removing encysted tumors has been already described. When the breast is affected with any disease of an incurable nature, the whole of the diseased parts may sometimes be removed with a knife, the wound healed, and the patient's life prolonged, or freed from great suffering and annoyance. The circumstances, under which the operation should be undertaken, are noticed in the remarks on cancer.

If the disease be a scirrhus, some particularity in the mode of operating is requisite. In this case, the surgeon, instead of merely removing parts which are palpably and visibly diseased, should make it a rule to take away a certain quantity of the substance in the immediate circumference of the disease. Every experienced man is fully aware of the great propensity of the skin to be affected, and the frequent extension of white or yellowish morbid bands into the surrounding adipose cellular tissue. These facts clearly show the propriety of making a free removal of the skin, whenever it is in the least discolored, puckered, adherent to the swelling, or in any way altered, and of taking away a good deal of the fat, in which scirrhous tumors are involved. On the contrary, if the disease be a mere chronic growth, or swelling of the breast, not of a cancerous nature, the removal of the skin is not necessary on this principle, though it may be so on others, viz. the superfluous quantity of it, when the tumor is very large, and the difficulty and tediousness of the proceedings for the removal of such a swelling when an attempt is made to preserve the whole of the integuments. When cancer recurs, the integument is the first part in which it usually makes its appearance, and the skin of the nipple in particular. Hence, many surgeons always make it a rule to remove the latter part, when it is judged proper to take away any of the integuments. As Sir Astley Cooper has observed, it is not sufficient to remove the tumor, but the gland, from the nipple to the tumor, must be removed, and the surrounding parts, to some extent, taken away.*

---

* Lectures, vol. ii. p. 199.

The patient is frequently operated upon in the sitting posture, but the recumbent has advantages, particularly when any gland in the axilla is to be taken away, or the patient is likely to faint. If the sitting posture be chosen, the pectoral muscle may be rendered tense by an assistant keeping the arm back, which state of the muscle will facilitate the dissection of the tumor from its surface.

When the case is not of a malignant character, and no part of the integuments is to be removed, a straight incision may be made through them; the tumor is to be regularly dissected on every side from the circumjacent parts; and, lastly, its base is to be detached, from above downward, till the whole is separated.

If the outer incision has been made more or less transversely, the lower half of the swelling should be separated from its surrounding connections, before the dissection of the upper portion is begun; by which means the surgeon will not be incommoded by the blood falling into the lower part of the wound, before the detachment of the adjacent portion of the tumor is effected. As soon as the lower half of the circumference of the swelling is separated from its connections, the surgeon is to undertake the dissection of the upper half. Lastly, he is to detach its base from the subjacent textures.

Such are the modes of removing all simple tumors, which are not of a malignant nature, nor of immense size.

When the tumor is malignant, and adherent to the skin and pectoral muscle, the operator is to remove at least an inch or two of the fat on every side of the disease. The portion of the skin, intended to be taken away, must be included in two semicircular incisions, which meet thus () at their extremities; and when the base of the tumor is to be detached, the surface of the pectoral muscle, wherever it is adherent to the tumor, is also to be removed. The advantage of making the incision, in the preceding manner, obviously consists in enabling the surgeon to bring the edges of the wound together after the operation, so as to form a straight line, and admit of union by the first intention.

The mere magnitude of a tumor frequently renders it highly judicious to take away a portion of the skin: if some were not removed, the dissection would be tedious; and, after the operation, the loose skin would lie in folds, and form, as it were, a large pouch for the lodgment of matter.

In the extirpation of a diseased breast, the direction of the external incision must, in some measure, be determined by the shape of the tumor: Desault thought there were advantages in cutting as much as possible transversely, when circumstances would allow it; and he believed that, as the integuments were more yielding upwards or downwards, than in a cross direction, especially near the sternum, the transverse wound could be more expeditiously united. These advantages seemed to him of higher importance, than the ready escape of matter at the depending angle of the wound; the

reason generally assigned in favor of the perpendicular direction of the incision. At the present day, these arguments do not sway surgeons to any great extent; but the direction of the wound is usually made obliquely downwards and forwards, and the base of the tumor cut from the pectoral muscle in a similar direction, the detachment being first accomplished at the upper and outer part of he wound, and then regularly extended to its lower and anterior end.

The tumor having been removed, the surgeon should examine the interior of the wound, in order to ascertain that no indurated part is left behind; and if any hardness be detected, it ought also to be removed. He should also examine the surface of every scirrhous tumor, immediately it is taken out, and see whether any of the white bands, shooting into the surrounding fat, have been divided; for, in this case, some portion of those bands must have been left behind, and ought to be taken away. Their situation may be known, by considering the position of the tumor before the operation.

When a tumor of the breast has been entirely detached, and the chief bleeding vessels tied, which are usually at the outer part of the incision, the arm is to be brought forward. Then, if there be any diseased gland in the axilla, the patient should lie down on the opposite side, and the arm be raised, so that the arm-pit may be completely exposed to the light. For this purpose, the first wound, if the outer and upper end of it be near enough to the axilla, may be extended over the gland about to be taken away; and the latter part, having been separated from its surrounding connections, may either be cautiously dissected from the subjacent parts, or, its base tied with a bit of strong silk. The latter method has been adopted by some distinguished operators, in consequence of the brisk hemorrhage which takes place from the short arterial branch distributed to the gland from the thoracic. As the axillary vein has occasionally been wounded in dissecting a diseased gland out of the axilla, and this by skilful and experienced operators, the plan, now mentioned, which was generally adopted at St. Bartholomew's by the late Sir Charles Blicke, deserves to be remembered.

Mr. Liston lays down one excellent rule in operations for the removal of tumors. In all cases (says he), the incisions ought to commence at the point where the principal vessels enter; in this manner, they are divided at the outset, can he readily secured by ligature, or by the fingers of an assistant, and the dissection is continued without risk of further hemorrhage. If the opposite course be pursued, the vessels will be divided several times during the operation, numerous ligatures will be required, and considerable loss of blood take place.*

In the removal of tumors in general, one rule is, to make a free external incision, which will materially facilitate and expedite the

---

* See Liston's Elem. of Surgery, part 1. p. 222.

subsequent dissection, and save the patient from the pain and other ill consequences of a tedious and protracted operation. For the same reason, if a fascia cover the tumor, it should be freely divided, so as to make, as it were, an outlet for the morbid mass.

In dissecting out tumors, another good general maxim is, to cut as much as possible in the direction of the muscular fibres.

PARACENTESIS ABDOMINIS.

This operation consists in making an opening into the cavity of the peritoneum, for the purpose of discharging the fluid collected there in dropsical cases. The proper instrument for this is a trocar, with a cannula through which the fluid can readily escape.

Not many years ago, it was the invariable practice to introduce the instrument at the central point of a line, drawn from the umbilicus to the anterior superior spinous process of the os ilium, and on the left side, in order to avoid all risk of injuring the liver. Modern practitioners usually prefer making the puncture in the linea alba, for several weighty reasons. The first is, that, in the other method, no surgeon can be sure of introducing the instrument in the exact situation of the linea semilunaris, and consequently may unnecessarily wound the thick muscular parietes of the abdomen, instead of merely a thin tendinous part. Another reason is, that, in the attempt to tap in the linea semilunaris, the epigastric artery has sometimes been wounded by surgeons of high repute. In dropsical cases, the rectus muscle is frequently much broader than in a healthy subject; and, as it always yields to the distension of the fluid in a greater proportion than the lateral layers of muscles, the above measurement is not unlikely to cause the wound to be made near the course of the epigastric artery.

When the operation is to be performed in the linea alba, the instrument should be introduced about two or three inches below the navel; or, as is usually directed, at the mid point between the umbilicus and the pubes. As soon as the trocar meets with no further resistance, it is not to be pushed more deeply, without any object, and with a possibility of injuring the viscera. The stilet is now to be withdrawn, the cannula pressed a little further into the opening, and the fluid discharged through it.

In consequence of the sudden removal of the pressure of the fluid from the viscera and diaphragm, patients are disposed to swoon, and even become affected with dangerous symptoms. In order to prevent these unpleasant occurrences, the abdomen is to be compressed with a bandage or belt, during the discharge of the fluid, and afterwards covered with a flannel compress and roller.

In cases of ovarial dropsy, the tumor generally inclines more towards one side of the abdomen than the other, so that the puncture cannot always be made with safety in the linea alba. Here the

custom is to make the puncture at the point where the swelling is most prominent, due care being taken, however, to avoid the epigastric artery. If, however, the ovarial cysts be of great size, it will frequently admit of a trocar being introduced into it through the linea alba with perfect safety. I have tapped many ovarial cysts in both ways.

REMOVAL OF A DISEASED TESTIS.

In considering the propriety of castration, nothing can be wiser than the general maxim, not to employ the knife, if there be any traces of disease in the viscera : it may be inferred, that the operation will not answer when the patient has frequent attacks of colic pains, a pallid leaden-colored countenance, indigestion, loss of appetite, frequent purging, a hard belly, or any distinct and separate indurations about the abdomen. In cases of medullary cancer of the testis, in consequence of the natural course of the lymphatics of this organ to the lumbar glands, the absorbent glands in the course of the external iliac and common iliac arteries, and near the aorta, are frequently implicated. Sometimes these form a tumor as large as a child's head, and perceptible with the hand especially when the abdominal muscles are relaxed. The kidneys also often partake in the disease; and hence, the prudence of always making careful inquiry into the state of those organs, before venturing to propose the operation. It is to be recollected, however, that the weight of the enlarged testis frequently produces in the loins extremely painful sensations, which might be mistaken for symptoms of diseased kidneys, if the difference were not indicated by the pain always diminishing, when the scrotum is well supported in a bag-truss, or the patient keeps himself in the recumbent posture. In such cases, the state of the urinary secretion would also afford useful light. If the scrotum be diseased, there may be enlarged glands in the groin, which are highly unfavorable whenever the disease of the testis consists of any species of tumor characterised by malignancy and a disposition to extend to other organs.

Attention should be paid to the state of the thoracic viscera; for experience proves, that various complaints of the chest frequently precede or follow the origin of medullary cancer of the testis, and seem to have a connection with it. In fact, in such cases, the structure of the lungs is often found interspersed with pulpy, medullary tumors. Hence, when the patient has a troublesome dry cough, shortness of breath, and irregular pain in the chest, and especially when these symptoms attend a medullary tumor of the testis, the operation is unadvisable. The success of castration materially depends upon the state of the spermatic cord; for here it is a point of the first rate importance to remove every particle of the disease—every thing which appears unsound and indurated. This

can easily be accomplished when the disease is confined to the testis and epididymis, the cord being unaffected. But when, as often happens, the latter part is in the same state as the testis, hardened and enlarged, the operation is improper. If the disease of the cord, however, were not to extend quite up to the ring, and its upper portion were still sound, it would yet be practicable to remove all the parts affected by cutting the cord through where it is quite healthy, and the operation be justifiable.* But it is not to be denied that, in such a case, the event is subject to great uncertainty, not so much on account of the commonly feared danger of cutting the cord through near the ring, as because the extension of the disease up the cord is always a ground for apprehending, that the complaint will return either in that part, or in the loins.

However, unless the case be medullary cancer, or fungus hæmatodes, it is only when the cord is truly scirrhous, that is to say, thickened, hardened, knotty, and painful, that it becomes an impediment to the operation; and, when its enlargement is flowing merely to a varicose dilatation of the veins, or an effusion of fluid in the cellular tissue of the part, the circumstance should not prohibit the use of the knife. Both these last states of the spermatic cord may be distinguished from the scirrhous alteration of the cord by their greater softness, and their diminishing when the patient keeps himself in a horizontal position.

The circumstance of the scrotum being diseased is sometimes deemed nearly as unfavorable to the success of the operation, as disease of the cord†, on account of the distemper being likely to recur in the skin. However, there is this difference, that we always have it in our power to cut away every part of the scrotum which may be affected, while, in the case of scirrhous affection of the cord, it is sometimes impossible to follow the disorder to its highest point.

Castration is one of the most simple, and yet one of the most painful, operations in surgery, especially when practised according to the old method, in which it was the custom to include in the ligature all the vessels and nerves of the spermatic cord. At the moment of doing this, the patient was put to excruciating torture; such suffering, indeed, as few could endure without complaint, however great their fortitude‡.

---

* A few years, ago, I removed a very large testis for medullary cancer; in the portion of the spermatic cord taken away were small particles, not larger than millet seeds, apparently medullary. Yet the patient had had no return of the disease four years after the operation. A section of the testis, with the cord, is in the possession of Sir Astley Cooper.

† Sir C. Bell, Operative Surgery, vol. i. p. 223.

‡ LeDran appears to have entertained a just aversion to this painful and unnecessary plan: " Of the several parts of the cord (says he), none but the artery will bleed; why then should the cremaster muscle, the vas deferens, and the nerve be tied with it?

The hair having been removed from the pubes and scrotum, the first thing is the incision through the integuments: it should commence a little above the abdominal ring, and be continued down nearly to the bottom of the scrotum. Two advantages result from extending the cut down to this point: lodgments of matter, which often seriously retard the cure, will be prevented; and the testicle can be more easily taken out. The first incision through the integuments will commonly divide the external pudic artery, which arises from the crural; and if it bleed profusely, the best plan is to secure it at once with a small silk ligature, the ends of which may be cut short, in the manner practised by M. Roux.[*]

The second object is to cut through the sheath of the cord, and separate the latter part, by making a short incision on each side of it at the point where it is intended to divide it. When its detachment is sufficiently completed to allow it to be taken hold of, and lifted up, between the thumb and forefinger of the operator's left hand, this second step of the operation is accomplished. It is a business which should never be done in a careless way; for a portion of omentum and a hernial sac may put on somewhat the appearance of thickened cellular tissue, and the protruded part be liable to injury, or the hernial sac might even be cut through at the time of dividing the cord[†].

The third object is the division of the cord; in doing which, the incision should always be made through it higher than the extent of the disease; for, if this rule be neglected, the patient will derive no effectual relief from the operation, and the wound will either not heal up at all, or, if it heal at first, will break out again. Aware of the inutility and pain of including the vas deferens in the ligature, and of the facility with which this vessel can be distinguished at the back of the cord by reason of its firm feel, some operators pass a ligature between it and the rest of the cord, over the front of which the knot is made, and they then cut through the cord below the ligature. The agony, however, created by the inclusion of all the spermatic nerves, is not only severe, but absolutely unnecessary in a proceeding, the sole aim of which should be the security of the patient from hemorrhage. A far better plan is to apply no ligature

We are sensible, that convulsive motions have ensued from this method of making the ligature upon them all." Operations in Surgery, p. 147, transl. by Gataker, edit. 2d.

[*] See Sketches of the Medical Schools of Paris, by John G. Crosse, p. 141. 8vo. Lond. 1815.

[†] "After the operation was completed, and the wound dressed, the patient being seized with a fit of coughing, to the astonishment and dismay of the surgeon, the dressings were forced off by the protrusion of several convolutions of small intestines." Sir Astley Cooper once removed a diseased testis, which was accompanied by a hernia. The bowels were first reduced, and the cord was then separated by dissection from the back portion of the sac. In Guy's Hospital, he also removed a diseased testis, to which the omentum adhered. Obs. on the Structure, &c. of the Testis, p. 164.

in any way to the spermatic cord previously to its division; but the surgeon should hold the part between his left thumb and fore-finger, just above the point where it is to be divided, and, as soon as it has been cut through, the spermatic artery, and that of the vas deferens, should be taken up with a tenaculum and tied. Desault's method consisted in dividing the cord in the preceding manner, and then holding the upper end of it between the thumb and fore-finger of his left hand, while with the forceps or tenaculum in his right hand, he immediately proceeded to take up the mouths of the spermatic arteries, and afterwards continued the dissection of the diseased testis from the scrotum.*

The fear of a retraction of the remnant of the cord into the inguinal canal before the arteries have been secured, has had a great deal of influence over the conduct of many surgeons in this part of the operation; and their alarm has been increased by Mr. B. Bell's having seen the thing happen twice in his practice, when both the patients were lost by hemorrhage. But, had the operator, in these unfortunate examples, been careful to take firm hold of the upper portion of the cord, before he ventured to divide it, the retraction could not have happened; and, when it did happen in consequence of this neglect, had he had discernment enough to know what ought then to have been done, neither of his patients would have fallen a victim to bleeding. In short, had he considered the course which the cord takes obliquely upward and outward, it would have been easy for him to have followed the bleeding part with perfect safety, within the inguinal canal, even to the origin of the cremaster muscle.† The retraction of the upper portion of the cord within the ring must be more likely to happen, when the extension of the disease upwards obliges the surgeon to divide the part higher up than will well allow the retraction to be securely prevented by the thumb and fore-finger of the left hand. In cases of this description, it has been proposed to avert the accident, by separating the cord into two fasciculi, and, with the aid of a needle, putting a double ligature betwixt them, before the part is cut through. The design of this ligature is to draw down the cord, while the surgeon is taking up the mouths of the vessels; or, if he cannot thus stop the hemorrhage, one portion of the double ligature is recommended to be tied over the front, and the other over the posterior part, of the cord.‡ Another plan consists in raising the exposed cord by passing under it the left fore-finger, and then, instead of cutting the part through at once, leaving the posterior third of it undivided. The first incision will divide the principal artery and its branches, which are to be taken up singly, while the weight of the testis hinders the part from

---

* Œuvres Chir. de Desault, par Bichat, tom. ii. p. 451.
† See Operative Surgery, by C. Bell, vol. i. p. 229.
‡ Sir C. Bell, vol. cit. pp. 225. 228.

retracting. Then the vas deferens is to be cut, and, if its artery be not large enough to require a ligature, the rest of the cord is to be divided. I have usually directed the end of the cord to be taken hold of with a tenaculum, until its vessels have been secured.

That part of the operation, which has for its object the taking of the diseased testicle out of the scrotum, whether it precede or follow the division of the spermatic cord, is extremely simple. It merely consists in dividing the loose cellular tissue which connects the testicle with the inside of the scrotum; and in performing this easy task, it is proper to incline the edge of the knife towards the tumor, which, after the division of the cord, may be considered as dead, and destitute of sensation.

When the diseased testicle is much enlarged, it is advantageous to remove a part of the distended scrotum, because a redundant quantity of loose skin would otherwise make it difficult to put the edges of incision evenly together, and is apt to serve as a lodgment for matter.* The manner of executing this object consists in including the portion of the scrotum that is to be taken away in two elliptical incisions, the length and interspace of which must be regulated by the magnitude of the swelling. Then the spermatic cord having been divided, and the arteries secured, the diseased organ is to be dissected out, the incisions being extended on each side from the elliptical cuts already made.

Also when a part of the scrotum is ulcerated, thickened, or adherent to the testis, two semilunar, or elliptical incisions are to be made, which meet together above and below, and include the diseased part of the skin, which is not to be separated from the swelling, but taken away with it.

When the diseased testicle is of considerable size, it may lie so close to the sound testicle and the penis, that, if attention be not paid to the circumstance, and the knife be too freely used, both these parts may be injured. Sometimes, a part of the tumor is close to the urethra, and, without care, this passage might be wounded. Frequently the swelling presses closely against the septum scroti, which is then liable to be wounded, and the tunica vaginalis of the sound testicle opened; an accident which may produce a good deal of inflammation, and therefore ought to be attentively avoided. Former surgeons had great apprehension of wounding the septum scroti, and the common warning, vociferated in the operation, used to be, " take care of the septum scroti:" but the truth is, if it were not for the chance of laying open the opposite tunica vaginalis and doing mischief to the sound testicle at the same time, a wound of that part, which is merely condensed cellular tissue,

---

* See Sharp's Treatise of the Operations, p. 51. edit. 3.; Bertrandi, Traité des Opérations de Chirurgie, p. 209. Paris, 1784.

would be of trivial importance.   There is no surer way of avoiding the foregoing inconveniences, than being particularly attentive, in the dissection of the diseased testis out of the scrotum, always to incline the edge of the scalpel towards the swelling.

The most troublesome bleeding after castration proceeds, not from the spermatic artery, but from vessels within the scrotum, which quickly retract amongst the loose cellular tissue; and though for a time they may cease to bleed, they often begin to pour out blood again, directly the force of the circulation returns.   The artery of the septum scroti, which, in cases of diseased testicles, is often of greater size than the spermatic artery itself*, or that of the vas deferens, should be sought for and tied.   In short, as Sir Astley Cooper advises, the surgeon should " secure every vessel of the scrotum which continues to bleed, or which has been observed to bleed freely during the operation."†   The ligatures, here used, should be made of common brown thread, or fine dentist's silk, and cut short after their application, because the wound always suppurates more or less, and the small fragments of thread or silk contained in it will come away with the discharge, without the slightest inconvenience.

The operation being finished, the patient should be carried to bed, and the part then merely covered with lint, wetted with cold water, till all apprehension of bleeding has ceased.   After this, the wound should be more completely closed with two or three stitches and a few strips of adhesive plaster.   A compress of lint may be laid over each side of the incision, and the whole supported with a T bandage.   Union by the first intention is here attempted under unfavorable circumstances; for it is difficult to maintain the edges of the wound in exact contact, and the scrotum, deprived of the enlarged testis, forms a cavity, in which it is hardly possible to hinder suppuration.   Some French surgeons, therefore, deny the advantage of the above mode of dressing, and pursue the old plan of filling the scrotum with charpie, and letting the parts suppurate and granulate.‡   It is true, complete union by the first intention is seldom or never accomplished, yet, by attempting it, the wound is much diminished, and the cure is rarely delayed later than three or four weeks; whereas the wound, when stuffed with lint, is usually not healed in less than seven or eight weeks.§

Sometimes, after the patient has been put to bed, hemorrhage takes place; and frequently, when the wound is opened, no partic-

---

* Flajani, Collezione d'Osserv, tom. ii. p. 151.
† See Obs. on the Structure and Diseases of the Testis, p. 163. 4to. Lond. 1830.
‡ Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Françoie, p. 120, &c. 8vo. Paris, 1815.
§ J. Green Croose, Sketches of the Medical Schools of Paris, &c. p. 144.

ular bleeding point can be discovered. I have generally found the application of cold water to the scrotum, by means of wet linen, placed over the adhesive plaster, and making the T bandage somewhat tighter, the best way of checking the bleeding. Should this plan be unavailing, however, the dressing must be taken off, and the vessels looked for, and tied. Such hemorrhage from the arteries of the scrotum may proceed to a serious degree, without being suspected; for the blood sometimes flows out of the lower angle of the wound into his bed, while the outward dressings are perfectly dry and unstained.

When severe inflammation follows castration, venesection, leeches, and other antiphlogistic remedies are indicated; while much disorder of the nervous system, great pain in the wound, spasms, restlessness, &c. will require opium and emollient poultices. Tetanus, retention of urine, convulsions, incessant vomiting, tension and swelling of the belly, peritonitis, abscesses in the course of the cord, delirium, and incurable fits of epilepsy; were more common after castration in former times, when it was the custom to include the whole of the spermatic cord in the ligature, than they are at the present day.

After the operation, the upper part of the spermatic cord occasionally swells so considerably, that it becomes strangulated by the abdominal ring, and vast suffering is the consequence; a case which may require a division of that aperture.*

AMPUTATION OF THE PENIS.

Cancer and mortification†, of the penis, are sometimes specified as the two cases, for which this operation is required. That the first disease is frequently a proper reason for amputating the penis, is unquestionable; but that mortification is so, every reflecting surgeon will deny. The mortified part will separate, and the living surface cicatrise afterwards, fully as well, as if the patient were to submit to a painful operation. I am glad to have it in my power to

---

* Bertrandi, Traité des Opérations, p. 209. Instead of removing a diseased testis, M. Maunoir tried the plan of exposing the cord and tying the spermatic artery; but, as he found it sometimes fail, he afterwards had recourse to the method of cutting the cord completely through, after the artery and its branches had been secured. Another suggestion is that of simply removing a portion of the vas deferens. The object of such proceedings is to bring about the absorption of the diseased testis, but they are not yet regarded as established practices; and, I apprehend, that their frequent failure will hinder them from being so.

† In mortification from paraphimosis, or other causes, the operation is recommended both by Heister (Institut. Chir. 816.) and B. Bell (Syst. of Surgery, vol. i. p. 538). Richter deems the operation unnecessary for the separations of the sloughs; but thinks the knife may sometimes be requisite for making the end of the stump equal, when it has healed with inequalities. However, beauty seems to me a subject here not worth considering, at least, in a surgical point of view.

adduce, in support of the foregoing remark, the authority of Loder, who declares, that, in examples of mortification, he would never undertake the operation. When the gangrenous mischief, says he, is spreading, amputation will be of no use, because it will not stop the disorder; but if the mortification has ceased to extend itself, the operation will be superfluous, as nature herself will throw off the dead parts.*

When the case is a scirrhous, or cancerous disease, the prospect of a perfect cure will greatly depend upon the testicles, skin about the pubes, and glands in the groin, being free from induration. I have seen this operation performed three times, and, in the first instance, the disease had extended to the testicles and inguinal glands; so that though the patient got rid of the disease, situated on the penis, the disorder continued to increase in the groin and scrotum, until life was exhausted.

As the serious mistake has sometimes happened, of amputating the penis for a disease, which, on further examination, appeared to be of a very simple and curable nature, surgeons cannot be too cautious in the investigation of the circumstances of the complaint for which the operation is proposed. In particular, they must carefully distinguish the cancerous disease of the penis from the more common warty excrescence. "I have seen (says Sir Charles Bell) a man just about to lose his penis, on account of a combination of phimosis with these warty excrescences from the glans, and which had burst through the prepuce with a malignant-like distortion. But the prepuce being freely cut open, the luxurient crop of harmless warty excrescences started forth."†

It is certainly true, also, that the penis has been cut off, when the prepuce or integuments were the only diseased parts. According to the investigations of M. Lisfranc, when cancer is situated in the body of the penis, at its root, or even on the scrotum, it commences in the skin, and the subjacent fibrous textures long impede its progress more deeply. Hence, in many instances, the possibility of saving the organ by merely removing the integuments.‡ What are commonly termed *venereal* warts, are well described by Sir Charles Bell: they have a spreading, mushroom-like top, and slender base; and if the intermediate parts can be seen, they retain their natural appearance. A tubercle, formed on some part of the prepuce, is often the beginning of cancer of the penis; it is at first, as Sir Charles Bell remarks, an irregular warty excrescence, with a broad base in the substance of the prepuce, or on the frænum. In a more advanced and ulcerated stage, the sore is of a dark red color, covered with a sanious discharge; its bottom is solid, and deep

* Chir. Med. Beobachtungen, p. 79.
† Operative Surgery, vol. i. p. 130. 8vo. Lond. 1807.
‡ See J. F. Malgaigne, Manuel de Méd. Opératoire, p. 639. 12mo. Paris, 1834.

excavations, and irregular cauliflower excrescences, present them-
selves. The neighboring skin, of a purple color, indurated, swell-
ed, and tuberculated, stands out from the sore, while its irregular
edge is turned inwards. The discharge has a peculiar smell, being
highly offensive; and when the urethra is ulcerated, the urine gushes
out from preternatural openings.*

Cancer may also commence upon the glans, as happened in the
first case, in which I had an opportunity of seeing amputation of the
penis performed. Here also the disease usually begins in the form
of a wart, or small, not very troublesome, induration, which gradu-
ally changes into most painful ulcerated excrescence. Sometimes,
as Richter informs us, the greater part of the penis is covered with
such excrescences, the cancerous nature of which is particularly in-
dicated by the deep extension of their bases into the substance of
the parts from which they grow, the parts appearing for some depth
to be converted into a similar hardened mass to themselves. I have
seen the whole glans, and part of the corpora cavernosa†, changed,
in this manner, into a firm incompressible substance, which had been
gradually extending itself for years, the glands in the groin being also
diseased in the same way.

Sometimes, after the prepuce has been slit open for the relief of
a congenital phimosis, a large irregular fungus sprouts out from the
extremity of the penis, and continues spreading until it has occu-
pied all that part of the organ, which naturally projects beyond the
scrotum. Frequently, in these circumstances, neither the prepuce,
nor the glans, can be distinctly perceived; but the whole projecting
part of the penis forms a confused mass of irregular granulated flesh,
discharging a very foetid matter.‡ It would appear, from several
of the cases recorded by Mr. Hey, that tubercles, or excres-
cences, actually existed within the prepuce before the operation, and
were found there as soon as the phimosis was cut.§ What is like-
wise remarkable, is the great frequency with which the cancerous
disease of the penis seems to be attended with, or preceded by, a
congenital phimosis. Mr. Hey found this to be the case in seven
out of nine examples which fell under his notice, and (says he)
"where I had an opportunity of seeing the disease in an early
stage, the phimosis evidently appeared to have been caused by an
unnatural formation of the internal membrane of the prepuce; and
this formation seemed also to have given rise to the cancerous af-
fection." The facts brought forward by this gentleman tend to
prove, that this malignant affection mostly commences upon the

---

* Op. cit. vol. i. p. 131.
† See case in Hey's Practical Obs. in Surgery, p. 463. edit. 2. A specimen of this
kind, taken from a patient under me at the Bloomsbury Dispensary, is placed in the
Museum of University College.
‡ See Hey's Practical Obs. in Surgery, p. 461. edit. 2.
§ See Cases, Op. cit. p. 463. 473. &c.

prepuce; and that, in its earliest stage, the whole lining of that part is studded with minute tubercles, or inequalities, which change into the worst kind of disease.

According to Mr. Travers, a malignant ulceration of the prepuce and penis, following phimosis, and requiring amputation, may be brought on by an indiscreet perseverance in the use of mercury during the period of inflammation.*

Whenever excrescences on the penis have a narrow base, they may be cured by cutting them off, and the amputation of that organ is totally unnecessary, and, of course, improper.† This I consider more judicious treatment than applying to them a solution of bichloride of mercury and opium for their cure, under the idea of their being venereal. Also, when the wart or excrescence is of a malignant kind, but limited to the prepuce, a cure may generally be effected by a removal of the part, without touching the glans or body of the penis itself.‡ Lastly, it is to be recollected, that diseases of this organ, which put on a malignant appearance, are sometimes cured by the carrot-poultice§, and the internal and external use of arsenic.

In the operation, the plan of saving as much of the penis, and also of the glans, as circumstances will allow, with due regard to the entire removal of every particle of the disease, is undoubtedly entitled to commendation; because the longer the stump is left, not only the more conveniently will the urine afterwards be discharged, but even the faculty of generation be more likely to be preserved. In confirmation of the latter point, the testimony of Heister might be adduced, and Loder mentions one example, in which the patient retained the power of propagating after amputation of the whole of the glans.‖

Amputation of a cancerous affection of the penis often brings about a cure, relapses being much less frequent than after the generality of operations for the removal of cancerous parts. In the three first cases published by Mr. Hey, the cure after the operation was permanent.¶ In order to insure this success, however, it is essential not to defer the use of the knife until the disease is no longer local, and the whole of it cannot be taken away. Hence, before determining to operate, it is a rule with surgeons carefully to examine whether the disease has extended to other parts, especially the glands in the groin. When they are indurated and enlarged, many good practitioners decline the operation altogether, the event of which is then always to be regarded as doubtful. Thus, in one instance, in

---

* Surgical Essays, part i. p. 152.
† Richter, Anfangsgr. b. vi. p. 183. Göttingen, 1802.
‡ See case in Hey's Practical Obs. p. 473. edit. 2.
§ Gibson, in Med. Obs. and Inquires, vol iv.
‖ Loder, Chirurgisch-Medicinische Beobachtungen, b. i. p. 81.
¶ Hey's Practical Obs. in Surgery, p. 478. edit. 2.

which the glands of the groin were much tumefied, Mr. Hey ventured upon the operation, because the swelling of the glands did not exist before escharotics had been applied to the disease of the penis, and consequently it was dubious whether their enlargement was truly cancerous or not; but the patient died from a relapse. The inguinal glands lessened for a time but afterwards increased considerably: there was, however, never any fresh ulceration.* Sometimes the only part affected, in addition to the penis, will be the integuments covering the ossa pubis, in which situation a hard tumor is perceptible. In one case of this description operated upon by Mr. Hey, a permanent cure ensued, care having been taken to cut out the swelling at the pubes: the wound here remaining for some time foul; but, on applying to it red precipitate and burnt alum, it assumed a better appearance, and afterwards healed.† When the cancerous disease does not extend beyond the glans, immediately behind which the incision can be safely executed, there is no objection to the method of cutting through the whole of the penis, with one stroke of the knife. However, in order to cover the ends of the corpora cavernosa with integuments, the plan is sometimes followed of first drawing them towards the pubes, before the incission is made, or else of merely making at first a circular cut through the skin, which is next pushed a little way up towards the pubes, and the rest of the penis divided in a line with the edge of the retracted skin. This last way of operating, however, is not approved of by the generality of modern surgeons; for it is slower, and more painful, than a direct incision through the whole organ; it does not shorten the cure, and is liable to inconveniences. If, indeed, the preservation of skin for covering the end of the stump were any real advantage, the surgeon would always have enough for this purpose by cutting straight through the part, because the corpora cavernosa constantly shrink towards the pubes as soon as they are cut through, and leave the integuments projecting. But the truth is, no benefit is derived from the redundance of skin: in one case, Mr. Hey made an attempt to heal the wound by the first intention, and, with that view, brought the integuments over the divided corpora cavernosa; and that he might make the integuments lie over the end of the penis without puckering, or covering the orifice of the urethra, he made a longitudinal division of them at the inferior part of the penis, and introduced a small silver cannula into the urethra. " I was disappointed," says he, " in my design of healing by the first intention; for the integuments would not adhere to the extremity of the corpora cavernosa. These spongy bodies, when divided, do not readily throw out granulations; but have usually for sometime an ill-conditioned appearance."‡ An objection to amputation of the penis by

---

* See Hey's Practical Obs. in Surgery, p. 470. edit. 2.
† Op. cit. p. 463.   ‡ Op. cit. p. 469.

the double incision is, that the superfluous flap of skin, further augmented by the natural retraction of the divided corpora cavernosa, renders it more difficult to secure the blood-vessels, which become concealed under it, and are disposed to retract, on account of the loose cellular substance with which they are surrounded. At all events, if the surgeon choose to save the skin, let him not prolong the patient's sufferings by two formal distinct incisions, with an intermediate dissection of the integuments from the corpora cavernosa, as it will be quite sufficient to draw the skin a little way towards the pubes, when the amputation may be completed with a single stroke of the knife.

When the penis is to be amputated near the symphysis of the pubes, less skin should be taken away, because the retraction of the corpora cavernosa is in proportion to the length of the portion of them left. Sometimes, however, their extremities in this situation lie so deeply concealed within the integuments, that the surgeon cannot discover, nor take up, the bleeding vessels. In one example, says Richter, the arteries shrunk so far under the pubes, that they lay two inches within the extremity of the skin.*

As the hemorrhage after amputation of the penis is profuse, and often cannot be effectually restrained, unless the larger arteries are secured with ligatures, it is a matter of great importance to perform the operation in such a manner as will enable the surgeon to get at these vessels with the least difficulty; and hence the utility of abandoning the project of saving skin for the purpose of covering the stump. Without this precaution, as a modern surgeon has remarked, while the tendinous business of getting the ends of the corpora cavernosa from beneath the integuments by which they are concealed, and of finding out the arteries, is going on, the continued bleeding often reduces the patient to the lowest state of weakness, and the practitioner is at last compelled to have recourse to compression, styptic applications, cold water, or the cautery. Nor are these means always capable of stopping the hemorrhage in time, or in a permanent manner, the effusion of blood ceasing only for a little while; and their irritation always increases the inflammation of the stump, and protracts the cure. Thus, in one example, where the hemorrhage was considerable, the blood flowing not only from many conspicuous arteries, but oozing largely from the divided corpora cavernosa, Mr. Hey took up one artery on the dorsum penis, and one in each corpus cavernosum. The bleeding, which still continued, seemed then to be a general oozing from the wound, on which account he applied sponge to it. But this would not do; for, about an hour after the patient had been put to bed, the bleeding burst out again, and Mr. Hey was therefore obliged to remove the dressings, and take up three other arteries. A fourth vessel, which

* Anfangsgr. b. vi. pp. 185, 186.

passed near the urethra, bled a little; but, as its extremity could not be clearly seen, a piece of sponge was laid upon it. On the third day, a fresh hemorrhage came on, which made it necessary to remove the last portion of sponge, and take up the vessel under it, which now bled freely.* In another example, Siebold could tie only one artery, the others having shrunk so deeply, that they could not be discovered. After the patient had fainted, the bleeding stopped; but it broke out again, and was at length checked with cold water. The weakness from loss of blood was such, however, that the patient was a month in recovering his strength, and his feet continued for some time œdematous.† Joerdens saw a case in which the stump became retracted under the pubes, and a violent hemorrhage ensued, which nearly proved fatal, and could hardly be restrained in half an hour, by tying three arteries, and having recourse to compression, and a styptic liquor.‡ B. Bell was still more unfortunate, for he ventured to trust entirely to pressure, without taking up any of the vessels; the consequence was, that so copious a bleeding came on, a few hours after the operation, that the patient lost his life.§ In another case, the surface of the stump, which had been treated with compression and styptics, was long ill-conditioned, pale, and indurated ; nor did the wound begin to diminish at all before the thirteenth day‖, in which space of time, another instance, treated differently, had completely healed.¶

Certain cases prove, that the corpora cavernosa sometimes have a great tendency to retract, when cut through towards the pubes; and that even when care has been taken to amputate more of the integuments than of them, their extremities will still frequently be deeply concealed, and the taking up of the arteries be difficult. Nor will the plan of encircling the stump with a tight piece of tape here avail in obviating the disadvantage of the retraction of the corpora cavernosa, and the immediate danger of hemorrhage, as the stump is short, and the band therefore liable to slip off. Even if the band could be fixed tightly on the part, it would only serve as a temporary means of stopping the bleeding, which would be renewed immediately the band was loosened for the purpose of enabling the operator to see the points from which the blood issued.** This plan, however, has been adopted with success in Germany,†† and Mr. Hey assures us, that, in one of his cases, he found great advantage from having applied some tape round the sound part, as he

---

* See Hey's Practical Obs. in Surgery, p. 465. edit. 2.
† Chir. Tagebuch, p. 52.
‡ Loder's Journal, 3 b. 1 st.
§ Syst. of Surgery, vol. i.
‖ Schmalz, in Loder's Journ. 1 b. s. 622.
¶ See Schreger's Chirurgische Versúche, b. i. p. 243.
** Ibid. p. 247.
†† Ollenroths, in Hufeland's Journ. 3 b. s. 56.

was thereby not only enabled to divide the integuments more easily and correctly, but was furnished with an useful kind of tourniquet, which kept the divided vessels from bleeding till he was prepared to take them up with the tenaculum and ligature.*

Were a case to present itself, in which the mouths of the arteries could not be taken up, the practitioner would be compelled to resort to means, which experience proves to have occasionally succeeded under similar circumstances; as, for instance, compression†, with agaric, sponge, or lint dipped in powder of gum arabic, ice-cold water‡, and the actual cautery§, a circular band, strip of plaster or tourniquet, &c. The uncertainty of all these methods, however, is generally acknowledged.

The arteries requiring ligatures, are those of the dorsum and corpora cavernosa.

In order to prevent a closure of the urethra, as well as to enable the patient to make water easily, and keep the urine from coming into contact with the wound, some surgeons, as soon as the operation is finished, introduce a short silver cannula, or an ordinary catheter into that canal. If the short cannula be chosen, it must be made with little rings, so that it may be conveniently fastened in its situation. Were the amputation about to be done towards the pubes, a silver catheter should be introduced before the operation, because here the retraction of the parts is such, that the introduction of the instrument afterwards might be found difficult, if not impracticable.

With respect to the introduction of any tube, either before or directly after the operation in ordinary cases, surgeons are not unanimous upon the subject. I have seen the operation done very well without it, and the parts favorably healed, a bougie having been passed a little way into the urethra once a day, after the removal of the dressings, to hinder the contraction of the orifice of the urethra. This was Mr. Hey's practice.

An elastic catheter, as creating less irritation, is preferable to a metallic one. The irritation of the wound by the urine, and the necessity of hindering the orifice of the urethra from closing, will probably always lead many practitioners to pass a catheter. The instrument, however, should be large; for otherwise the urine, by getting out between it and the urethra, and wetting the dressings, irritates and frets the wound. Le Dran mentions a case, in which, from the neglect to pass a catheter, the orifice of the urethra became impervious, so that the urine could not be discharged.‖ Ber-

---

* Hey's Practical Osb. on Surgery, p. 478. ed. 2.
† Dolignon, Journ. de Médicine, t. lxxxiii.
‡ Siebold, Chir. Sagebüch, p. 52.
§ Sabatier, Médicine Opératoire, t. ii. p. 306. Ollenroths, Hufeland's Journ. 3 b.
‖ Operations in Surgery, p. 158. ed. 2.

trandi cites another case, where, on this account, it became requisite to enlarge the orifice of the urethra by an incision.

PUNCTURING THE BLADDER.

The fifth, sixth, and seventh days, from the commencement of the total obstruction, are those on which the urine is likely to escape from the bladder, hence, Sir Charles Bell recommends an outlet for it to be made on the fourth day.*

Although I am an advocate for not delaying the operation, after milder methods have decidedly failed, I believe that these will almost always prove successful in skilful hands, and that it may generally be avoided. At the present day, the necessity for paracentesis is frequently superseded by the excellent practice of making an opening in the membranous portion of the urethra, which, in cases of bad stricture, is generally dilated behind the obstructed part of the canal.

The bladder may be punctured, either in the perineum, above the os pubis, or through the rectum. Of the first operation I shall say nothing, for it is now generally relinquished. I allude to the old method of opening the bladder with a trocar, between its neck and the insertion of the ureter; because cases frequently present themselves, in which letting out the urine by an incision in the perineum is much more advisable, than either puncturing the bladder from the rectum, or above the pubes. But the operation to which I refer, is not a hazardous thrust of a trocar at a point between the neck of the bladder and the insertion of the ureter, a point which can never be hit with certainty; but a simple incision in the dilated membranous portion of the urethra. In retentions of urine from strictures, not admitting relief by other means, Sir Astley Cooper prefers making an opening in the urethra to the practice of puncturing the bladder, which, in male subjects, he considers hardly ever necessary. In them, retention of urine mostly arises either from strictures or disease of the prostate gland. Of the latter, Sir Astley has never seen a case, in which a catheter, of proper form and size, could not be passed.† "If," says Sir Charles Bell, " a man have a stricture in the urethra, and the surrounding parts be indurated, so that there is no immediate hope of removing it by the caustic, or the bougie; if with this, there has occurred a sudden obstruction, and the bladder has risen and lost its action, and there remains no expectation of spontaneous relief, or of ease from lesser remedies, then I apprehend it is better to open the urethra in the perineum behind the stricture. And this is to be immediately done, if the

---

* Operative Surgery, vol. i. p. 315.
† Surgical Obs. vol. ii. p. 61. 8vo. Lond. 1818. If the urethra has already burst, and effusion taken place, only free external incisions seem necessary.

symptoms indicate a rupture of the urethra, and effusion of urine."*

In University College Hospital, I had a case, where a diseased prostate gland rendered the included portion of the urethra perfectly spiral, so that only a smallish flexible catheter was capable of passing through it; and at length the point of this entered the substance of the prostate, a part of which was found after death to be exceedingly soft. Had it gone a quarter of an inch further, it would have reached the cavity of the bladder. As the symptoms were urgent, I punctured the bladder above the pubes, and drew off a considerable quantity of urine. The man did not recover, and, on examination of the parts after death, it seemed that a small quantity of urine had insinuated itself between the cannula and sides of the wound, and excited inflammation, which had extended to the peritoneum. The preparation, which is preserved in the museum of University College, shows the track of the trocar completely below the reflection of the peritoneum, and the enlargement of the prostate gland has the peculiarity of being principally directed towards the rectum.

PUNCTURE ABOVE THE PUBES.

Some surgeons make a perpendicular incision, about two inches in length, through the integuments and fat covering the lower part of the linea alba. Were the bladder thickened and contracted, or the patient corpulent, this preliminary incision would be proper; but, if the distended bladder can be plainly felt, the trocar may be at once introduced through the parietes of the abdomen into that viscus. A trocar, the diameter of which should be such as will afford a very ready outlet for the urine, and the curvature form a segment of a circle seven inches in diameter, is to be passed through the integuments and linea alba into the bladder. It is to be held with its convexity towards the patient's navel, and pushed obliquely downward and backward in the axis of that viscus. Sir Astley Cooper, who uses a straight trocar, directs it towards the basis of the sacrum, and not so low down as I have mentioned; his reason is, that the risk of the instrument slipping between the pubes and the bladder may be avoided.† At all events, it is necessary to guard against this accident, which has sometimes happened. A curved instrument of this kind is much less likely, than a straight trocar, to penetrate the back part of the bladder, and wound the rectum; besides, having this advantage, that, when the urine is evacuated and the bladder collapses, the cannula will be less disposed

---

* Lectures, vol. ii. p. 315. It seems that Sir Astley Cooper is entitled to the merit of first reviving this forgotten but valuable practice, of which I find traces in the valuable work of L. L. Petit, entitled Traité de Mal. Chir. 3 tomes. 8vo. Paris, 1790.

† Lectures, vol. ii. p. 309.

than a straight one to be separated from that organ. Here we may
discern another reason for making the puncture immediately above
the pubes, and not an inch or two higher up, as Sharp and B. Bell
recommend: the bladder, which rises up between the peritoneum and
recti muscles, descends again, when the urine is discharged, and,
consequently, must be more liable to slip from the cannula, the
higher the puncture is made.*

When the operator perceives, from the want of resistance, that
the point of the instrument is in the bladder, he is to take hold of
the cannula, and push it further in, while he withdraws the stilet.
After the urine has been discharged, some practitioners, amongst
whom is Sir Astley Cooper, pass an elastic catheter, duly shortened,
into the bladder through the cannula, and then take the latter out.

Since an elastic catheter does not fill the wound, the urine is dis-
charged, not only through it, but also between its outer surface and
the track of the wound; so that the chance of the urine becoming
diffused in the cellular tissue is not guarded against, as it is by al-
lowing the cannula of the trocar to remain in the wound two or
three days, until inflammation has agglutinated together the sur-
rounding cellular substance. In some examples, the cannula, after
having been kept a few days in the wound, was taken out, and rea-
dily introduced again as occasion required.†

Still, I do not feel authorised to recommend this proceeding; be-
cause it has happened, that the tube could not be replaced, and the
urine became confined again, so that a repetition of the operation
would have been absolutely necessary a third time, had not Schre-
ger succeeded in procuring an evacuation through the urethra, by
distending this canal with warm water, injected with some force into
the passage by means of a syringe and a cannula, introduced as far
as the stricture would allow.‡

Long, straight, silver cannulæ have been known to form a com-
munication between the bladder and rectum, in consequence of ul-
ceration, or sloughing, produced by the pressure of their points on
the back part of the bladder. Mr. Sharp saw this accident§; and
a modern author informs us, that in a case where a common trocar

---

* Richerand, Nosographie Chir tom. iii. p. 499. By the employment of a long
straight trocar, of course the objection here specified might be removed; but the can-
nula of such an instrument has sometimes pressed against the opposite side of the
bladder, and caused an ulcerated opening in it. In consequence of the bladder hav-
ing slipped away from a short cannula, a repetition of the puncture became necessary
in a case under Professor Schreger. See Chirurgische Versüche, b. i. p. 212. Nu-
renberg, 1811.

† See Bohnüber Harnverhaltung and Blasenstich, Leipzig, 1794; Noel in Desault's
Journal de Chirurgie, tom. ii.; Turner in London Med. Journal, vol. xi.; Journal de
Médecine, tom. lxxxiii.

‡ Versüche Chirurgische, b. i. p. 216. 8vo. Nurenberg, 1811. In cases of reten-
tion of urine, from calculi lodged near the neck of the bladder, Schreger employed the
same artifice with success. It is this principle of distending the urethra with fluid,
that was once so strongly recommended by Mr. Arnott in various affections of that
canal.

§ See a Critical Inquiry into the Present State of Surgery, p. 127. ed. 4.

was used, he dissected the parts; "the bladder fell on the sharp edge of the trocar, this produced inflammation of the bladder and peritoneum, which occasioned the death of the patient."*

The outlet thus formed for the urine is, of course, merely designed as a temporary one, until the impediment in the natural passage has been removed. In one case, seen by Sir Astley Cooper, where the latter object had not been accomplished, twelve months after the puncture, a female catheter was yet worn in the opening.†

This operation has the advantage of being generally done at a distance from the diseased parts, and without risk of injuring any organs of importance.‡ The possibility of the urine getting out of the bladder into the wound, was exemplified in the case under me in University College Hospital, and this notwithstanding the cannula was not withdrawn and exchanged for an elastic catheter, till the end of two days from the period of the puncture. When the cannula happens to slip out of the bladder, it is alleged that the puncture becomes impervious. In fact, this happened in Schreger's, case, where the tube slipped out twice; viz. on the evening of the day on which the bladder was first tapped, and again on the third night from the second performance of the operation; for, after each displacement of the cannula, no probe could be passed into the bladder, no urine escaped, and that receptacle became enormously distended again. When a smallish trocar is used, this closure of the puncture by the mucous coat would perhaps generally be likely to take place for a day or two after the operation; but, in a later stage, it would be less likely to occur: it did not happen in the example related by Schreger himself, in which he took out the cannula of the trocar on the thirteenth day, and put in another§; and it is therefore not to be regarded by any means as an invariable consequence of the tube slipping out. The displacement of the cannula, the possibility of not being able to get in another, and of an extravasation of urine, therefore, may still be considered objections to this method of operating. Another disadvantage is, that the opening is not made in a depending situation, and consequently the whole of the urine cannot be readily discharged. I once saw Mr. Abernethy attempt this operation in St. Bartholomew's Hospital; but the trocar did not enter the bladder. No urine was discharged, and the patient died the following day.

---

* See a History of the High Operation for the Stone by Incision above the Pubes, and an Account of the various Methods of Lithotomy, by J. C. Carpue, p. 176. 8vo. Lond. 1819.

† Lectures, vol. ii. p. 310.

‡ The preparation in the museum of University College, exhibiting the track of the trocar, proves that Mr. King's statement of the peritoneum being necessarily pierced twice by the trocar, before the bladder is reached, is a mistake. See Lithotrity and Lithotomy compaired, by Thomas King. 8vo. Lond. 1832. p. 31.

§ Versûche Chir. b. i. p. 225.

PUNCTURE THOUGH THE RECTUM.

The patient is to be put in the posture recommended for lithotomy. The patient is to make pressure on the abdomen, just above the pubes, in order to render the prominence of the bladder more distinct to the surgeon's finger in the rectum. A curved trocar, with the point of its stilette draw within the cannula, is to be introduced with the right hand, and under the guidance of the left forefinger first passed into the rectum so as to feel the base, or posterior part, of the prostate gland. It should be kept exactly in the central line of the front of the rectum, and, as soon as the end of the cannula is beyond the prostate gland, its handle should be depressed, and the stilette pushed into the bladder, through the anterior part of the intestine, as nearly as possible in the middle of a small triangular space, bounded at the sides by the vasa deferentia and vesiculæ seminales, which converge to the prostate gland, and behind by the line at which the peritoneum is reflected from the bladder to the rectum. If the puncture be made in the centre of this space, just beyond the base of the prostate gland, while the bladder is distended, there will be no danger of wounding the vasa deferentia, vesiculæ seminales, or peritoneum.*

After the urine has been discharged, the cannula should be fixed in its place, of two pieces of tape passed through its rings, and fastened in front and behind to a bandage round the waist. It is to be closed with a stopper, which may be taken out as occasion requires, and may be further secured with a compress and T bandage. As soon as the obstruction in the urethra is removed, the cannula is to be withdrawn, or in some cases it may be withdrawn in from twelve to twenty-four hours, and the urine allowed to pass through the new openining. The reason in favor of this plan is, to get rid of the annoyance of the cannula in the rectum: the reasons against it are, the possibility of the opening closing prematurely, and of the urine causing inflammation, ulceration, and sloughing of the rectum. Sir Astley Cooper objects to this operation, on the ground, that the irritation of the urine is likely to bring on inflammation and disease of the rectum, as happened in a case under Dr. Cheston. When the prostate gland is enlarged, it is manifestly inapplicable.

LITHOTOMY.

The generality of vesical calculi are originally formed in the kidney, whence they descend into the bladder through the ureter, but are either too large to be voided through the urethra, or are prevent-

---

‡ Sir Astley Cooper, Lectures, vol. ii. p. 311. Also J. F. Malgaigne, Manuel de Méd. Opératoire, p. 682. 12mo. Paris, 1834.

ed from entering the latter passage by the projection of an enlarged prostate gland.* When, however, any foreign body remains in the bladder, it soon becomes incrusted with other matter deposited on it from the urine, and thus forms the nucleus of the calculus.

The composition of calculi is various:—1. Lithic acid. 2. Oxalate of lime, or mulberry calculi, which are of a dark color, very hard, and have a regular surface. 3. Triple phosphate of ammonia and magnesia. 4. Phosphate of lime. Calculi, composed entirely of this, are rarely met with in the bladder; and when they are, the researches of Dr. Prout tend to prove, that they are derived, not from the urine, but from the secretions of the bladder itself. 5. Calculi, consisting partly of the triple phosphate of ammonia and magnesia, and partly of the phosphate of lime, blended together. 6. Lithate of ammonia, seldom met with except in children. 7. Lithate of soda, exceedingly rare. 8. Cystic oxide. 9. Carbonate of lime. A calculus, composed altogether of this substance, is very rare, though a small quantity of it is often commixed with other matters. 10. Xanthic oxide. 11. Fibrous calculus. The two latter, first described by Dr. Marcet, are uncommon.† Children and elderly persons are well known to be more liable to calculi, than persons of the middle periods of life. In the poor classes, children are afflicted with remarkable frequency; but, in the higher, the disorder is more common in old than young subjects.

The museum of University College affords abundant evidence of the great liability of patients with diseased prostate glands to the formation of calculi. Their bladders can never be completely emptied; and, as Sir Benjamin Brodie correctly remarks, if a small calculus from the kidney find its way into the bladder, it cannot escape by the urethra, and remains and increases. Lithic acid, and particles of phosphate of lime, or any thing else which can act as a nucleus, becomes also, under these circumstances, the foundation of a stone in the bladder. In cases of diseased prostate gland, the mucous membrane of the bladder sometimes becomes inflamed, and the mucus secreted by it deposits phosphate of lime in small masses, and each of these becomes the nucleus of a calculus; but such calculi may unite and form larger ones.

While a stone in the bladder is of trivial size, smooth, and not angular in its figure, little inconvenience may result from it; but, when it is above a certain weight, rough, and of irregular figure, it always produces more or less suffering. The symptoms, however, seem to be influenced by the quality of the urine, which may be unusually acid, or alkaline, depositing the triple phosphate. As Sir Benjamin Brodie has remarked, in either of these cases it will

---

* Sir Benjamin Brodie on Diseases of the Urinary Organs, ed. 2. p. 209 8vo. Lond. 1835.

† On this subject, consult the writings of Brande, Marcet, Prout, Henry, Yelloly, and Brodie.

be too stimulating, and the symptoms produced by the stone will be aggravated. The state of the bladder itself also makes considerable difference, nothing augmenting the severity of the symptoms so much as inflammation of the mucous membrane. While this exits, a small calculus will cause infinitely greater distress than a large one under ordinary circumstances.* Another reason, assigned by him for the increased severity of the symptoms, when the urine is alkaline, is, that the state of the general health, which causes alkaline urine to be secreted, is attended with a morbid sensibility of the nervous system in general. A dull, annoying pain is felt at the extremity of the penis, and hence, children are continually pulling the prepuce, and it often becomes remarkably lengthened. A sense of weight is experienced in the perinæum; there is a frequent desire to make water, and sometimes uneasiness about the rectum, tenesmus, or, in children, even prolapsus ani. In consequence of a small stone falling on the inner orifice of the urethra, the stream of urine is apt to be suddenly stopped, although the bladder yet contains a considerable quantity. The evacuation is attended with pain, especially towards the conclusion of it, when the inner surface of the bladder embraces, as it were, the foreign body.

The urine contains a good deal of mucus, which forms a sediment, and, when the patient takes exercise, sometimes blood. In an advanced stage, ulceration of the inner coat of the bladder occurs, and then the urine has an offensive smell, becoming putrid and ammoniacal, and depositing a mixture of mucus and pus, more or less blended with blood. After a time, the symptoms of disease of the bladder and kidneys are added to those of stone; the patient loses his appetite, becomes hectic, and the urine albuminous. Frequently, the patient, if not relieved by operation, falls a victim to inflammation of the bladder, already much diseased. Occasionally, large abscesses form in the cellular tissue of the pelvis. Together with these symptoms, there may be numbness in the thighs, and the testicles are often painful and retracted. In the case of a gentleman lately attended by Mr. Bransby Cooper, Dr. Rigby, and myself, and who died of stone, one kidney was much enlarged, and the left ureter, whose communication below, with the bladder was obliterated, was as wide and capacious as one of the small intestines.

An enlarged prostate gland is attended with symptoms more or less similar to those of stone; but, with this difference, that riding in a coach, or on horseback, does not augment the grievances, when the prostate gland is affected; while, in cases of calculi, it does so in an intolerable degree, bringing on likewise a discharge of bloody urine. The fits of pain from a calculus in the bladder

---

* Sir Benjamin Brodie on Diseases of the Urinary Organs, p. 225. ed. 2.

generally come on at intervals; whereas the pain from a diseased prostate gland is neither so unequal, nor so acute.

As the symptoms of stone in the bladder bear a strong resemblance to those of several other affections, surgeons never ponounce a decided opinion on the nature of the disease, until they have introduced a metallic instrument (called a sound) into the bladder, and actually touched the stone itself. But a judicious practitioner, who may not be able to feel the calculus, will be cautious not to say positively, that there is no stone in the bladder; for the next time the patient is sounded, its position may be different, and it may be distinctly hit with the instrument. In relation to this part of the subject, I admire the candor of Sir Astley Cooper, when he says: " I have myself sounded, and not detected a stone at one time, which I have afterwards felt. I have sounded, and not discovered a stone, which another surgeon has afterwards perceived. I cut a patient, and extracted thirty-seven stones from his bladder, who had been sounded, and declared not to have a stone."*

OF SOUNDING, OR SEARCHING FOR THE STONE.

The instrument, expressly calculated for this purpose is denominated a sound, which is not hollow like a catheter, but solid, and made of the best steel. As a stone is generally carried by its own weight to the lowest part of the bladder, the sound is less curved, and somewhat longer than a catheter, in order that it may reach behind and below the neck of that viscus. Being only a particular kind of probe, the chief use of which is to convey information through the medium of the organ of touch, its handle should be highly polished, so that as may points of it may be in contact with the fingers as possible. The mode of introducing it is the same as that of passing a silver catheter.

When its extremity is in the bladder, it is first to be inclined downwards, for the purpose of ascertaining whether the stone occupies its most frequent situation, beneath the extremity of the instrument. If the calculus cannot be felt in this direction, the end of the sound may be gently turned, first to one side and then the other; and, in the event of the calculus not being now touched, the handle of the instrument is to be depressed, and its extremity inclined upwards and forwards, in order to learn whether the foreign body may not lie more towards the fundus of the bladder. Frequently, the stone cannot be felt before the whole of the urine has been voided, and the bladder is contracted; and sometimes the sound cannot be made to strike the calculus, unless this body be first raised up by a finger passed into the rectum, in doing which

---

* Sir Astley Cooper's Lectures, vol. ii. p. 248.

the surgeon may occasionally feel the stone, if it be large, through the intervening coats of the bowel and bladder. As, however, this method is seldom requisite, except when the calculus is smallish, the practitioner must not always expect to feel it with his finger through the bowel; nor is it a matter of any practical importance, because the information thus obtained is more liable to be fallacious, than what the sound affords, and if the stone cannot be felt with this instrument, any kind of feel, communicated to the finger within the rectum, would not warrant the making an incision into the bladder.

When the stone is smallish, and lies on one side of the neck of the bladder, it may not admit of being readily hit with the sound. Also, when, from repeated attacks of inflammation, hardened folds, or, from other causes, distinct cysts have been formed within the bladder, the calculus sometimes lies within a depression, or cavity, and cannot be felt with the instrument. Under such circumstances, before the sound is introduced, the patient should hold his water, until the bladder is quite full, and, if possible, until it is so distended as to efface, or diminish, its preternatural excavations Then the patient should stand up, and make water, with his body inclined forwards, whereby the calculus will be carried towards the neck of the bladder, and admit of being struck with the instrument.* I have known several cases, where the calculus could be touched with a silver catheter, but not with a sound. Instruments of different curvatures and lengths should be tried, when the symptoms are strongly marked, yet the calculus cannot be felt. Whenever the surgeon cannot readily touch the stone, the patient is to be sounded in different attitudes.

In sounding, how possible it is to mistake a thickened, indurated bladder for a stone in that organ, may be well conceived, when it is considered that Cheselden, with all his judgment and experience, actually cut no less than three patients, none of whom had any stone in the bladder at the time of the operation. On the other hand, the case of the celebrated French surgeon, La Peyronie, exemplifies most convincingly, the possibility of failing to discover a stone even of considerable size, though the sound be repeatedly passed.

There are three methods of treating calculous patients generally considered by writers; one is that of attempting to dissolve the stone; a second, that of palliating the symptoms; and the other aims at the removal of the calculus from the bladder by a surgical operation. In women, the latter object may often be performed by dilating the meatus urinarius, without using any cutting instrument†; but, in the male sex, the great length, narrow diameter,

---

* Richter, Anfangsgr. b. vii p. 103.
† Notwithstanding the many respectable advocates for this practice, some men of

winding course, and considerable irritability, of the urethra, make the extraction of calculi through it, and even the getting hold of them in the bladder with any instrument introduced through the passage, more difficult. However, the success which Sir Astley Cooper, Sir Benjamin Brodie, and others have had in extracting calculi of moderate size from the bladder with the urethral forceps constructed by Messrs. Weiss, and the efficiency with which lithotrity is frequently resorted to for reducing larger stones to small particles, capable of discharge with the urine, have already made due impression on every practitioner, desirous of lessening the frequency of one of the most painful and fatal operations in surgery. At the same time, when the calculus is above a certain size, or the bladder is diseased, and incapable of bearing the irritation of the fragments, lithotrity is likely to prove even more fatal than lithotomy. When the kidneys are diseased, the chances of recovery after either operation must be hopeless.

Though the calculus may have been felt with a sound, at some period or another previously to the time fixed upon for the operation, it is an established maxim in surgery, *never to perform lithotomy, unless the stone can be plainly struck with a sound, or staff, immediately before the operation.* A man may have a stone in the bladder to-day, and the surgeon may strike it so manifestly with the sound, as to make the circumstance perceptible to the ears of the by-standers, as well as to his own fingers; but to-morrow, the stone may protrude between the fasciculi of the muscular fibres of the bladder, carrying along with it a pouch, formed by the lining of this viscus, and, in this circumstance, the stone is no longer in the cavity of the bladder; consequently, it can neither be felt with the sound, nor extracted by the operation of lithotomy.

An interesting case is recorded by Sir Benjamin Brodie, where a calculus was included in a sac, composed of the muscular, as well as the mucous coat, and used to create severe pain whenever it passed, as it sometimes did, out of the sac into the cavity of the bladder.

In many instances, there is only a single calculus in the bladder; in others, several; and sometimes thirty or forty. When their number is greater than one, their rubbing against each other generally gives them a smooth surface.

---

considerable eminence object to it, as being more tedious and painful, and more likely to be followed by an incontinence of urine, than the use of a cutting instrument. Of this sentiment is the experienced Klein, who has tried both methods, and in 1816 had cut for the stone 79 patients. See Practische Ansichten der Bedeutendsten Chirurgischen Operationen, auf eigene Erfahrungen gegründet von D. C. Klein, p. 21. 2 tes Heft, 4to. Stuttgart, 1816.

OPERATION.

As one of the principal dangers of lithotomy is inflammation of the bladder and peritoneum, I think the common principles of surgery teach us, that it must be a matter of prudence to remove, if possible, before-hand, any state of the constitution known to promote the access of inflammation. A low regimen, for a few days previously to the operation, and a dose or two of mild aperient medicine, are generally advisable. The rectum should be emptied with a clyster a few hours before the patient is cut, as its distension would expose it to injury.

Many surgeons deem it advantageous to let the bladder be somewhat distended with urine when the patient is cut; and hence, he is usually directed to avoid making water for an hour or two before the operation. This advice I consider well founded, particularly when a gorget is to be thrust into the bladder, which, in an empty state, must be more liable to be wounded at its posterior part; but, in operating with a knife, whether this organ contain urine or not, cannot be a matter of importance, unless the escape of the urine, when the instrument enters the bladder, is to be considered as useful information. Klein, who is in the habit of using a common scalpel, never gives himself any concern about the bladder being empty or not.*

The patient should be placed upon nearly a flat surface, where it is much easier to introduce an instrument in the direction of the axis of the pelvis, than when the table slopes considerably, which would also oblige the operator to kneel down to gain the advantages which he fully has sitting down at his ease, before a table that has nearly a straight horizontal surface.† The table should be high enough to bring the perineum on a level with the surgeon's breast. The buttocks should be somewhat more raised than the abdomen; the patient lie upon pillows conveniently placed; and the nates project rather beyond the edge of the table.‡

In arranging the posture of the patient, the chief objects to be attended to are, first, to let the buttocks be exactly even; to take care that neither of the assistants draws the thigh too much towards his own side; and that the parts, situated between the raphe of the perineum and the ascending ramus of the ischium be stretched, in which condition the requisite incisions can be performed with more facility.§

A staff is then to be introduced into the bladder. Two strong

---

* Chirurgische Bemerkungen, p. 26.
† Ibid. p. 23.
‡ C. J. M. Langenbeck über eine einfache und sichere Methode des Steinschnittes mit einer Vorrede von Dr. J. B. Siebold, p. 44. Wurzburg, 1802.
§ Langenbeck, op. cit.

garters or ligatures, each about two yards long, are then to be doubled, and placed by means of a noose round the patient's wrists, who is next to take hold of the outside of his feet with his hands, the fingers being applied to the soles. The two ends of the ligature are then to be carried in opposite directions round the ankle, over the back of the hand, and under the foot, where they may be tied in a bow. The hands and feet being thus securely connected together, the knees and feet are to be supported, kept steady, and held apart by the assistants.

The staff should be introduced before the patient's hands and feet are bound together; first, because, if the calculus cannot be felt with this instrument (which being now used for the sound, saves the patient the pain of a double introduction through the urethra), it will not be necessary to tie up the patient at all, as the operation must not be attempted; secondly, because, while the patient is unbound, the instrument is more easy of introduction, and in searching for the stone, a change of posture is often necessary.

A curved director, the groove of which serves to guide a cutting instrument into the bladder, is an exact definition of a staff. It is shaped like a sound, or catheter, so that it may pass through the whole of the urethra. Its handle, instead of being smooth, like that of a sound, should be rough, in order that it may be held with greater steadiness. The groove, which is to be deep and wide, should terminate in a short conical beak. The diameter of the staff should be as great, as can easily be passed into the urethra; for, the larger the size of the staff, the more easily can it be felt in the perineum, the more distended the membranous part of the urethra becomes, and the more regular the incision in it is likely to be made. That the instrument is fairly in the bladder, may be known by its handle sinking towards the ground, without the least impediment.

In the first stage of the operation, the staff is to be held by an assistant, who also raises the scrotum with his left hand, and gives the surgeon a complete view of the perineum. Some operators are anxious, that the convexity of the instrument should project distinctly in the perineum, for which purpose, the assistant is desired to hold the handle perpendicularly to the patient's trunk, and to propel the whole staff gently towards the part, where the first incision is to be made into it. The manner of holding the staff, in the first stage of the operation, differs, however, with different operators. Sir Benjamin Brodie and many other surgeons prefer that position of it, in which it is nearly perpendicular, with the handle a little inclided towards the patient's right groin, so as to cause the convexity of the instrument to project slightly on the left side of the peri-

neum.* Scarpa, Dupuytren, Lyston†, Syme‡, and others, deem it better to raise the concavity of the staff towards the arch of the pubes, and to hold it firmly there, the handle being exactly perpendicular, without any inclination of it to the right or left, or any projection of the instrument in the perineum. After the presence and probable size of the stone had been ascertained with the staff, Dupuytren gave to the latter a vertical direction, so that the straight part of the instrument formed a right angle with the axis of the body, while the curve was kept somewhat elevated towards the symphysis pubis, rather than pressed downwards and backwards upon the rectum. A steady assistant retained it precisely in this position. "Its curved part is drawn up closely under the arch of the pubes in order to prevent its pressing too much downwards upon the rectum." However, some of the advocates for the latter plan make use of a staff, the groove of which, as it passes towards the bladder, runs in the interval between the convexity, and right side of the instrument. "The groove being placed upon the side of the staff enables the surgeon to cut into it more easily, and also to give that direction to his knife, by which he divides the neck of the bladder and the prostate on the left side."§

The patient having been secured in the proper position, and the staff held perpendicularly, with the groove directed a little towards the left side of the perineum, the surgeon traces with his left forefinger the descending ramus of the pubes, and the ascending ramus and the tuberosity of the ischium, and then makes his first incision through the integuments and superficial fascia, beginning it in an adult an inch and a quarter above the anus, close to the left side of the raphe, and carrying it obliquely downwards and outwards, about three inches, to a point, situated one third from the inner side of the tuberosity of the ischium, and two thirds from the anus.|| The knife should be pushed in fully one inch deep; and, as it is carried downwards to the termination of the incision, it is to be gradually withdrawn from its deep position, in order to avoid the rectum.¶ By extending the cut in this manner to a point nearer the ischium than the anus, the edge of the knife, in the future steps of the operation, can be more conveniently and surely directed away from the rectum. In a full-grown person, the beginning of the first incision should never be more than about an inch and a quarter above the anus, because laying open a greater extent of the urethra, towards

---

* On diseases of the Urinary Organs, p. 271. ed. 2.‡ Sur une Manière Nouvelle de pratiquer l'Opération de la Pierre. fol. Paris, 1836.

† Liston's Elements, part iii. p. 197. ‡ Syme's Principles, p. 511.

§ See Morton on the Surgical Anatomy of the Perinæum, p. 72.

|| See a paper on Lithotomy, in Med. Chir. Trans. vol. viii.; and E. Stanley, on the Lateral Operation, p. 5. 4to. Lond. 1829.

¶ Sir Charles Bell's Great Operations of Surgery, p. 117. Th. Morton, op. cit. p. 73.

the bulb, will have no more effect in facilitating the extraction of the stone from the bladder, than if the whole of the urethra were divided. Besides, when the external incision is made too high up, and the internal completed, the former is likely to be placed too high in relation to the opening in the bladder. The consequences are, that the same impediment to the extraction of the calculus is experienced, as if the wound were too small; and the urine, not finding so ready an outlet from the bladder after the operation, is more likely to become effused.

The first incision is made through the integuments, fat, and superficial fascia. The second divides the lower fibres of the accelerator urinæ, the transverse muscle and artery of the perineum, and a part of the levator ani and deep perineal fascia. Then, the surgeon feels for the staff in the upper part of the wound with his left forefinger, and, cutting into its groove, opens the membranous part of the urethra. In accomplishing these objects, the principal things for avoidance are cutting the bulb of the urethra, endangering the great pudic artery, wounding the rectum, and opening the urethra too high up. Next, supposing the operation to be finished with a scalpel that has no beak, the point of it is to be raised, the handle depressed, and its edge directed downwards and outwards towards the lower angle of the wound. The point having now been securely placed in the groove of the staff, with the back of the blade turned upwards and inwards, the rest of the membranous portion of the urethra, and the left side of the prostate gland, are to be cut through by pushing the knife inwards, along the groove of the staff, guided, as it were, and followed by the left forefinger into the bladder.

In dissecting down to the membranous part of the urethra, and in laying it open, as well as in cutting deeply towards the prostate gland, the surgeon should never direct the edge of the knife straight downwards, because he would thus cut the lower part of the rectum; neither should he cut horizontally, for the great pudic artery would be endangered. While the surgeon is completing the deeper incisions, he should endervor the depress the rectum towards the right side with his left forefinger.*

If a beaked knife, or a gorget, is to be employed for the division of the prostate gland, the operator, as soon as the membranous part of the urethra has been laid open, is to place the beak of the knife or gorget in the groove of the staff, and, being sure that this is effected, he is to take hold of the handle of the staff himself; bring it forwards, so as to elevate the further portion of its groove away from the rectum; and then push the beak of the knife or gorget along the groove into the bladder. The gorget divides the

---

* See Morton's Surgical Anatomy of the Perinæum, p. 73.

prostate gland as it enters, and so will a knife of broad construction; but when a narrow beaked scalpel is used, the division is made as the instrument is withdrawn. Whatever instrument is employed, its edge is to be directed downwards and outwards.

When lithotomy is performed with a knife, it seems to me, that there is great advantage in letting an assistant hold the staff throughout the operation, because the operator's left forefinger is then of considerable use to him as he is making the requisite incisions. As a staff nearly straight, like that of Mr. Aston Key, will admit of being readily introduced through the whole of the urethra, and it is much easier to pass a gorget, or knife, along a straight groove than a convex one, it may be asked, why such a staff is not generally preferred? One objection made to it is, that it occupies the surgeon's left hand, while the section is made, instead of leaving it at liberty to press aside the rectum, and ascertain when the incision has been carried far enough. "In children," says Mr. Syme, "where the prostate is easily divided, and where, from the necessarily small size of the instrument that is introduced, the difficulty attending a curved direction of the groove is greatest, the straight staff may be preferable."*

When a knife is used in an adult subject, it should be, with the handle, about seven inches long; for the distance of the bladder from the surface of the perineum is sometimes such, that a shorter instrument would be disadvantageous. When the prostate gland is enlarged, the neck of the bladder is occasionally found to be elevated considerably away from the perineum, as is well shown in one of the plates of Mr. Stanley's Treatise on the Lateral Operation. "In subjects of an advanced age," he remarks, "a deep perineum, as it is termed, is frequently met with. This may be occasioned either by an unusual quantity of fat in the perineum, or by an enlarged prostate, or by the dilatation of that part of the rectum which is contiguous to the prostate and bladder. Under either of these circumstances, the prostate and bladder become situated higher in the pelvis than naturally, and consequently, at a greater distance from the perineum." In such cases, Mr. Stanley prefers the gorget; while, for a young subject, a thin adult, or a case where the bladder is closely contracted on the stone, he expresses a preference to the knife.

When the knife or gorget has entered the bladder,—a circumstance, indicated by the discharge of urine from the wound, — and the requisite section of the left lobe of the prostate has been made, and the knife or gorget has been withdrawn, the surgeon is to pass his left forefinger into the bladder, along the staff, which is then to be removed. With this finger, the position of the stone is ascertained, and the forceps directed accordingly. The finger should

* Syme's Principles, p. 511.

bear against the posterior wall of the incision, in order to prevent the possibility of the forceps being passed between the bladder and rectum, which accident has been known to occur.*   If the surgeon cannot immediately feel the stone with his finger, he should then introduce the forceps, and use this instrument as a probe for detecting the exact place of the calculus.

Some years ago, the forceps used to be made too thick and clumsy, the inside of the blades being frequently furnished with teeth, intended to keep the stone from slipping.   These were exceedingly objectionable; first, because they often broke the calculus before it was out of the bladder ; and secondly, because those situated towards the back part of the blades, when the stone happened to be grasped there, had the effect of increasing the expansion of the instrument so considerably, that it could not be drawn out.†   The teeth have also a bad effect in preventing the stone, when it is grasped with its long axis across to the wound, from turning, as the forceps are drawn out, into a better position.   However, though teeth are not to be commended, the inside of the blades ought to be somewhat rough.

The surgeon should always be provided with several pairs of forceps, of different sizes.   The handles should be two thirds of their length, and the blades one third.   The blades of some ought to be flat, for the extraction of small calculi, or fragments; while the blades of others should be curved, to reach calculi behind the pubes, or prostate gland.‡

In attempting to get hold of the stone with the forceps, the operator should not expand the instrument as soon as it has arrived in the bladder, without knowing where to direct it; but he should first make use of it as a kind of probe for ascertaining the precise situation of the stone.   If this be lodged at the lower part of the bladder, just behind its neck, and be distinctly felt below the blades of the forceps, the forceps may be opened immediately over the stone, and, after the blades have been depressed a little, they are to be shut. Certainly, it is much more scientific to imitate Cheselden, and use the forceps, at first, merely to ascertain the position of the stone; for, when this is known, the operator is far more able to grasp the extraneous body, in a skilful manner, than if he were to open the blades of the instrument immediately, without knowing where they ought next to be placed, or when shut.   No man can doubt, that the injury which the bladder frequently suffers from reiterated and awkward movements of the forceps, is not an uncommon cause of a fatal inflammation of it and the peritoneum.

---

* Dupuytren, Mém. sur l'Opération de la Pierre; publ. par. L. J. Sanson. Fol. Paris, 1836.
† Langenbeck über eine einfache und sichere Methode des Steinschnittes, p. 43.
‡ Sir A. Cooper's Lectures, vol. ii. p. 253.

If the calculus cannot readily be felt, the forceps should not be roughly moved about, so as to bruise the bladder, and put the patient to insufferable agony: on the contrary, they should be taken out, and the forefinger gently introduced, with which the situation of the calculus may generally be felt. If the stone cannot be felt with the finger, on account of the great depth of the perineum, nor laid hold of with the forceps, on account of its lying deeply behind the prostate gland, in the bas-fond of the bladder*, the stone should be raised up, and brought within the grasp of the forceps by means of the left forefinger passed into the rectum. When the place of the calculus has been ascertained, the blades of the forceps are to be separated, and the stone received between them: this must be done with great gentleness. If the extraction be violently resisted, the stone should be quitted, the forceps withdrawn, the position of the stone examined with the finger, and, if necessary, its long axis made to correspond to that of the bladder. Stones are often broken, which might be removed whole, if the surgeon were less violent, and more cautious. The mode of preventing a calculus from being broken is, after it has been taken hold of, to put the thumb, or finger, between the handles, so as to hinder them from being forcibly closed.† The forceps should always be withdrawn from the bladder in the direction of the external wound, with a wriggling motion, and towards the lower angle of the incision, because here the space between the ossa ischii is greatest.

When the stone is so large, that, turned in any position, it cannot be extracted from the wound without violence and laceration, the surgeon must either break it with a strong pair of screw forceps, or enlarge the wound with a probe-pointed curved bistoury, introduced under the guidance of the left forefinger. To the employment of the knife in this circumstance, I must express my decided preference; because breaking the stone creates a risk of fragments being left behind, and, consequently, of a return of the disorder. Some operators, instead of enlarging the wound, so as to divide the bladder, prefer making a cut through the opposite side of the prostate gland.

If the stone is broken, as many of the fragments are to be taken out with forceps as can be readily removed, and the surgeon is then to feel with his finger, whether any others still remain. If they do so, gentle attempts must be made to extract them with the scoop. Lukewarm water is also sometimes injected, with the view of washing them out.

Directly the calculus has been extracted, it should be examined; if it be rough, it is a presumptive sign that it is the only one; if smooth on one side, and rough on the other, or excavated at any

---

* See Morton, Op. cit. p. 74.
† Sir Astley Cooper's Lectures, vol. ii. pp. 254—262.

surface, there may be other stones. But, in every instance, the forefinger should be introduced, to obtain decisive information on this point; for it would be unpardonable to put the patient to bed while another calculus remains.

DANGERS OF GORGETS.

The disastrous accidents, which occasionally result from the employment of gorgets, have induced many judicious surgeons to prefer finishing the operation with a knife, or, at all events, some kind of cutting instrument, not suddenly thrust into the bladder, like a common gorget, with a risk of slipping away from the staff, and doing the most fatal mischief. From mistakes and unskilfulness in this part of the operation, I have known of two cases, in which the urethra was entirely severed from the bladder, and the patients, after suffering excruciating torture upon the operating table, died from the injury done, with the stone unextracted, the bladder not having even been opened. I have known the gorget slip between the bladder and rectum, and patients lose their lives with the stone unremoved. I have seen patients opened after this operation, in whom the gorget had injured the opposite side of the bladder. I recollect other cases, in which the gorget slipped between the bladder and pubes, and, of course, the calculus never had an opening made for its extraction. In one or two cases, I have known the rectum to be cut more than the bladder itself. Now, when it is further considered, that besides such mischief, arising from the slipping or unskilful use of a well-made gorget, a broad, badly constructed, or an ill-directed one, may cut the pudic artery*, it must be confessed, that there is great cause for wishing that lithotomy could always be performed with an instrument attended with fewer dangers.

According to Klein, than whom few have written more sensibly on lithotomy, that method of operating must be accounted the most advantageous, in which the surgeon is best enabled to make with certainty the right kind of incision; that is to say, in which the opening in the bladder may be made larger, or smaller, as may be judged requisite; in which also the fewest instruments are needed; the least irritation produced; the operation most expeditiously finished; and in which the instruments will serve for every age and sex, and for all cases, whether the stone be large or small. A scalpel of proper size is the only instrument possessing such recommendations, and with it the operation can be perfectly executed.

Question,—*Whether the opening should always be made large*

---

* In using Cline's gorget, Klein cut the pudic artery. See Chir. Bemerkungen, p. 15.

enough to let the stone pass out, without contusion and laceration of the prostate gland and adjoining part of the bladder.

Le Cat and Scarpa* are in favor of a very limited incision, and they insist on the danger of carrying it at all beyond the base of the prostate gland; which method, they conceive, would expose the patient to the perils of an effusion of urine in consequence of the vesical reflexion of the deep perineal fascia over the prostate gland being divided. This doctrine influences the practice of many distinguished modern operators, amongst whom may be enumerated Dupuytren, Sir Benjamin Brodie, Mr. Anthony White, Mr. Liston, and Mr. Syme. After having partly divided the prostate gland, Sir Benjamin Brodie introduces a blunt gorget to dilate the wound, and split the undivided portion of the prostate.† His observations convince him, that an incision of the prostate, extending into the loose cellular texture surrounding the neck of the bladder, is replete with danger. Such a division of parts he thinks never necessary where the calculus is of moderate dimensions, but cannot be avoided where it is of large size; and hence, the vast increase of danger in the latter examples.

On the other hand, Klein, one of the most successful lithotomists in Germany, lays down, as the basis of his method, the necessity of always dividing, not only the prostate gland carefully through, but also a portion of the bladder itself. "Upon this basis," says he, "rests the success of my operations; and hence I invariably make it a rule to let the incision be rather too large than too small, and never to dilate it with any blunt instrument, when it happens to be too diminutive, but to enlarge it with a knife, introduced, if necessary, several times."‡ My own observations lead me to believe, that though patients sometimes die of effusion of urine in the cellular tissue of the pelvis, such effusion only happens where the wound is not direct and free, the outer part of it being too high up in relation to the cut in the prostate gland. The inference, drawn by me from the many *post mortem* examinations which I have attended, is, that effusion of urine in the cellular tissue of the pelvis is not the usual cause of the fatal inflammation which ensues in the pelvis and abdomen, but the injuries of the bladder—sometimes a diseased one—from the protracted and rough manœuvres frequently exercised to get a calculus out of an opening of very insufficient size. The more easily the stone has passed out, the greater has appeared to me to be the success of the operation. I am therefore an advocate for letting the incision be proportioned to the size of the stone, and avoiding all laceration and

---

* Memoir on Hawkins's Cutting Gorget.
† On Diseases of the Urinary Organs, p. 278.
‡ Practische Ansichten der Bedeutendsten Chirurgische Operationen, p. 27. Cheseldon and Martineau, who had greater success, perhaps, than any other surgeons, also made a free opening.

contusion of the parts. The wound, of whatever size, should always be direct: this will materially obviate the risk of effusion of urine, and all occasion for the use of a tube to conduct the urine from the bladder through the wound,—a practice now and then adopted, and, I believe, chiefly recommended, in the Edinburgh schools.

As the questions, Whether a free incision through the prostate gland should be made? or, Whether this should be avoided as dangerous, and dilatation and even laceration be preferred as safer? are of the highest practical importance, and by no means definitively settled, each view of the matter being supported by good authorities, the present state of surgery appears to demand, that very correct information should be collected on these contested points. In particular, it seems desirable to ascertain more fully, whether, in fatal cases, where a *free* and *direct* incision has been made, a common cause of death be really effusion of urine in the cellular tissue of the pelvis?

No dressings are necessary directly after the operation; but a folded napkin, or sheet, is to be placed under the nates, and changed whenever it becomes wet.* Sir Astley Cooper does not consider it necessary to keep the patient always on his back; but says, the patient will derive great relief from lying sometimes on his side. The scrotum, he observes, should always be supported with a bandage, so as to hinder it from being irritated by the urine.† The patient may drink freely of barley-water, and afterwards of lemonade. Sir Astley Cooper gives his patients at first large quantities of linseed tea, or barley-water with gum acacia in it; and when the danger of inflammation is over, beef-tea, broth, or gruel. Klein gives an opiate, as soon as the patient is put to bed; and on the second day, the bowels are opened with a clyster, or gentle purgative. Sir Astley Cooper sanctions the exhibition of opium, if the patient be very irritable; but, unless absolutely necessary, dispenses with it, as it checks the action of the bowels. When the wound suppurates, Klein dresses it with dry lint, and never finds any other application requisite, except sometimes a little caustic towards the end of the case.‡ In proof of the success of his method, he tells us, that in 1816, he had cut into the bladder seventy-nine times, and not one patient had died, unless where the prostate gland, bladder, kidneys, or ureters, were diseased. Notwithstanding the free division of the bladder, most of the patients got well in from eight to fourteen days; a few in a month; and one alone was three months in recovering. Though the sphincter of the bladder was divided, no paralysis of it

---

* Sir A. Cooper's Lectures, vol. ii. p. 269.
† Vol. cit. p. 268—270.
‡ Chirurgische Bemerkungen, pp. 37—48.

was the result. Except when the calculi were large, or something unusual happened, the operation was completed in thirty seconds, or a minute.* When the wound begins to granulate, Sir Astley Cooper ties the legs together: if this be done too soon after the operation, he says, it hinders the free escape of blood and urine from the wound.†

OF WOUNDS OF THE RECTUM.

Unless the operator cut very carelessly, and turn the edge of the knife directly downwards, instead of obliquely sideways, the rectum cannot be injured. With a gorget, however, there is really more danger of such an accident, when the instrument slips out of the groove of the staff. Also, when the rectum is distended with feces, it is more exposed to injury; but, why should the surgeon ever operate, without having previously emptied that intestine? I once saw a case, in which the rectum was wounded with a lithotomy knife; but the cut in the bowel healed, and never gave any trouble.

OF WOUNDS OF THE PUDIC ARTERY.

No doubt, some of the profuse bleedings, which have taken place in lithotomy, have not proceeded from the pudic artery itself, but either from the artery of the bulb, when the incision was made too high up, or, in other cases, from the trunk of the perineal artery. I am surprised, however, that M. Roux‡ should assert, that, in directing the incision too far laterally, there is no risk at all of wounding the pudic artery. This is an observation which is entirely erroneous, and migh encourage the admirers of broad, long-edged gorgets to persevere with their instruments, until they had learned from experience, that lithotomy can never be done with safety, unless the incision be made, not only of sufficient size, but in a proper direction. Klein twice had the ill luck to wound the trunk of the pudic artery; the first instance was in a child four years of age; the hemorrhage was suppressed by introducing into the wound a piece of sponge, which was removed on the fifth day; the part was healed in a fortnight, but, for nine weeks, an incontinence of urine contined, which was ascribed to the pressure of the sponge.§ The second case happened in a patient, twenty-six years of age, from cutting too much sideways with Cline's gorget. After

---

* Pactische Ansichten der Bedeutendsten Operationen, pp. 28, 29.
† Lectures, vol. ii. p. 269.
‡ Rélation d'un Voyage fait à Londres en 1814; ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p. 322. 8vo. Lond. 1815.
§ Chirurgische Bemerkungen, p. 11.

the extraction of the calculus, the wound was distended with a linen tent and a piece of sponge; and the patient kept quiet on the operating-table twenty-four hours, during all which time the assistants relieved each other alternately in making pressure on the wound. The patient lost four pounds of blood in the operation; his pulse was exceedingly feeble, and rapid; his countenance cadaverously pale; and his strength so much reduced, that the greatest fears were entertained for his life.

When the trunk of the pudic artery is wounded, the calculus should be taken out, and the wound distended with sponge.*   If it were practicable to tie this artery, it would not be advisable, previously to the extraction of the stone, the passage of which outwards would inevitably force the ligature off the vessel.†   In one case, operated upon by Sir Everard Home, Sir Benjamin Brodie passed a ligature round the pudic artery with a small, flexible, silver needle.   The patient was a very thin subject.‡   Pressure on the artery, where it crosses over the spine of the ischium, was found useful in stopping an alarming hemorrhage from a phagedenic ulcer of the penis, in a case under Mr. Travers§: the same plan might also be worth trying for the stoppage of the bleeding after lithotomy.

OF INFLAMMATION WITHIN THE ABDOMEN AFTER THE OPERATION.

The majority of patients, free from visceral disease previously to the operation, who die in consequence of lithotomy, perish of peritoneal inflammation.   Hence, on the occurrence of any tenderness, pain, and tension over the abdomen, with great restlessness, thirst, heat of the skin, and a small quick pulse, copious venesection should be put in practice.   At the same time, twenty or thirty leeches should be applied to the hypogastric region.   Much benefit will also be derived from the warm bath, fomentations, blisters, the exhibition of oleum ricini, and emollient clysters.

I have seen several old subjects die of the irritation of a diseased, thickened state of the bladder, continuing after the stone had been extracted.   They had not the acute symptoms, the inflammatory fever, the general tenderness and tension of the abdomen, as in peritonitis; but they referred their uneasiness to the lower part of the pelvis; and, instead of dying in the course of two or three days,

---

* A cannula should be passed through the sponge, for the easy evacuation of the urine. See C. J. M. Langenbeck über eine einefache und sichere Methode des Steinschnittes, p. 58. 4to. Würzburg, 1802.

† Klein, Op. cit. pp. 12—21.

‡ Sir B. Brodie on Diseases of the Urinary Organs, p. 299. ed. 2.

§ See Harrison's Surgical Anatomy of the Arteries, vol. ii. p. 101., and Morton's Surgical Anatomy of the Perinæum, p. 52.

as those usually do who perish of peritoneal inflammation, they, for the most part, lingered for two or three weeks. In such cases, opiate clysters, and blistering the hypogastric region, are proper.

In some instances, collections of matter form in the vicinity of the neck of the bladder. Gangrene of the scrotum from the violence used in the extraction of the stone, and an extravasation of urine in the cellular tissue, are most likely to be avoided by making a direct opening into the bladder, and not beginning the incision too high up towards the scrotum. With the same view, many operators avoid carrying the incision in the prostate gland beyond its base.
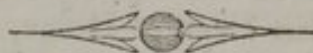
AMPUTATION.

AMPUTATION of limbs is performed either in the continuity of them, or in one of the articulations; each of which modes, however, cannot always be practised indifferently—the choice depending upon the situation, extent, and nature of the disease, or injury, for which the removal of the part becomes indispensable. In all amputations at joints, it is the general practice to make a flap of flesh for covering the end of the bone; but when the operation is performed at another part of the limb, it is frequently at the option of the surgeon, whether the method adopted be *amputation with one or sometimes two flaps*. or *amputation by a circular, or an oval, incision*. In this metropolis, the circular incision is more common than flap-amputation, which, however, has now many advocates, because, it is more quickly performed, and consequently less painful, than the circular incision; the parts are cut smoothly, and left in a state favorable to union; and a better covering is afforded to the bones, than can be obtained from any modification of the other operation.*

That it is the quickest method of amputation, and that it forms an excellent covering for the ends of the bones, I believe is generally admitted; but some of the most experienced surgeons in London, amongst whom is Sir Astley Cooper, are of opinion that a stump, after a flap amputation is generally followed by more copious suppuration, and less frequently unites by adhesion, than another formed by the circular incision. This is a point of importance open to the observation of the profession at large, who have now abundant opportunities of coming to a sound decision. It seems to me, that the quickness and facility of flap amputation, the certain-

---

* See Syme's Principles, p. 198.

ty with which the soft parts are smoothly cut, and the greater fre-
quency with which the protrusion of the end of the bone is avoid-
ed, are its principal advantages. In particular cases, it is decidedly
the only method applicable to circumstances; in others, the surgeon
may make his choice.

Before proceeding to this description of the methods of taking
off limbs, let me just remind the reader of one of the best funda-
mental rules for our guidance in the performance of amputation: " as
little of the flesh should be cut away as possible; but the more bone
is removed, the better."*

CIRCULAR AMPUTATION OF THE THIGH.

The thigh should 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 an-
kle of the sound limb is to be fastened, by means of a garter or
handkerchief, to the nearest leg of the table.

TOURNIQUET.

If this instrument be used, its 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 far up, a tourniquet is inconven-
ient, and, in this case, an assistant is to compress the femoral artery,
as it passes over the os pubis, with his fingers or thumb, or any
commodious instrument, having a round blunt end, adapted for mak-
ing direct pressure on the vessel, without injuring the integuments.

In amputation, the greater number of surgeons in this metropolis
still employ the tourniquet; but others prefer compression of the
artery by a trusty assistant, when such is at hand. In University
College Hospital, I have never seen the tourniquet employed in
amputations. If the patient, however, were exceedingly reduced,
I believe, that the tourniquet ought to be employed. Putting out
of present consideration the assistant's liability to fail in regularly
commanding the flow of blood through the artery, on account of
the violent struggling of the patient, we are to remember that, be-
sides this vessel, there are others concerned in supplying the thigh
with blood, which are branches of the internal iliac, and come out
of the openings of the pelvis; as, for instance, the arteria obtura-
toria, the glutea, and the ischiadica. Hence, pressure upon the fe-
moral artery, below Poupart's ligament, can never stop the bleed-
ing, but incompletely. My colleague, Mr. Liston, objects to the

---

* " On doit couper des chairs le moins qu'il est possible, et des os, le plus qu'on
peut." J. L. Petit, Traité des Maladies Chirurgicales, tom. iii. p. 150.

use of a tourniquet, because compression on all the circumference of a limb causes venous congestion in the whole of the member below such compression, and a rapid oozing from the veins on the face of the stump. "I would rather trust (says he) to no very efficient assistant, than put on a tourniquet." I fully coincide with him on one point, which is, that when a tourniquet is used, it should not be put on, till the moment when the surgeon is ready to begin the incisions.*

FIRST INCISION.

The operator is to stand on the right side of the patient, whether the right or left limb is to be removed. By this means, he acquires the advantage of always having his left hand next the wound, so as to be of very essential assistance. This advantage more than counterbalances the inconvenience of having the right limb in the way of the operator, when the left thigh is to be amputated.

An assistant, firmly grasping the thigh with both hands, is to draw the skin and muscles upwards, while the surgeon makes a circular incision, as quickly as possible, through the integuments down to the muscles. When the integuments are sound in the place of the incision and above it, their retraction by the assistant before they are cut through, and a very slight division of the bands of cellular substance with the edge of the amputating knife towards to point, will generally preserve a sufficient quantity of skin for covering, in conjunction with the muscles cut in a mode about to be described, the extremity of the bone; and the painful method of dissecting up the skin from the fascia, and turning it back, previously to dividing the muscles, may be considered useless and improper in all amputations of the thigh, where the skin retains its natural moveableness and elasticity.

It appears to Mr. Guthrie, that, in primary amputations, or those done at an early period after the receipt of a gunshot injury, while the part of the limb, where the incisions are to be made, is in the natural state, and the skin loose and moveable, " it will be sufficient to touch the thread of membrane, or fascia adhering below, with the point of the same (the amputating) knife, to give ample covering for an excellent stump, without putting the patient to the torture of having his skin pinched and dissected back, for the space of a couple of inches, for four or five minutes." At the same time, he particularly insists on the utility of dividing the fascia and integuments together, by which means, the latter can be retracted much further than would otherwise happen.

In operations, however, performed from the third to the twelfth day after the receipt of the wound, and near the injured parts, Mr.

* See Elements of Surgery, Part iii. pp. 361, 362.

Guthrie admits of the propriety of dissecting the integuments a little way up from the fascia, as in these cases the retraction, effected by the assistant, and the natural elasticity of the skin, will not avail in saving enough of it to cover the surface of the stump well; yet even here he rightly disapproves of turning back the separated integuments, as is often done, like the top of a glove.

"In secondary amputations," says he, " with the exception of those, in which the operation is required in parts actually unsound, the integuments may be sufficiently retracted, without any formal dissection of them from the subjacent fascia."*

I have said, that the surgeon is to begin the operation by making an incision through the skin all round the limb. The generality of surgeons, rightly considering this as one of the most painful parts of the operation, do it with as much quickness as possible, and therefore carry the knife all round the member with one sweep, the hand, which holds the knife, being carried round under the limb until the edge can be placed perpendicularly on the skin covering the extensor muscles. Excepting the appearance of greater skill, and a little greater quickness, however, the foregoing mode of dividing the skin all round the limb with one stroke of the knife, has no particular advantage over the method of completing the cut with two sweeps of the knife.

OF DIVIDING THE MUSCLES.

The ancient surgeons used to cut directly down to the bone at once, and the frequent consequence was a conical or sugar-loaf stump, extremely unfit for bearing any degree of pressure, and, therefore, kept healed with difficulty. The end of the bone, in fact, often protruded beyond the soft parts. At length, however, the improvement was made of cutting the integuments through first, and then the muscles: a method, well known amongst surgeons by the name of the *double incision*.

But, although the double incision enabled the surgeon to save skin, and saw the bone higher up, a conical stump, and projection of the bone, sometimes followed. The great innovations, which ultimately proved nearly effectual in the prevention of such tedious miserable cases, were, besides the saving of skin, the oblique division of the muscles, suggested by Alanson; the cutting of the loose muscles first, and the fixed ones afterwards, proposed by Louis; and the immediate closure of the wound, after the bleeding had been stopped, the great utility of which was first brought to light in the early trials of what are called flap-amputations.

---

* G. J. Guthrie on Gunshot Wounds of the Extremities, requiring the different Operations of Amputation, with their after Treatment, &c. pp. 84, 85. 8vo. Lond. 1815.

M. Louis, for whose memory every admirer of surgical science ought to entertain sincere respect, first discerned the principal cause of the projection of the bone. He observed, that the muscles of the thigh became retracted in an unequal manner when divided; those which are superficial, and extend along the limb more or less obliquely, without being attached to the bone, becoming retracted with greater force than others which are deep, and, in some measure, parallel to the axis of the femur, and fixed to this bone throughout their whole length. Their retraction begins at the moment of the operation, and, for some time afterwards, continues unfinished. Hence, the effect should be promoted, and be as complete as possible, before the bone is sawn. With this view, M. Louis practised another kind of double incision: by the first, 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 connected with the femur. On the first deep, circular cut being completed, M. Louis used to remove the band encircling the limb above the track of the knife, in order to allow the divided muscles to become retracted without any impediment, and he then cut the deep muscles, on a level with the surface of those which had been first divided, and which were now in a retracted state. In this way, he could evidently saw the bone very high up, and the painful dissection of the skin from the muscles was avoided.[*]

Alanson's mode of amputating was as follows:—The integuments having been divided by a circular wound, the knife was applied close to the margin of the retracted skin, upon the inner edge of the vastus internus, and, at one stroke, an incision was made obliquely through the muscles, upward in respect to the limb, and down to the bone: in other words, the cut was made in a direction which laid the bone bare, about two or three fingers' breadths higher than a perpendicular incision would have done. The operator now drew the knife towards himself, so that its point rested upon the bone, still observing to keep the instrument in the same oblique position, in order that the muscles might be divided all round the limb

---

[*] See Mémoire sur la Saillie de l'Os après l'Amputation des Membres; ou l'on examine les causes de cet inconvénient, les moyens d'y rémédier, et ceux de la prévenir. Also, Second Mémoire sur l'Amputation des membres, *Mém de l'Acad. de Chirurgie*, tom. v. p. 244. and 401. edit. in 12mo. And Nouvelles Observations sur la Rétraction des Muscles après l'Amputation de la Cuisse, et sur les Moyens de la prévenir. Op. Cit. tom. xi. p. 63 edit. in 12mo. Baron Dupuytren's mode of amputating was as follows:—With one sweep of the knife he divided the integuments and muscles down to the bone, most frequently perpendicularly, but sometimes obliquely. The retraction of the soft parts by the assistant who grasped the limb, and the contraction of the muscles, instantly gave to the wound the shape of a cone. At the base of this cone, and on a level with the retracted skin and muscles, he applied the knife again, and cut through whatever soft parts presented themselves there. Thus he was enabled to saw the bone more than six inches above the first incision, and to complete the operation with surprising quickness. (See Leçons Orales de Clinique Chir. t. 4. p. 298.) By this method, the patient is saved from all the pain of dissecting the skin from the fascia, or the fascia from the muscles. It is as quick as a flap-amputation.

in that direction, by a proper turn of the knife. During the performance of this movement, the point of the knife was kept in contact with the bone round which it revolved.*

Many writers have objected to the difficulty of making the oblique incision exactly as Alanson has directed, and Mr. Hey even questions the possibility of the practice, without a different result from what was intended. It is evident (says Mr. Hey) that a conical incision through the muscles of the thigh cannot be made with a continued stroke, in the usual mode of amputating. For, supposing the edge of the knife to have once penetrated obliquely through the muscles, so as to be an inch higher, when arrived at the bone, than when it penetrated the surface; if the incision be continued with a flowing stroke, the knife must then cut the surface of the undivided muscles an inch higher than at the commencement of the incision.† How far it is actually practicable to keep the point of the knife in contact with an exact circle on the bone, during the oblique passage of the instrument all round the member, it is not for me to say, because, seeing its difficulty, I have never attempted it; nor can I suppose, that Alanson himself ever really did what he literally recommends. Of one thing also I am sure, that I have seen many surgeons, in their attempt to do this business after Alanson's directions, get so high up as to cut the reflected skin.

The late Mr. Hey is not the only, nor the earliest writer, who has pointed out the inaccuracy of Alanson's directions. Richter has offered several judicious criticisms upon them, which perfectly coincide with Mr. Hey's views. It is remarked, that when the knife, with its edge turned obliquely upwards, has reached the bone, a flap is actually formed on the side where the incision is practised: and the edge of the knife is now three inches higher than the cut in the skin. In this state the surgeon cannot possibly continue the incision. The only thing which he can now do, is to place the knife on the opposite side of the thigh in the same manner, and make a flap there. The operation, says Richter, is then rather a flap-amputation; not done in the best way, than an operation really practised as Alanson thought possible. By following precisely his instructions, Richter thinks it would be quite impracticable to form a hollow stump, though perhaps it might be done by reiterated oblique strokes of the knife all round the limb. But, he exclaims, what a stump there would then be, and what a method of operating! He comments also on the difficulty of making a knife cut properly by mere pressure, as would be the case, were its point kept unremittingly against the bone, in carrying the incision round the member; on the preferable nature of amputation with a flap to this method,

---

* See Alanson's Practical Obs. on Amputation, 2d ed.
† Hey's Practical Observations in Surgery, p. 529. ed. 2.

the wound left by which is longer in healing; and on the pain and delay of separating the skin to be saved,—a proceeding altogether unnecessary in amputating with a flap.*

Many excellent surgeons, whom I have seen operate, do not cut at once obliquely down to the bone, after the integuments have been divided and retracted; but so far adopt the principles of M. Louis, as to divide the loose muscles first, and lastly, those which are intimately attached to the bone, taking care, with a scalpel, to cut completely through the deep muscular attachments, about an inch higher up, than could be executed with the amputating knife itself. This last measure causes very little pain, and has immense effect in averting all possibility of a subsequent protrusion of the bone, or of a bad sugar-loaf stump. Such used to be the practice of Mr. Hey, who calls it the *triple incision*[†]: and Mr. Guthrie,[‡] in his account of amputation of the thigh, is a decided advocate for a similar mode. In this method, however, the advantage of the oblique incision through the different layers of muscles, was invariably retained. I believe that, in the circular amputation of the thigh, a combination of the principles of Alanson with those of M. Louis, is the best. However, I am obliged to confess, that the attempt to divide the loose muscles first, and then the more fixed ones, is apt to make a hasty surgeon cut the whole, or a great part, of the same muscle through more than once; a fault, which deserves to be reprobated in the strongest terms.

USE OF THE RETRACTOR.

Having cut completely down to the bone, a piece of linen, somewhat broader than the stump, 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. Thus the retractor will evidently keep every part of the surface of the wound out of the way of the saw. In circular amputations, I have seen the saw do so much mischief, in consequence of neglecting to use the retractor, that when the amputation is performed with a circular incision, my conscience obliges me to censure the employment of the saw without a defence of the soft parts by this simple contrivance. I think no one will say, that the retractor can do harm; and I know, that many who have been with myself eye-witnesses 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

---

* Anfangsgr. der Wundarzn. b. vii. p. 187.
† Hey's Practical Observations on Surgery, p. 526. edit. 2.
‡ On Gunshot Wounds of the Extremities, &c. p. 86.

parts skilfully divided; and the operators, directly afterwards, lose all the praise, which every one was ready to bestow, by their literally sawing through one half of the ends of the muscles, together with the bone. 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.*

OF SCRAPING THE BONE.

Another proceeding, not to be imitated, is the practice of scraping up the periosteum with the knife, as far as the muscles will allow. This is a sentiment, in which I must still continue to join the experienced and judicious Petit, notwithstanding a modern author† has actually devoted a section of his book to the praise of what is here particularly condemned. The chief argument for the practice, urged by Brünninghausen, is, that, by scraping the periosteum upwards from the bone, a portion of the detached membrane will yet remain connected to the muscular fibres, thus pushed back, and afterwards admit of being brought down with them over the sawn bone. As, however, I have seen the bone extensively scraped, without an exfoliation being a regular effect of the method, I do not consider, as Petit did, that a part of the bone must *inevitably* die, after the periosteum, is thus freely scraped away; but I look upon the improper and useless separation of this membrane as one of the circumstances, which tend to produce the exfoliations that sometimes happen after amputations. At all events, it is a superfluous 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, round the whole of its circumference. Thus a circular division of the periosteum will be made, and here the saw should be placed.

---

* J. L. Petit earnestly recommends the employment of a linen retractor; when a surgeon once told him, that he did not use it, because the teeth of the saw were apt to get entangled in it, he answered: "Il est vrai que cela peut arriver lorsqu'on ne sait pas le placer; les meilleures manières d'opérer ont leur inconvénient, si on néglige les circonstances qui les font réussir." Traité des Maladies Chir. t. iii. p. 152. Dupuytren is another distinguished advocate for the use of the retractor. See Leçons Orales, &c., t. 4. p. 299.

† H. J. Brünninghausen, Erfahrungen und Bemerkungen über die Amputation, p. 67. Bamberg, 1818.

‡ Petit's opinion is thus expressed: Si par trop d'exactitude, on dépouille trop en avant les os de leur périoste, l'exfoliation, qui devient inévitable dans ce cas, se fait long-temps attendre, et retarde beaucoup la guérison; je préfère donc de scier le périoste, avec les os; j'ai toujours éprouvé que cette méthode étoit moins douloureuse et qu'elle éviait souvent l'exfoliation." Vol. cit. p. 158.

OF THE MANNER OF SAWING THE BONE.

As Petit justly remarks, that this part of the operation is by no means easy to a person unaccustomed to handle a saw. The principal difficulty arises from the bone being sawn up in the air (as it were); at least the part is in general but very imperfectly fixed by two persons, who, however strong they may be, cannot resist the saw, and hinder the limb from being shaken, whereby the direction of the instrument becomes altered. Besides the two assistants rarely act so well in concert together as always to hold the limb in the same direction, and with an equal degree of strength. It is true, such irregularity is not of much consequence at first, while the bone is not half sawn through: but, as soon as the instrument has cut to this depth, the irregular movements of the assistants, who hold the limb, make the sawn surfaces come nearer together, and the saw is so pinched, or locked betwixt them, that it cannot stir, in one direction or the other.

A skilful surgeon (observes Petit) may obviate the difficulty by supporting the part with his left hand, as Mr. Liston actually prefers, and resisting or yielding at seasonable opportunities to such circumstances as impede the motion of the instrument. But the difficulty may depend upon the saw itself, when its blade is not duly stretched, the teeth not well turned alternately to the right and left, their points not in good order, their edges not sharp enough, or they are not filed obliquely, so that the bone-dust may be readily thrown off to each side. The latter object requires also, that the blade of the saw at the teeth part should be rather thicker than the rest of it, or else the fissure in the bone would be completely filled with the instrument, and the bony particles, not easily escaping, would obstruct the movements of the saw. In order to saw the bone as close to the flesh as possible, Petit says the nail of the index finger is to be placed on the point where the sawing is to begin. Many surgeons, however, find it more convenient to use the nail of the left thumb for this purpose. The flesh being retracted, the saw is now to be applied exactly at the angle formed by the nail and the bone; and the instrument is to be worked very gently and with scarcely any more pressure than that of its own weight, until a groove is cut, from which it will not start: then the force is to be gradually increased.*

The saw should cut with both edges, whether the instrument be moved backwards or forwards, by which means, as a modern writer† has remarked, the operation will be expedited, and the splintering of the bone, when it is nearly divided, prevented, inasmuch

---

* Petit, Traité des Maladies Chir. t. iii. p. 159, 160.
† G. J. Guthrie on Gunshot Wounds of the Extremities, &c. p. 89.

as the surgeon, when he uses a saw which cuts in both directions, has it in his power to finish the latter part of the division of the bone entirely with backward sweeps of the instrument, which are always the most regular and gentle.

In order to form the groove for the saw, it is best to begin by drawing the instrument across the bone with a backward sweep, the teeth near the handle being first applied to the part close to the operator's left thumb or finger nail, and the whole extent of the edge is then to be steadily and briskly drawn back to the point. The movements of the saw should never be short and rapid, but every stroke of the instrument should at first be long, bold, and regular, without too much pressure. When about two thirds of the bone are cut through, the pressure and force must be lessened, and, towards the end of the business, two or three gentle movements of the saw backward will complete it, without risk of an extensive splintering. In the latter part of the sawing, the assistant who holds the leg, must be careful to avoid depressing the condyles of the femur, as it would inevitably break the bone, previously to its complete division. Indeed, it is difficult to say, whether this mismanagement, or the rough, unskilful mode of using the saw itself, is the most frequent cause of the latter accident. The assistant certainly has rather a delicate task to perform, because if he raises the limb too much, he pinches the saw; if he depresses it, he breaks and splinters the bone.*

If the bone should break, before the sawing is finished, the sharp projecting spiculæ, thus occasioned, must be removed by means of the bone nippers.

OF STOPPING THE HEMORRHAGE.

After the removal of the limb, the femoral artery is to be taken hold of with a pair of forceps, and tied, without including the accompanying branches of the anterior crural nerve in the ligature. None of the surrounding flesh ought to be tied; but the ligature should be placed round the artery, just where it emerges from its lateral connections. Désault recommends tying the femoral vein, as well as the artery; because when the former remains open, and the bandage compresses the upper part of the limb too forcibly, the venous blood returns downward, and hemorrhage takes place.† Mr.

---

* It is on this account that Mr. Liston insists upon the rule, that the management of the lower part of the limb should always be by the person using the saw. See Elem. of Surgery, Part iii. p. 364.

† Œuvres Chir. de Desault par Bichat, tom. ii. p. 550. Venous hemorrhage almost always ceases on the removal of the tourniquet, or any other tight bandage. At the present day, indeed, the practice of tightly bandaging stumps is completely abandoned in London.

Hey also met with a few instances of bleeding from the femoral vein, and therefore he generally inclosed it in the ligature along with the artery.* The risk of bringing on phlebitis, however, should teach us to abstain from this practice, which is not necessary, because compressing the mouth of the vein a minute or two with the finger, will put an end to the bleeding from it, provided the tourniquet is removed, and no bandage applied. The smaller arteries are usually taken up with a single or double tenaculum. After tying as many vessels as require it, one half of each ligature is to be cut off near the surface of the stump. The right qualities of ligatures, used for securing blood vessels, having been considered in the chapters on hemorrhage and aneurism, it is unnecessary now to return to that interesting topic; nor shall I speak here again of the proposal of moving both ends of the ligature, close to the knot.

When the large bleeding vessels have been tied, the tourniquet should be slackened, and the wound well cleaned, in order to detect any vessel, which may lie concealed with its orifice blocked up by coagulated blood; and, before the dressings are applied, the whole surface of the wound should be examined with the greatest accuracy. By this means, a pulsation may often be discerned, where no hemorrhage has previously appeared, and a small clot of blood may be removed from the mouth of a considerable artery. As the lodgment of much coagulated blood would be unfavorable to the speedy union of the wound, the surgeon has an additional motive for being careful to make its whole surface clean with a sponge and water, before it is finally closed. The number of arteries, requiring to be tied, will depend very much upon the incision having been made in sound and uninflamed parts, or upon parts in a state of inflammation, swelling, and disease. This accounts for the truth of an observation, made by military surgeons, that, in amputations performed immediately, or soon after the receipt of an injury, there are fewer vessels to be taken up, than in what are termed secondary, or long delayed operations.†

I have occasionally seen examples, in which it was not necessary to take up a single artery. A young child was run over by a hackney coach, the wheel of which crushed the lower part of the leg, and rendered immediate amputation necessary. The operation was done by the late Mr. Ramsden, without delay; no vessel was tied; and the stump healed without any subsequent bleeding. Some instances have also fallen under my notice, where arteries like the ulnar and anterior tibial, even in adults. require no ligature. The absence of hemorrhage is sometimes explicable by the clot of blood, formed in the large vessels in cases of gangrene. Thus, a modern surgeon tells us, that he amputated the arms of two Cossacks, four

---

* Hey's Practical Obs. on Surgery, p. 530. ed. 2.
† See Guthrie on Gunshot Wounds, &c. p. 90.

months after the limbs had been shot through above the elbow, and while they were affected with hospital gangrene: not a vessel was tied; no secondary hemorrhage arose; and the stumps healed in the most favorable manner.*

OF DRESSING THE STUMP.

The skin and muscles are now to be placed over the bone, in such a direction that the wound may appear only as a line, across the face of the stump, with the angles at each side, where most of the ligatures are to be brought out, as their vicinity to their angle directs. The skin is commonly supported in this position by long strips of adhesive plaster, applied from below upwards, across the face of the stump. Over these, and the ends of the ligatures, it is best to place some pieces of lint, spread with the unguent. cetacei, in order to keep them from sticking, which becomes a trouble-some circumstance, when the dressings are to be removed. I am decidedly averse to the plan of loading the stump with a 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 not too tightly round the limb, from above downward. The first turn of the roller, indeed, should go round the patient's body; and, being continued down, will fix the two cross bandages over the end of the stump. Here, as after all other operations, the dressings should generally be superficial, and make no compression: if the vessels have been properly secured, there is no risk of hemorrhage; and if they have not, it is not a lit-tle degree of constriction that will hinder bleeding. Besides, much pressure has the serious inconvenience of causing a tendency to bleeding depending on obstruction of the venous circulation ; ir-ritating the parts; exciting inflammation and suppuration, causing absorption of the cellular tissue, and a sugar-loaf stump.†

When the weather is not too cold, it is an excellent rule to dress stumps lightly, and to cover them with linen, or lint, wet with cold water. Mr. Liston commonly follows this plan, using two or three sutures, and no adhesive plaster, till the oozing of blood has entire-ly ceased, at the end of about six or eight hours. Then he has re-course to slips of oiled silk, rendered adhesive with a solution of isinglass in brandy. Interstices are left for the sutures and liga-tures. These isinglass plasters do not irritate, and are not loosen-ed by the discharge. After twelve or twenty-four hours, the su-tures are cut and removed. If the case prove favorable, Mr. Lis-

---

* Klein, Practische Ansichten der Bedeutendsten Chirurgischen Operationen, ltes Heft. p. 62. 4to. Stuttgart, 1816.
† Œuvres Chir. de Desault, t. ii. p. 552.

ton finds no change of dressing requisite, till the stump is healed. It was the custom of Dupuytren to let more than an hour elapse before the stump was dressed, in order that he might not be obliged to take off the dressings again by the quick return of bleeding.* The part is kept cool, and the discharge, if it be sufficient to fall on the oiled cloth covering the pillow, on which the stump is laid, is wiped away from time to time.

If the common mode of closing stumps with adhesive plaster be adopted, the dressings should never be removed before the third day ; but, in general, it is quite soon enough to change them on the fourth or fifth : when the weather is hot, and there is much discharge, they should be taken off earlier than under other circumstances. The favorable healing of a stump will depend very much upon the skill and tenderness with which the dressings are changed, more especially the first dressings. In order to facilitate the removal of the plasters, they should be first thoroughly wet with warm water, which is not to be rubbed upon them with a sponge, but allowed to drop, or flow over them. Each strip of plaster should be taken off, by raising its ends, and drawing them gently up together towards the extremity of the stump, by which means the surgeon will avoid pulling the recently united parts away from each other. During the change of the dressings, an assistant is always to support the flesh and keep it from being retracted ; and for the more complete prevention of the same disadvantage, it is a good rule never to let every strip of plaster be off the limb at one time ; but, as soon as some are removed, to put on others, before the rest are loosened and taken away. It is hardly necessary to add, that, when matter is collected within the stump, it should be gently compressed out with a sponge, in doing which the pressure should be so regulated, as not to force back the flesh.

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

FLAP-AMPUTATION OF THE THIGH.

Although this operation is not universally regarded as the best method for ordinary cases, its advantages, under particular circumstances, are generally acknowledged, and it is unquestionably a rapid and showy method. In Germany, flap-amputations seem to have numerous advocates; and, I believe, that whoever will take

---

* Leçons Orales, &c. t. iv p. 332. I believe, that we are now falling into the serious error of leaving stumps too long unclosed, so that the exposure of the wound leaves little or no chance of union of any part of it by the first intention.

the trouble of inquiring into the actual state of surgery in that country, will find this method of operating quite as frequently practised as the circular incision.* Desault employed both modes on the thigh, or arm, indifferently; though he did not adopt flap amputation in the leg, or fore-arm.† In England, where the latter method first originated with Lowdham, and where, at various periods, it has been strongly commended and improved by several men of great eminence, it has not retained so many advocates as in Germany and Scotland, where the successful manner in which it was practised by Mr. Liston, and the able remarks of Mr. Syme‡ in its favor, made it the common method.

All British surgeons agree, however, that flap-amputations are generally the best, when a limb is to be taken off at a joint, and, also, in every instance in which the skin and soft parts are quite sound on one side of a member, while, on the other, they are diseased, or destroyed for a considerable extent upwards. Here, amputating with a flap will be the means of preserving more of the limb than could be saved by the circular incision, and becomes praiseworthy on the very same principle, which has sometimes been thought to render the latter method most eligible under ordinary circumstances.

As Mr. Hey has remarked, sometimes the integuments of the thigh are in a morbid state on one side of the limb, while they are sound on the other. In this case, a longer portion of integuments and muscular flesh must be left on the sound side; which will not prevent the formation of a good stump. The morbid state of the anterior or posterior side of the thigh sometimes extends so far above the knee, that it is advisable to amputate with a flap§.

Were the thigh-bone injured high up, and had gangrene extended about the trochanter major and posterior upper part of the thigh, if the head of the femur were sound, and the patient able to bear the operation, I would make a flap at the inner and upper part of the member.‖ Indeed, a flap-amputation of the thigh must always be attended with some difference, according as the soft parts on all sides of the limb happen to be sound, or not. When, in consequence of the flesh being severely injured, or diseased on one side, the flap must be entirely formed on the other, it will be necessary to save more skin and muscle in the latter situation, than if the surgeon had it in his power to form two flaps for covering the end of

---

* Consult C. C. Siebold, Diss. de Amputatione femoris cum relictis duobus carnis segmentis, Wirceb. 1782 ; Gräfe, Normen für die Ablösung grösserer Gliedmassen. Berlin, 1812; Richter, Anfangsgr. der Wundarzneykunst, b. vii. ; Kap. 7. 8vo. Göttingen, 1804; Klein, Practische Ansichten der bedeutendsten Chirurgischen Operationen, 1tes Heft. 4to. Stuttgart, 1816; H. J. Brunninghausen, Erfahrungen und Bemerkungen über die Amputation, 12mo. Bamberg, 1818.
† Œuvres Chir. de Desault, t. ii. p. 547.
‡ See Edinb. Med. & Surg. Journ. 1823.
§ Hey's Practical Obs. in Surgery, p. 531. ed. 2.
‖ See Klein's Ansichten bedeutendsten Operationen, pp. 39—42, &c. 1tes Heft.

the bone. If possible, however, there should be two flaps, and
placed laterally, or anteriorly and posteriorly, according to circum-
stances. In an operation high up the limb, if the flaps be lateral,
Mr. Liston finds that there will be risk of a protrusion of the bone,
because no muscles are left to oppose the muscles inserted into the
trochanter minor, which will then raise the bone involuntarily to-
wards the abdomen. Hence, in this part of the thigh, he prefers
anterior and posterior flaps; for, then the more the stump is raised,
the better is the end of the bone covered; the anterior flap folds
over it." He recommends the posterior flap to be made rather
longer than the anterior. In the lower part of the thigh, lateral
flaps are the best.* If the limb is to be taken off at, or below its
middle, the pad of the tourniquet, if this be used at all, should be
applied to the femoral artery, where it lies between the sartorius
and adductor longus; but, if the operation is to be performed higher
than this, the tourniquet would interfere with the knife, and prevent
the due retraction of the muscles, and, consequently, it is better to
compress the femoral artery as it is passing over the os pubis. In
making the first flap, which I think should be an external one, in
order not to cut the femoral artery in the commencement of the
operation, the point of the knife, the edge of which is directed
down towards the knee, should pass perpendicularly till it touches
the bone, round the outer side of which it is to be closely guided,
and then pushed through the integuments in the central line of the
posterior part of the limb. With a gentle sawing motion, the ex-
ternal flap is then to be formed, consisting of the integuments, fas-
cia, and part of the cruralis, and rectus, and of the vastus externus
and biceps muscles. The length of the flap must depend on the
diameter of the thigh; but, in general, from three to four inches will
be sufficient; for, if the flap be too long, it rarely unites favorably.
The point of the knife is then to be introduced perpendicularly
again at the anterior and superior angle of the external flap, till it
touches the bone, closely round which it is to be conveyed, till it is
in a position to pass through the limb precisely at the upper and
posterior angle of the external flap. The transfixion having been
made, the internal flap is then formed by cutting downwards and
inwards to the point chosen as the limit of its length. The bone
having been sawn through, and the arteries secured, the flaps are
brought together with two or three sutures, so as to meet in a per-
pendicular line, and lint dipped in cold water laid over the stump,
until all oozing of blood has ceased, when common adhesive, or
isinglass plaster, may be applied, and the sutures removed. The
inner flap will comprehend the integuments, the fascia, part of the
cruralis, adductor, sartorius, gracilis, semimembranosus, and semi-
tendinosus, with the femoral artery, vein, &c.

---

* See Liston's Elements, Part iii. p. 394.

AMPUTATION AT THE HIP-JOINT.

In this operation, the following circumstances merit recollection:—

1. The acetabulum not being deep enough to contain the whole of the head of the femur, and the latter being partly embraced by the orbicular ligament, this ligament, if not divided close to the brim of the acetabulum, will form some impediment to the disarticulation. 2. When the thigh is in the position of abduction, the ligamentum teres is rendered tense by the head of the femur, and readily presents itself to the edge of the knife. 3. If it be intended to form two flaps of equal size, they should be separated by a line extending from the great trochanter to the opposite point of the diameter of the limb. 4. As the femoral artery corresponds above to the junction of the middle third of the head of the femur with its internal third, and only gets parallel to the bone three or four inches lower down, there must necessarily be between the artery and the neck of the femur, for a considerable part of this extent, a distance of fifteen lines, which, in several modes of operating, would permit the knife to pass over the neck of the bone without wounding the artery, and afford an opportunity for the vessel to be compressed before the anterior flap is completed. As the arteria profunda also takes the same direction as the femoral till it is at least an inch and a half below the trochanter minor, the knife need not interfere with it.*

Lisfranc adverts to four methods of finding the hip-joint with precision in the living body.

1st. From the anterior superior spine of the ilium make a perpendicular mark, fifteen lines long, and the external and front part of the joint will lie exactly six lines to the inner side of the lower termination of such mark.

2d. From the anterior inferior spine of the ilium, draw a perpendicular line, about six lines in length, and its termination will correspond to the upper part of the joint.

3d. If from the end of a transverse line, drawn from the spine of the os pubis outwards, rather more than two inches and a quarter long, another line, a quarter of an inch in length, descend at a right angle, it will also pass over the joint.

4th. If, from the outer, front, and upper part of the trochanter, a line half an inch long, be drawn perpendicularly upwards, and then another line be drawn from the end of the first at a right angle inwards to the extent of an inch, the second one will extend to the head of the femur some little allowance being made for the difference in the length and direction of the neck of the femur in different subjects.

---

* Malgaigne, Manuel de Méd. Opératoire, p. 356.

When the patient is in the recumbent posture, the tuberosity of the ischium projects about fifteen lines in front of the acetabulum.

METHOD OF LISFRANC WITH TWO LATERAL FLAPS.

First Stage.—The femoral artery is to be compressed as it passes over the os pubis. When the left limb is to be removed, the surgeon is to stand on the outer side of it, while the patient is in the recumbent posture, with the tuberosities of the ischium projecting a little way beyond the end of the operating table. If possible, the limb itself is to be in the middle position between adduction and abduction; and the anatomical points, above specified, in relation to the joint, are to be well recollected, and especially the directions for ascertaining the precise situation of its anterior and external part. At this place a long, narrow, but strong, sharp-pointed knife is introduced, with its edge directed towards the apex of the great trochanter. The point having passed down close to the head of the femur, is to be carried round its outer side; but, in proportion as the point enters further, the handle must be inclined outwards and upwards, so that the point may pass out a few lines below the tuberosity of the ischium. In order to fulfil this object, an assistant, or the surgeon himself, should grasp and draw outwards the integuments and muscles at the back of the limb. The transfixion having been completed, the knife, with the edge still turned towards the apex of the great trochanter, is to be carried downwards along the bone, with a sawing motion, rather than by pressing much upon it, and thus the external flap is formed. This is to be immediately raised, and such arteries as pour out much blood compressed with the fingers of the assistants, and tied before the rest of the operation is proceeded with.

Second Stage.—The surgeon, with his left hand, then pushes the soft parts inwards, and introduces the point of the knife below the head of the femur, on the inner side of the neck, with the edge turned directly downwards. Then the knife is to be carried under the neck of the femur, and pushed through the limb, without touching the bones of the pelvis, at the posterior and superior angle of the wound. Being now held perpendicularly, it is conveyed two inches downwards close to the femur, avoiding, however, the trochanter minor; and, as soon as the incision affords room enough, an assistant compresses the femoral artery contained in the flap, and the second stage of the operation is concluded by giving to this internal flap a length corresponding to the external.

Third Stage.—The surgeon now takes hold of the femur with his left hand, and with a scalpel freely divides the orbicular ligament at the inner side of the joint, which being done, the ligamentum teres can easily be reached with the end of the knife, and cut through. Lastly, the knife, held perpendicularly, is to be applied

to the inner side of the joint, and carried from within outwards, so as to cut through the rest of the orbicular ligament, and any fasciculi of muscular fibres not previously divided.

When the right limb is to be removed, the surgeon must stand by the side of the patient's trunk, in order to be able to operate with the right hand.

The advantages of Lisfranc's method are, the quickness with which it is executed, as I have often demonstrated at University College on the dead subject; and its occasioning as little loss of blood as possible, the arteries of the external flap being tied before the internal one is formed, and the femoral artery taken hold of by an assistant before the latter flap is completed. The flaps meet well, and the extensive wound admits of being completely closed, which may be accomplished with straps of adhesive plaster, aided, if necessary, with three or four sutures.

When, owing to the state of the injury, or disease, a sufficient flap cannot be saved on one side of the limb, the flap on the other side is to be made proportionably longer.

BECLARD'S METHOD.

The thigh being held in the state of half abduction, the scrotum carefully raised, and the artery compressed, as it passes over the os pubis, the surgeon, standing on the outside of the limb, feels for the great trochanter, and introduces the point of the knife one inch above it. The edge is to pass as close as possible to the bone, at the inner side of the limb, its point being pushed out in a situation precisely opposite the place of its entrance. The knife is next carried down, close to the anterior surface of the bone, to rather more than three inches below the joint where the anterior flap is to end. Then the capsule, and any soft parts covering it, are to be divided transversely, and the ligamentum teres cut through. The knife is next to pass, from before backward round the head of the femur to the back of this bone, down which it is to be carried to the extent of about three inches below the joint. Thus the posterior flap is completed.* According to Velpeau, Béclard made the anterior flap, after the completion of the posterior one.

Mr. Liston also prefers anterior and posterior flaps. " Transfixion, with a knife proportioned in size to the dimensions of the limb, is made horizontally, the instrument being passed in a somewhat semicircular direction, so as to include as much of the soft parts as possible; and an anterior flap is made by cutting downwards. During the passage of the knife across the joint, the assistant rotates the limb a little, so as to facilitate the bringing of the instrument out, with its point well inwards. In the left limb, the ro-

---

* J. F. Malgaigne, Manuel de Méd. Opératoire, p. 358.

41*

tation will be inwards; in the right, outwards. After the formation of the flap, the assistant abducts forcibly, and presses downwards; the joint is opened, the round ligament cut, the capsule divided, and the blade of the knife placed behind the head of the bone and the large trochanter; and the posterior flap is then made rapidly. After transfixion for the superior flap, and when the sawing motion has advanced but a little way, the compressing assistant shifts his hands into the incision, immediately behind the back of the knife, and so obtains a firm grasp of the femoral artery previously to its division."* As this cannot now bleed, Mr. Liston secures the other arteries first.

AMPUTATION OF THE LEG.

In the thigh, amputation is performed as low as the case will allow. In the leg, the common practice is to make the incision through the integuments sufficiently low to enable the operator to saw the bones, about four inches below the lower part of the patella. This is necessary in order to have a sufficient surface in front of the limb for the application of a wooden leg, and not to deprive the stump of that power of motion, which arises from the flexor tendons of the leg continuing undivided.

The tourniquet, or pressure with the thumb, should be applied to the femoral artery, two thirds of the way down the thigh, just before the vessel perforates the tendon of the adductor muscle. The operator is to stand on the inside of the leg, in order to be able to saw both bones at once. The leg being properly held, the integuments should next be drawn upward by an assistant, while the surgeon, with one quick stroke of the knife, divides the skin completely round the limb.

Having made a circular division of 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, and other muscles between the tibia and fibula, including those covering the latter bone; for, throughout this extent, there are no bulky muscles which can be made very serviceable in covering the end of the stump. But, on the posterior part of the leg, the skin should never be detached from the gastrocnemius muscle, which, when obliquely divided, will, with the soleus, here form a sufficient mass for covering the stump. Hence, as soon as the skin has been separated on the anterior and external side of the leg, the surgeon is to place the edge of the knife in the incision of the integuments, and cut in the Alansonian way through the muscles of the calf, from the inside of the tibia, quite to the

---

* See Liston's Elements, Part iii. p. 396. For a description of other methods, I refer to my Dictionary.

fibula. Then the flap, formed by the calf of the leg, is to be held back by the assistant, while the surgeon completes the division of the rest of the muscles, together with the interosseous ligament, by means of the catling, or any narrow double-edged knife.

In amputating below the knee, particular care must be taken to cut every fasciculus of muscular fibres, before the saw is used. Every part being divided, except the bones, the soft parts are to be protected from the saw by a linen retractor, made with three tails, one of which is to be drawn through the interosseous space.

The principal arteries, requiring ligatures, will be the anterior and posterior tibial, and the peroneal. The sharp anterior edge of the tibia, if likely to injure the integuments, may be removed by means of pliers, or a fine sharp saw.

In dressing the wound, the soft parts preserved for covering the bones should be brought together, so as to make the line of their union not transverse, but obliquely perpendicular, the lower end of it being more external than the upper. Thus the tibia and fibula may be effectually covered, without the strips of adhesive plaster forcibly pressing the skin against the sharp edge of the tibia. The strap of plaster, on which most dependence is placed, should go over the centre of the stump, at the point corresponding to the interosseous space.

FLAP-AMPUTATION OF THE LEG BELOW THE TUBEROSITY OF THE TIBIA.

If the right leg is to be removed, the operator places himself on its inner side, and grasps the lower part of the limb with his left hand, while an assistant supports the foot. The knife enters over the outer side of the fibula, and is carried upwards along that bone for an inch and a half or two inches. The incision is then extended across the front of the leg in a semicircular direction; and as soon as the knife reaches the inner part of the tibia, transfixion is performed, the point being pushed along the posterior surface of the two bones, and out at the upper angle of the incision over the fibula. The knife is then carried downwards, and a posterior flap formed of sufficient size to cover the stump.

All this is effected by uninterrupted sweeps of the knife, that is, without ever removing its point from the track of the incision. With the same knife, the integuments on the forepart of the leg are then dissected up a little way, so as to form a small semilunar flap. The muscles in the interosseous space are next divided, and the knife is carried round the bones for the division of any of the the parts yet uncut. Mr. Liston prefers sawing the bone in the perpendicular direction. Before laying down the flap, he removes the sharp anterior ridge of the tibia with the cutting pliers. In operating on the left leg, transfixion is commenced by passing the

knife close behind the tibia, and its point is afterwards pushed through the preliminary fibular incision.* The most simple plan is first to form the posterior flap by transfixion, and then to make the anterior flap, and divide the muscles in the interosseous space. The anterior flap should be somewhat longer than usually made, so as to cover the tibia better, and render it unnecessary to have a posterior flap of great length, which always proves a source of profuse suppuration.

AMPUTATION OF THE ARM.

The structure of the arm bears a great analogy to that of the thigh. There is only one bone round which the muscles are arranged, the deep ones being adherent to it, while the outer ones extend from their origins to their insertions, without being attached to it. The first are the brachialis internus, and the two short heads of the triceps; the others are, the long portion of the latter muscle, and the biceps. Hence amputation of the arm may be performed in a very similar manner to the same operation on the thigh, unless it be necessary to remove the limb above the insertion of the deltoid muscle.

The patient may either sit on a chair, or lie near the edge of a bed, and an assistant is to hold the arm in a horizontal position, if the state of the limb will allow it. The pad of the tourniquet is to be applied to the brachial artery, as high as convenient. The assistant is then to draw up the integuments, while the surgeon makes the first circular incision. In this operation, the skin need only be detached from the muscles to a very moderate extent, for there is no risk of not having sufficient flesh and integuments to cover the bone. Here, indeed, some surgeons imitate Dupuytren, and cut at once through the skin and loose portions of muscle. If the ordinary method be followed, the biceps may be divided first, and, after the retraction of this loose muscle, the brachialis internus, which is fixed to the bone, may be cut through and separated a little upwards from the bone.

The triceps may next be cut through at once, by one sweep of the knife, with its edge turned obliquely upward. The other proceedings do not require description, after the account already given of what is necessary in amputating the thigh.

When it becomes indispensable to amputate the arm high up, the subclavian artery is to be firmly compressed, as it passes over the first rib, by an assistant, who can effectually accomplish this important object with his thumb, or by pressing the vessel from above the clavicle with the handle of the key, covered with soft materials. When the bone can be sawn through below the insertion of the pec-

---

* See Liston's Elements of Surgery, part iii. p. 391.

toralis major, there is no peculiarity in the method of operating. But, if it be necessary to take off the limb still higher up, the circular incision is not advisable. Here some surgeons make a flap of the deltoid muscle, and commence with making an incision corresponding to its margin in shape and situation. Then the muscle is to be detached from the bone beneath, so as to form the flap, which is to be turned up. The operation is now finished by cutting through the other soft parts, from one side of the base of the flap to the other.

Instead of making a short stump, when the arm must be taken off high up, Larrey prefers amputating at the shoulder-joint. He says, that, if the humerus is sawn through higher than the insertion of the deltoid muscle, the stump becomes retracted towards the armpit by the pectoralis major and latissimus dorsi; the ligatures on the vessels irritate the axillary plexus of nerves ; great pain and nervous twiches are excited; tetanus is frequently brought on; the stump is affected with considerable swelling; and at length, anchylosis of the shoulder follows.*

According to Mr. Guthrie, when amputation is attempted at the insertion of the pectoralis major, the bone will mostly protrude after a few dressings; and a disagreeable painful stump be the consequence. The artery is also liable to retract into the axilla, where it cannot readily be taken up. Here, instead of amputation at the shoulder-joint, he recommends the following operation:—" Two incisions of a similar shape are to be commenced, one or two fingers' breadth below the acromion, as the case may require; the point of the inner one, instead of ceasing, as in the operation of the shoulder, a little below the pectoral muscle, is to be carried directly across the under part, to meet the point of the outer incision; so that the under part of the arm is cut by a circular incision; the upper, in the same manner as in the operation at the shoulder. These incisions are only through the skin and cellular membrane, which have liberty to retract, but are not to be turned up. The deltoid and pectoralis major are then divided close to the inner incision, and the opposite portion of the deltoid, with the long head of the biceps on the outside, to the extent of the outer incision. A half-circular cut on the under part, in the line of the skin down to the bone, clears it underneath, and shows the artery retracting with its open mouth, which is at this moment advantageously pulled out be a tenaculum, and secured." The flaps are then held asunder, and the bones sawn, &c.†

AMPUTATION OF THE ARM WITH LATERAL FLAPS.

One of the quickest methods of removing the arm is Dupuy-

---

* Mémoires de Chirurgie Militaire, t. iii. p. 53., &c.
† Guthrie on Gunshot Wounds, p. 240.

tren's operation, in which he cut the integuments and muscles to-
gether, separated the muscular fibres upwards from the bone, and
then applied the saw. Another expeditious method, and one which
also forms an excellent stump, is amputation with the lateral flaps,
which may be adopted at any point below the insertion of the del-
toid muscle. The limb is held up from the side at a convenient
height, and the point of the knife, with the edge directed towards
the elbow, is introduced directly down to the bone, either at the
front or posterior part of the limb, and, as nearly as possible in the
middle of it. As soon as the point of the knife touches the bone,
it is to be conveyed very closely round it, till the position of the
blade is such, that the point can be pushed through some part of the
central line of the limb, directly opposite to the place where the
knife first entered. The transfixion having been completed, a flap
is formed by cutting rapidly downwards, with a sawing motion of
the knife, inclining its edge downwards or upwards, according as it
may be the internal or external flap which is being formed. As
soon as one flap has been made, an assistant is to hold it out of the
way while the surgeon makes the other. " The knife is again en-
tered, about half an inch below the commencement of the first in-
cision, and by inclining the handle, the point is brought round the
bone, and made to appear on the opposite side also of the first in-
cision."* When it is the external flap which is being formed, this
part of the operation is facilitated by pulling the soft parts outwards
with the left hand. Lastly, the knife is carried rapidly round the
bone, so as to divide any of the adherent muscular fibres yet un-
cut, and then the saw is to be used.

I have sometimes tried this method in University College Hos-
pital, and find it has the advantages of expedition and of making
a good stump. The hemorrhage was effectually commanded by
the pressure of the fingers on the brachial artery just below the ax-
illa. The projection of nerves is most likely to be avoided by
giving the edge of the knife rather a sudden turn outwards, after
the proper length of flap has been secured.

AMPUTATION OF THE FOREARM

Should be performed as low as the case will allow. The tourni-
quet is to be applied with its pad on the brachial artery, at the in-
ner edge of the biceps muscle, or the flow of blood through that
vessel may be commanded by an assistant making pressure on it.
While one assistant holds the hand, another grasps the forearm,
above the place where the first circular wound is to be made, and
draws up the integuments. After the amputating knife has been
carried round the limb, the skin is to be detached from the fascia,

---

* See Liston's Elements, Part iii. p. 383.

a little way upward. The muscles are then to be divided oblique-ly upwards with the same knife, which, if not too broad, is also to be employed for completing the division of the parts, between the radius and ulna. If the blade be wider than is convenient for this purpose, the catling, or any narrow double-edged knife, must be used. The retractor is to be applied, and the bones sawn, with the hand in a state of pronation.

In general, only four vessels require ligatures, viz. the radial, ul-nar, and two interosseous arteries.

Larrey deems it advantageous to take off the forearm in its fleshy part, notwithstanding the nature of the disease, or injury would admit of the operation being done towards the wrist. However, as I have amputated several forearms near the wrist, and the stumps healed in the best way, I see every reason for still adhering to the old good maxim of saving as much of the limb as possible. The cause of the bad success, which many of the French surgeons have had after amputating in the tendinous part of the forearm, has been correctly referred by Mr. Guthrie to their prejudices against the attempt to heal the stump by the first inten-tion.[*]

FLAP-AMPUTATION OF THE FOREARM, AS PRACTISED BY KLEIN[†], LISTON, &c.

The surgeon, with his left hand, grasps the wrist, and places the forearm in the middle state between pronation and supination. Supposing the right forearm is to be removed, the knife, held perpendicularly, enters over the centre of the radius, and its point, after reaching the bone, is inclined inwards, and, being conveyed across close to the palmar surface of it and the ulna, completes the transfixion at a point opposite that of its entrance. By cutting ra-pidly downwards and inwards, the first flap is then formed. The knife is again introduced over the radius, just below the upper part of the first wound, and conveyed across the opposite side of the bones until its point emerges at the other extremity of the first inci-sion. The second flap is then made. The two flaps being retract-ed, the knife is carried round the bones, and passed freely between them, after which they are to be sawn perpendicularly with the forearm in the same position. Amputation of the forearm, by means of the circular incision, may be performed, with tolerable ex-pedition, and, in my own practice, the stump has usually healed up with facility, so that I am rather in favor of it; though which op-eration is here preferred, may be a point of no very great impor-tance.

---

* On Gunshot Wounds of the Extremities, p. 370.
† Practische Ansichten der bedeutendsten Chir. Operationen, p. 45. 1tes Heft, 4to. Stuttgart, 1816.

FLAP-AMPUTATION AT THE WRIST.

If the hand be extended back, the angle which it forms with the forearm will denote the radio-carpal articulation, which is one line below the transverse projection of the radius, and about five above the cutaneous fold between the hand and forearm. The middle of the joint may also be found two lines and a half above a line, drawn across from the point of the styloid process of the radius to that of the ulna. The knife is to pass across from one styloid process to the other, and the anterior flap be formed. The hand being then put into the prone position, the knife is introduced at one of the upper angles of the first incision, transfixion performed, and a posterior semilunar flap made. The operator is then to make an incision below the styloid process of the radius, and with a semicircular sweep of the knife corresponding to the direction of the articulation, all the ligaments are to be cut, and the operation finished. According to Malgaigne, this method, which is followed by Lisfranc, is a quick and showy one, but less advantageous in its results, than amputating at the wrist with a circular incision.

AMPUTATION AT THE SHOULDER-JOINT.

The loss of blood is to be prevented, by compressing the subclavian artery from above the clavicle. The choice of the method of operating must be determined by the state of the soft parts covering the joint.

LA FAYE'S METHOD WITH ONE FLAP.

With a large common bistoury, a semicircular incision is to be made, with its convexity downward, across the integuments covering the deltoid muscle, about four inches below the acromion.* The skin is not to be detached; but the surgeon is to proceed immediately to raise the muscle from the bone, quite up to the joint. If the circumflex arteries bleed considerably, they are now to be tied, before the operator proceeds further. Then the surgeon should cut the tendons passing over the joint, and also the capsular ligament, so as to be enabled to dislocate the head of the bone. With one stroke of the amputating knife, he is then to divide the skin, muscles, and other parts underdeath the joint, and thus complete the separation of the limb. Then the axillary artery is to be instantly taken hold of with the forceps or double tenaculum, and

---

* The horns of the semicircle, if I may use the expression, are to extend upward along the anterior and posterior margin of the deltoid muscle.

tied. The flap of the deltoid muscle is next to be laid down, and its edge will then meet the lower margin of the wound.

The preceding method is one of remarkable simplicity, as I can truly affirm, not only because I have tried it myself, in three instances, but seen it performed on several occasions by other surgeons. The last case, in which I was requested to give my assistance, was a patient of Dr. Blickes', of Walthamstowe: the operation was practised as a last resource for a spreading mortification of the arm from external violence; and though the man survived only about a fortnight, nothing could be more easy than the operation itself, and it was impossible to have had a better stump.

In order to make a flap of the deltoid muscle, some operators prefer first pushing a catling, or long, straight, double-edged knife, through this muscle near the joint, and next cutting downwards, they detach as much of the flesh from the bone as they consider necessary; the flap is then turned up; the tendon of the long head of the biceps and other muscles passing over the joint are divided; the capsular ligament is cut; the head of the bone disarticulated; and the operation finished, by passing the knife downwards between the glenoid cavity of the scapula and the head of the humerus, and, with one stroke, dividing all the parts towards the axilla.

DUPUYTREN'S METHOD WITH ONE FLAP.

The arm being raised from the side, the deltoid muscle is grasped with the left hand, and a double-edged knife passed through its base, directly below the acromion, and carried down close to the outer side of the humerus, so as to form an external flap of suitable extent. This is to be held up by an assistant, while the humerus is moved near to the side, in order to incline those tendons outwards, which are inserted near the head of the bone, and which are now to be divided, beginning with the posterior ones, which are more easily got at, on account of the greater space between the acromion and the head of the humerus, than between the latter part and the coracoid process. The fibrous tissues, connecting the head of the bone to the acromion, must likewise be divided, after which the operator takes hold of the arm with his left hand, dislocates the head of the bone outwards, and passes the knife inwards for the purpose of dividing the soft parts in that direction, where the principal nerves and bloodvessels are situated. At this moment the assistant, who holds up the external flap, pinches up the soft parts, by placing the thumb of his right hand on their bleeding surface, and the four fingers under the axilla, and thus compresses the artery. The operator, now having no fear of hemorrhage, completes the division of the parts on a level with the attachments of the pectoralis major and latissimus dorsi to the humerus. The flap is then brought down and united by the first intention. This is the opera-

tion of La Faye and Ravaton simplified, and perfected. As M. Malgaigne observes, by directing the edge of the knife inwards, the capsule of the joint might be laid open by the first stroke.

LISFRANC'S METHOD WITH TWO FLAPS.

In this operation, the surgeon is particularly to remember that, between the acromion and the coracoid process, there is a triangular space, bounded behind by the clavicle, and where the arch over the joint is simply fibrous.

1st. Supposing the left arm is about to be removed, it is to be raised outwards nearly to a right angle. The surgeon stands behind the patient, and grasps the cushion of the shoulder with his left hand, putting his thumb on the humerus, and the index and middle fingers on the above-mentioned triangular space. Then taking a double-edged knife, eight inches long, he introduces it parallel to the humerus, at the outer side of the posterior margin of the axilla, in front of the tendons of the latissimus dorsi and teres major, with the blade in such a position that its flat part forms with the axis of the shoulder an angle of 35 deg., while its upper edge is turned a little forwards. The knife is carried up along the posterior and external side of the humerus, till it arrives under the acromion: now its point is to be depressed, and its handle raised, to the distance of two or three inches from the arm, till it forms with the axis of the joint an angle of 30 or 35 deg. Then the surgeon is to press directly on its point, which will pass through the joint, and come out in front of the clavicle at the inner side of the acromion, at the triangular space above described. Next, while the handle is kept nearly motionless, the end of the blade is carried round the head of the humerus from within outwards, and from below rather upwards; and directly the knife is clear of the acromion and head of the bone it is carried boldly downwards along the external side of the arm, and the posterior flap is formed, about three inches in length.

2d. The operator, keeping his hand depressed, and cutting from the heel to the point, slides the knife from behind forward at the inner side of the head of the humerus, depresses the handle till it is perpendicular to the horizon, directs an assistant to compress the artery, and thus completes the anterior flap.

When the right arm is to be amputated, the surgeon may either plunge the knife into the triangular space, above indicated, and bring its point out in front of the posterior margin of the axilla; or else he may stand at first behind the patient to make the posterior flap, and then move to the patient's side to finish the anterior one.

No method is more expeditious than the foregoing. In the first stage, the surgeon cuts at once the tendons of the latissimus dorsi, teres major and minor, supra and infra spinatus, a portion of the

deltoid, one half of the capsular ligament, the subacromial fibrous tissue;—in a word, almost all the parts attached to the humerus, the head of which can be immediately afterwards disarticulated.

When the patient is under the age of fifteen, M. Lisfranc, recollecting the cartilaginous state of the acromion, recommends another method with two flaps, the peculiarity of which consists in directing the knife, so as to remove the cartilaginous extremity of that part of the scapula. But, as M. Malgaigne justly remarks, the latter expedient, by lessening the prominence of the shoulder, would be likely to increase the deformity resulting from the operation.

LARREY'S OVAL METHOD.

An incision is begun at the acromion, and carried down to an inch below the level of the neck of the humerus, dividing the integuments and the deltoid, down to the bone, into two equal portions. An assistant then draws up the skin of the arm towards the shoulder, and the operator makes two oblique incisions, which commence from the termination of the first, an inch below the acromion; one extending to the anterior border of the axilla; the other to its posterior border; and both prolonged so as to divide the pectoralis major and latissimus dorsi very close to their insertions.

The cellular connections of the two flaps to the bone are next divided, and the flaps themselves held by an assistant, who, at the same time, stops the bleeding from the circumflex arteries by the pressure of his fingers. The joint is now exposed, and, with one stroke of the knife, over the upper semicircle of the head of the humerus, the capsule and tendons are cut through. The head of the humerus is then dislocated; and the knife being conveyed to the inner side of the bone, the flesh is detached from the latter. Finally, while an assistant compresses the axillary artery, the surgeon completes the operation by cutting transversely through the remainder of the skin and muscles, on a level with the lower ends of the two oblique incisions.

The arteries having been secured, there are, strictly speaking, no flaps; the wound, on being closed, presenting, as after all oval amputations, merely the appearance of a straight line.

CIRCULAR AMPUTATION AT THE SHOULDER.

Garengeot, Alanson, Graefe, Sanson, and Cornuau, are recorded amongst its patrons. A circular incision is made through the integuments, three inches and a half, or four inches below the acromion. The skin is retracted, and the deltoid cut obliquely from be-

low upwards, so as to expose the joint. With another stroke of the knife, the tendon of the biceps and the upper part of the cap-sule are divided. The head of the humerus is then dislocated; the knife carried to the inner side of the bone; the muscles separated from it in that direction; and, while an assistant compresses the ar-tery, the soft parts towards the axilla are cut on a level with those on the outer side of the shoulder.

M. Sanson makes his first incision one finger-breadth from the acromion and unites the anterior with the posterior wound: in fact, as M. Malgaigne remarks, the result is the same as that of Larrey's mode, divested of the upper incision, but more difficult of execution.*

Excellent as some of the preceding operations are, the exclusive preference to any one of them, as declared by some writers, has been made without reflecting, that, in many of the examples in which amputation at the shoulder is indicated, the deltoid muscle is much lacerated, or more or less of it actually torn away. Under such circumstances, a sufficiency of soft parts for making the flaps must be saved, from whatever quarter they can be obtained, wheth-er the external, or the anterior, or the posterior side of the should-er. Sometimes a flap can be obtained, indeed, only at the poste-rior, or the anterior side, as every experienced military surgeon is well aware of.

AMPUTATION OF PARTS OF THE HAND.

As Dr. Macfarlane correctly observes, the propriety of some-times attempting to save a portion of the foot, or hand, in cases of injury, or disease, by having recourse to partial amputation, has been long known, and acted upon both in this country and on the Continent. If the thumb and little finger can be preserved, or a portion of either of them, the advantage to the patient will be con-siderable. In University College Hospital, we have had many pa-tients, whose hands were so badly shattered and crushed by machin-ery, that, at first, it seemed as if it would have been impossible to save any part of them. Yet the experiment of partial amputation having been made, very useful portions of the hand were saved. Thus, the thumb, and one or two fingers have sometimes been sa-crificed and the rest of the hand saved; or, what has been still bet-ter, the thumb and one or two fingers have been saved, though the other fingers, and even some of the metacarpal bones have been unavoidably removed. With such facts before him, let every sur-gical practitioner pause a little, before he sanctions so great a muti-lation as that of removing the whole hand.

---

* See J. F. Malgaigne, Manuel de Médecine Opératoire, pp. 329—334.

AMPUTATION OF THE TWO LAST PHALANGES OF THE FIN-
GERS.

These phalanges, though but loosely confined in their respective places by the anterior ligament, and behind by the extensor tendon, are closely retained in it by the lateral ligaments. Hence, in order to open the joint freely, it is the latter, which require division. The line of the articular interspace, as M. Malgaigne remarks, has nearly a transverse direction, and in the articulation, of the first with the second phalanx, is situated on a level with the cutaneous fold on the palmar side of the finger; while, over the articulation of the second phalanx with the third, the articular interspace is half a line below the cutaneous fold.

Lisfranc's first Plan.—In removing the last phalanx, the operator takes hold of it with his thumb and forefinger, and bends it to an angle of 45°. There are then three guides to the articular interspace. 1. At the back of the joint a conspicuous wrinkle of the skin: the line of the articular interspace is half a line below it. 2. If this wrinkle be wanting, the dorsal prominence caused by the flexion is to be noticed, and the incision made half a line below it.

3. The termination of the furrow of the palmar surface is seen on each side of the joint: half a line below this, the articulation will be found. The heel of a straight bistoury is to be placed perpendicularly on the skin over the left extremity of the articular interspace, and a small semicircular flap is formed by cutting towards the right side of the finger. This first stroke will frequently lay open the ligament at the back of the joint. The next thing is to divide the lateral ligaments. In cutting through the left one, the knife is to be held perpendicularly to the axis of the last phalanx, with the handle nearer than the blade to the operator, and the edge also slightly inclined towards him. In this way, the incision is accommodated to the disposition of the articular surfaces, and the ligament is cut through at the first stroke. The knife is then applied to the other side, and the second lateral ligament divided in the same direction, but with the handle of the knife directed downwards, and kept further from the operator than the blade. The joint having now been largely opened, the phalanx is to be placed in an extended position, and the knife, having been carried through the joint and capsular ligament towards the palm, is there brought out, a semicircular flap being formed of sufficient size to cover the end of the bone.

Amputation between the first and second phalanges is performed in a similar way, except that the dorsal incision should terminate on each side precisely at the extremity of the palmar fold of the skin. The surgeon, as he is dividing the lateral ligaments, is to avoid cutting the base of the palmar flap.

42*

Lisfranc's second Method.—All the fingers are to be bent, except that which is about to be removed; and the hand is to be placed in the supine position. The surgeon takes hold of the phalanx with the forefinger and thumb of his left hand. A straight, very sharp-pointed knife, with the edge directed toward the extremity of the finger is introduced half a line below the palmar cutaneous fold, if it is the third phalanx which is to be removed; but exactly at the base of this fold, if it is the second phalanx. The knife is to pass closely across the palmar and lateral surfaces of the bone, nearly to the heel of the blade, and then the edge is to be inclined upwards, and a semilunar flap made. The knife is next applied perpendicularly at the base of the flap for the purpose of cutting the palmar portion of the capsule. But, in this method, it is scarcely necessary to divide the lateral ligaments separately, as with a single stroke, the knife may now be carried completely through the articulation, and the integuments divided, without making any dorsal flap. If the extensor tendon should project too much, a piece of it should be cut off with scissors.

In general, no ligature is necessary, and the flap is to be retained in its place with adhesive plaster.

AMPUTATION OF A FINGER AT THE METACARPAL EXTREMITY.

The articulation is an enarthrosis with loose ligaments; and the articular prominence, or knuckle, presenting itself when the finger is bent, is formed entirely by the metacarpal bone, the phalanx playing on its inferior surface. In the healthy state, the joint is usually situated ten or twelve lines above the commissure of the fingers.

Here amputation may be performed with two flaps; or the oval, or the circular method may be adopted. The oval method seems to me the best.

1. The precise situation of the joint having been ascertained, and the phalanx bent, an oblique incision is to commence three lines beyond the articulation, and terminate at the digital commissure. The finger is then to be extended, and the incision continued across the palmar side of it, precisely in the direction of the cutaneous furrow between the finger and the hand. The knife having reached the opposite digital commissure, the finger is to be bent again, and the incision extended so as to rejoin its other extremity two lines below the point where it was begun.

2. The fingers are then to be strongly separated, the edges of the wound dissected up, the back of the capsule opened, the lateral ligaments cut, and the operation concluded by detaching the finger on its palmar side. The result is a linear cicatrix not at all encroaching on the palm.

AMPUTATION OF ALL THE FINGERS TOGETHER FROM THE ME-TACARPUS.

In this operation, it is useful to remember, that the heads of the second and fourth metacarpal bones are really on the same level; but that the third, which supports the middle finger, projects beyond them about one third of a line; while, on the contrary, the fifth, on which the little finger rests, is half a line shorter.*

LISFRANC'S METHOD.

1. In the right hand, the operator begins with making a semicircular incision, with its convexity downwards, extending from the inner side of the head of the fifth metacarpal bone, over the points where the fingers separate from the hand, and terminating on the external side of the head of the second metacarpal bone. The integuments are retracted by an assistant, and, if necessary, the surgeon dissects them a little way upwards.

2. The point of the knife is carried across the four joints, so as to divide the dorsal ligaments; then the lateral ligaments of each articulation are cut in succession; and afterwards the palmar ones.

3. Lastly, the knife is conveyed under the inferior surface of the phalanges, and the palmar flap formed, at first towards the little finger, the incision following the direction of the cutaneous furrow of the palm, and each finger being lifted up successively, as the knife traverses the parts.

The mode of proceeding is the same for the left hand, except that the first incision is carried from the forefinger to the little finger.

The same method will also answer for the amputation of two or three fingers; an assistant holding the others out of the way, while the surgeon makes the dorsal flap principally with the point of the knife, and begins and finishes the incisions on a level with the articulations, which are to be opened.

Circular Method; as practised by M. Cornuau.—1. The hand being placed in the supine position, the operator grasps the four fingers with his left hand, and makes in the digito-palmar furrow a semilunar incision, successively through the skin, vessels, nerves, and flexor tendons, down to the joint. 2. The hand is then turned prone, and the circular incision completed on the back of the hand, on a level with the commissure of the fingers, dividing all the soft parts there, and penetrating into the articulation. 3. The heads of the phalanges are now to be dislocated, and the operation finished by cutting through the lateral and anterior ligaments.

---

* See J. F. Malgaigne, Op. cit. p. 313.

AMPUTATION OF THE THUMB.

While the palmar aspect of the metacarpal bone of the thumb is thickly covered, the dorsal surface is almost subcutaneous. This bone is connected by means of loosish ligaments to the os trapezium, the articular surface of which is slightly concave from within outwards. By inclining it towards the metacarpal bone of the forefinger, its head may be made to project externally. On the inner side, the articulation is separated from that of the adjoining metacarpal bone by an osseous ridge, one line in breadth, appertaining to the os trapezium. Lastly, the direction of the joint is oblique, or corresponding to a line, which, when drawn from its outer side, would exend to the root of the little finger.

In the ordinary mode of amputating the thumb and its metacarpal bone from the trapezium, the thumb is placed in the position of abduction. 1. The heel of a bistoury, held perpendicularly, with the point upwards, is then applied to the middle of the commissure, and an incision boldly made downwards, but gradually inclining towards the metacarpal bone of the thumb, until the knife is stopped by the trapezium. 2. Then the edge of the knife is to be conveyed into the articulation in the direction above specified, and the head of the metacarpal bone luxated towards the palm. 3. The joint having been thus cut through, the edge of the knife is reversed, and carried along the radial edge of the metacarpal bone, so as to form the external flap, which should be as fleshy as possible, and end a few lines beyond the articulation of the metacarpal bone with the first phalanx.

Some operators commence with forming the external flap, after transfixion of the soft parts at its base; and they then open the joint from without inwards.

AMPUTATION OF THE THUMB BY AN OVAL INCISION.—SCOUT-ETTEN'S METHOD.

If the left thumb is to be removed, the hand is placed supine, and a longitudinal incision made through all the soft parts down to the bone, beginning one line above the articulation of the trapezium, and ending at the commissure on the inner side of the first phalanx of the thumb. The hand is now to be put into the prone position, and the incision prolonged from the first over the dorsal surface, precisely in the direction of the upper cutaneous furrow, and to the point where the first incision began. The muscles adherent to the whole extent of the external side of the bone are then to be divided; but, on the palmar side, only at the upper half of the bone. The joint is then laid open at its posterior side, the metacarpal bone dislocated outwards, and the detachment of the thumb completed

by carrying the knife close to the inner surface of the metacarpal bone.

In amputating the right thumb, the first incision is made on its radial side.

AMPUTATION OF THE LITTLE FINGER AND THE METACARPAL BONE.

The surface of the unciform bone, which receives the fifth metacarpal bone, is concave from behind forwards; and slightly from within outwards, so that a knife cannot be pushed at once completely across the joint; but it will pass very well half way through it from within outwards, in the direction of a line, which would terminate at the middle of the second metacarpal bone.

1. In order to determine the place of the joint, the inner edge of the metacarpal bone is to be traced with the forefinger, till a prominence is felt extending towards the palm. This is the unciform process, and directly in front of it lies the articulation. The articular interspace may also be felt on the back of the hand especially when the bone is moved.

2. The soft parts being grasped and drawn away from the bone, a sharp knife is introduced perpendicularly through the skin and muscles opposite the ulnar side of the articulation, and the edge carried close to the bone from behind forwards. Thus a flap is made, which ends a little beyond the head of the phalanx. 3. While an assistant holds the flap out of the way, the surgeon dissects the integuments from the back of the bone, leaving untouched, however, the extensor tendon. The soft parts being drawn outwards, the knife is carried along the other side of the bone, without injuring the integuments on either side; and passing from behind forwards, it divides every thing as far as the digital commissure. 4. Its edge is then applied to the inner side of the articulation, and enters half way into it in the direction above specified, and in being withdrawn again cuts through the dorsal ligament. Then, for the division of the ligament of the two metacarpal bones, the point is passed obliquely between the bones, with the edge turned towards the wrist. All that now remains to be done, is to cut through the muscles and ligaments on the palmar side.*

In this country, the operation is frequently executed by cutting through the interosseous space down to the os unciforme; forming the flap; and then cutting through the joint.

---

* See Observations on Amputations of the Foot and Hand. Med. Gaz. 1836. For many of the foregoing directions, I am indebted to M. Malgaigne, whose little treatise on the Operations is one of considerable merit.

AMPUTATION OF METACARPAL BONES ALONE.

The removal of injured, or diseased metacarpal bones, without their corresponding fingers, is sometimes practised. In compound fractures or dislocations, when the injury is confined to one or two of these bones, they may be excised, and a useful hand preserved; but, when the injury is more extensive, primary or secondary amputation will generally be required. In one instance of disease of the metacarpal bone of the ring finger, Dr. Macfarlane, of Glasgow, removed the bone by transfixing the metacarpal space on each side with a French bistoury, and cutting down from the carpal articulation to the first phalanx. A useful hand was the result. In another instance, he removed the metacarpal bones of the middle and ring fingers: he aimed at preserving no flap, and divided the metacarpal spaces by cutting upwards from the division of the fingers, taking care to avoid the extensor tendons of the fore and little fingers, which are apt to be divided on approaching the carpus. The metacarpal bones are readily dislocated from the os magnum and os unciforme, and with a little force the parts were put in contact. After several months, a serviceable hand, with free motions of the fingers, was obtained. Portions of these bones may be easily cut out with the aid of the cutting pliers.

AMPUTATION OF PARTS OF THE FOOT.

I. *Amputation of a single Toe.*—The joints of the toes resemble those of the fingers; but the great toe has usually three sesamoid bones, two situated inferiorly, and one internally; while the second toe sometimes has one, and the little toe another. The methods of operating are here the same as on the hand: but that practised with an oval incision is often preferred.* Whether in amputating the great toe, it is most advantageous to disarticulate its first phalanx from the metatarsal bone, or to amputate in the continuity of the latter, is a disputed point. The first method is objected to by some practitioners, because the head of the first metatarsal bone is left, forming too great a projection, difficult to cover properly, and not well calculated to bear pressure. On the other hand, it is argued, that the head of this bone constitutes one of the points of the tripod, on which the foot rests, and hinders the internal side of the foot from inclining too much downwards. Hence, it is contended, that, if possible, it ought to be preserved. If the plan of amputating through the metatarsal bone be preferred, it is to be divided either with a fine saw, or a strong pair of cutting pliers.

II. *Amputation of the five Toes, according to the Method of*

---

* J. F. Malgaigne, Op. cit. p. 335.

Lisfranc.—Few accidents are likely to occur, involving all the
toes so severely as to require their removal, without the metatarsal
bones being likewise implicated. Yet such cases have been met
with, and, perhaps, as Velpeau observes,* they are more likely to
happen where the toes are frost-bitten and perish, than from any
other cause. But, even in examples of this kind, the necessity
for the operation may sometimes be superseded by allowing time
for the dead parts to be detached, after which, the end of the foot
will heal by the granulating process. In the operation, it is to be
recollected, that the second metatarsal bone is one third of a line
longer than the first, which lies nearly on the same plane as the
third; the fourth is half a line behind the latter; and the fifth still
more backward, so that, according to the calculation of M. Mal-
gaigne, a transverse line, drawn from its articulation, would pass
over the origin of the articular part of the first.

1. A semilunar incision is begun at the inner side of the head of
the first metatarsal bone, and extended close to the line at which
the toes leave the foot, to the external side of the fifth metatarsal
bone. The flap is then dissected up.

2. The point of the knife is then passed from within outwards
over the joints, so as partly to open them; after which, the lateral
ligaments are to be cut.

3. The knife is next introduced under the phalanges of the great
and little toes, and then under all the phalanges at once. The sur-
geon, with his left hand, now presses the toes upwards toward the
instep, and carries the edge and point of the knife from within out-
wards, following the track of the furrow in the fore part of the
sole. The arteries having been tied and the wound dressed, the
foot is to be laid on its outer side, in order that the pus may more
readily escape in the event of suppuration.

III. *Amputation of the first Metatarsal Bone.*—The posterior end
of this bone has an extensive articular surface, in the direction from
above downwards, slightly concave, and articulated only with the
great cuneiform bone. The articulation is strengthened by four
ligaments, an internal, a dorsal, a plantar, and an interosseous liga-
ment. The following method is adopted by M. Lisfranc:—The
operator takes hold of the integuments and muscles at the inner side
of the bone with the thumb and fingers of his left hand, and draws
them inwards as far as he can, in order to have a flap of suitable
thickness. The point of a narrow straight bistoury is then intro-
duced perpendicularly between the inner side of the bone and the
soft parts, two lines behind the articulation, and a flap formed
along the bone, terminating a little beyond the joint between the
metatarsal bone and the first phalanx. From the base of this flap,
which is to be held back by an assistant, another incision is made,

* Nouveaux Elém. de Méd Opératoire, t. ii. p. 449.

which crosses the upper surface of the bone rather obliquely, and terminates at the inner and upper part of the articulation with the first phalanx.   The knife is then carried between the two metatarsal bones, as close as possible to their posterior ends, and brought out on the external and plantar side, without touching any point of the skin; and every thing in the way of the knife is now cut through as far as the commissure of the toes.   The next step is the disarticulation, which is accomplished by dividing the internal ligament, with the point of the bistoury kept perpendicularly, and the edge directed rather obliquely from within outwards, and from behind forwards, so that it may follow the direction of articular interspace. The upper ligament having been next cut through, the edge of the knife is turned upwards, and the point plunged between the external side of the first cuneiform bone and the inner side of the extremity of the second metatarsal bone.   The interosseous ligament is then divided by cutting upwards, after which the surgeon completes the disarticulation by cutting through the few remaining ligamentous and muscular fibres.

Instead of making a second incision, after the flap is formed, the skin may be dissected up, from the base of the flap as far as the joint between the metatarsal bone and first phalanx, and drawn outwards by an assistant.   Here, as M. Malgaigne observes, the essential thing is to be able to pass the knife between the two metatarsal bones, without wounding the integuments.

Instead of disarticulation, the first metatarsal bone is sometimes divided with a strong pair of cutting pliers, which plan, if the disease or accident will allow, has the advantage of being less likely to excite inflammation in the joints of the tarsus.*

IV. *Amputation of other Metatarsal Bones.*—The fifth may be amputated in a similar way.   For the removal of the second, third, or fourth, the oval method is often preferred.   Béclard used to amputate the two first metatarsal bones as follows:—An incision is begun at the first interosseous space, six lines in front of the articulation, and extending obliquely as far as the commissure between the second and third toes; it next descends along the furrow under the second and first, and then passes obliquely upward to the point where it commenced.   It is a true oval incision.   Then, from the upper angle of this incision, two others are made, twelve or fifteen lines in length; one passing inwards and backwards, and the other outwards and backwards.   The integuments are then dissected up on each side, and the bone freed from the parts covering it.   Next, in order to get at the articulation, the posterior flap, bounded by the two last incisions, is reflected.

---

* The disadvantage of removing the first metatarsal bone, without the great toe, has been ably explained by Mr. Rynd. See Dublin Journ. of Med Science, vol. viii. p. 292.

The same mode of proceeding is applicable to the disarticulation of the fourth and fifth metatarsal bones.

V. *Amputation of the whole of the Metatarsus.*—Here the joint is formed on one hand by the three cuneiform bones and the cuboid bone, and on the other by the five metatarsal bones; and its direction is such, that its inner side is nine lines more forward than its outer. The tuberosity of the metatarsal bone of the little toe will denote the situation of the joint between that bone and the cuboid; for it is situated immediately in front of a depression, which corresponds to the articulation. When the foot is placed in the position of abduction, the tendon of the peronæus brevis, which is attached to the tuberosity, may also be seen, or felt. The inner side of the joint may be found by attending to the following guides. 1. If a transverse line be drawn from the tuberosity of the fifth metatarsal bone to the inner edge of the foot, the joint will be found three quarters of an inch in front of it. 2. If the forefinger be carried along the inner and interior side of the first metatarsal bone, from before backwards, a tuberosity is first felt, then a depression, and lastly, a second protuberance. The joint is between these two eminences. 3. If the finger be passed along the inner edge of the foot, from behind forwards, the prominence of the navicular bone is felt an inch in front of the malleolus internus. The joint lies about thirteen or fourteen lines still more forward. 4. If the foot be bent on the leg, the tendon of the tibialis anticus, which is attached both to the great cuneiform and the first metatarsal bone, may be felt. 5. Lastly, as Malgaigne observes, the most prominent point of the instep, in front of the navicular bone, being ascertained, the joint is three lines nearer the toes.

As for the direction of the articular surface, the outer part, between the fifth metatarsal bone and the cuboid bone is doubly oblique; at first, in the direction of a line, drawn from this point to the first joint of the great toe; and then in the direction of another line, drawn from the same point to the middle of the first metatarsal bone.

The direction of the articulation of the fourth metatarsal bone corresponds to a curved line, about an inch in length, begun externally, and terminating inwardly, four lines in front of the point of its commencement.

The articulation of the third metatarsal bone is nearly transverse, and usually half a line more forward than the last.

The second metatarsal bone extends backward, being lodged in a kind of mortise, formed by the three cuneiform bones, the internal side of which is four lines deep, and oblique from behind outwards; while the external side is two lines deep, and oblique from behind inwards. The posterior side is six or seven lines in breadth, and flat, and nearly transverse.

The articulation of the first metatarsal bone is three lines in ad-

vance of that of the third, and its direction corresponds to a line drawn from its inner part to the middle of the fifth metatarsal bone.

In respect to the ligaments, if the second metatarsal bone be excepted, which is fixed in the mortise by three ligaments, each metatarsal bone has on its dorsal side but one ligament. The plantar ligaments are not of less importance than the three interosseous. The first internal one, which is the strongest, goes from the outer side of the first cuneiform bone, and the inner side of the second, to be inserted into the corresponding surfaces of the first and second metatarsal bone. The second, or middle ligament, proceeds from the external side of the second cuneiform bone and the inner side of the third, to the outer side of the second metatarsal bone, and the inner side of the third. The third is fixed, on one hand, into the outer side of the third cuneiform bone, and the inner surface of the cuboid; and, on the other hand, into the external side of the third, and the inner side of the fourth, metatarsal bone.

In consequence of the foregoing arrangement, the lateral parts of the mortise are only in immediate contact with the second metatarsal bone towards the dorsum of the foot, and the interspaces, left on the plantar side for the lodgment of the interosseous ligament, will permit the point of the knife to enter.*

Lisfranc's Method.—On the right foot, a semilunar incision is made across the instep, half an inch in front of the joint, through the whole thickness of the soft parts. The skin is drawn back, and the point of the knife placed on the outer side of the joint. The edge, being carried in the directions above specified, now enters the joint, and passes as far as the third metatarsal bone. There the knife is to be inclined half a line more forward, and the incision extended almost transversely to the second metatarsal bone. In this part of the operation, the general maxim is to be followed of not letting the blade become locked in the joint, but merely to aim at dividing the ligaments with its point. As soon as the knife has reached the second metatarsal bone, it is to quit this side of the joint, in order to attack it at the internal side. Here it is to be held perpendicularly, and introduced with the edge towards the tarsus, so as to pass close along the inner surface of the first metatarsal bone; and directly it is stopped by the head of the bone backwards, its position is to be made perpendicular to the axis of the foot, and the joint is to be penetrated by a sawing motion, in the direction of a line extending to the middle of the fifth metatarsal bone. In detaching the mortise connection, the operator passes the point of the knife between the first cuneiform and the second metatarsal bone, with the edge turned towards the leg, and cuts along the whole of the inner side of the mortise not forgetting its slight obliquity inwards. In this manner, the penetration of the joint be-

---

* See J. F. Malgaigne, Manuel de Méd. Opératoire, pp. 342—344.

tween the first and second cuneiform bone will be avoided, and the internal interosseous ligament be completely divided. The knife is then withdrawn, and its point carried transversely over the dorsal ligament at the posterior part of the mortise, and then from behind forward over the dorsal ligament at its external side. Gentle pressure is now to be made on the end of the foot to separate the articular surfaces; while the external and middle interosseous ligaments are divided from above downwards, with the point of the knife.

In finishing the operation, the surgeon places the foot in a perfectly horizontal position, and carries the point of the knife freely over the plantar ligaments; detaches the textures which are adherent to the posterior end of the metatarsus, avoiding the tuberosities of the first and fifth metatarsal bones; and then pushing the knife under the whole row of them, he carries it forward along their inferior surface, and thus forms a semilunar flap, the inner part of which should be two inches long, and the outer one inch. The aim should be to save more skin than muscle. If any large tendons should be left denuded in the flap, they are to be cut away with scissors. It is the plantar flap which is designed to cover the whole of the wound; the small upper flap being only intended to prevent any exposure of the upper surface of the tarsal bones. The upper flap should only be employed as a cover for the end of the foot, when there is not enough skin afforded by the state of the limb for the perfect formation of the planter flap; because the cicatrix will be situated too much forward, and ill calculated to bear pressure.

VI. *Amputation at the Middle of the Tarsus, or the Articulation between the Astragalus and Os calcis behind, and the navicular and cuboid Bones in front.*—If the foot is extended, the outer side of this joint will be found twelve or fifteen lines in front of the extremity of the fibula; its inner side, ten or eleven lines in front of the malleolus internus; and its middle part, about an inch in front of the ankle joint. When the foot is flat on the ground, the articulation is about three quarters of an inch in front of the tibia; but, when extended, the interspace may be nearly thrice this measurement. Another guide is the mid-point between the malleolus externus and the tuberosity of the fifth metatarsal bone; here is the articulation between the os calcis and the oscuboides, situated, according to Lisfranc, six lines behind that tuberosity. In passing the finger along the outer side of the foot from the malleous externus, the first tuberosity met with is formed by the os calcis, and the joint is in front of it. To find the inner end of the joint, the finger may be passed forward along the internal side of the foot from the malleolus internus; and the first protuberance met with, will be that of the navicular bone: the articulation is directly behind it. (Richerand.) The precise situation of the upper and middle part of the joint may be ascertained by extending the foot, and placing

it in the position of adduction; if the finger is now put on the junction of the external with the middle third of the intermalleolar space, and the instep traced with it, the first eminence met with, will be the head of the astragalus, constituting part of the joint itself. (Dupuytren.)

As for the direction of the articular surfaces, when the foot is bent, the astragalus and os calcis are nearly in the same line ; when it is extended, the os calcis advances at least three lines more forward than the astragalus. The navicular bone extends a good way towards the maleolus internus, and here the direction of the articulation is that of a line, drawn from the back and inner part of that bone, to the place of junction of the posterior with the middle third of the fifth metatarsal bone. In its middle third, the articulation inclines slightly backwards towards the malleolus exturnus ; then it turns a little forwards, and lastly rather backwards again. Therefore, in cutting into the joint at its external side, the knife should be inclined a little forwards.

The most important ligament, the true key to the joint, as M. Malgaigne expresses himself, is the interosseous, attached on one side to the os calcis and the astragalus ; and, on the other, to the navicular and cuboid bones. Its situation corresponds to the depression of the external and inferior side of the head of the astragalus: and here it must be attacked.

The *operation* is performed on the left foot as follows :—The surgeon places his left thumb on the external side of the joint, and his fore-finger on the tuberosity of the navicular bone. Between these two points a semilunar incision is made, the middle part of which should be half an inch in front of the joint. The inner part of the joint is then opened in the direction above particularised, and the knife then carried to the front of the head of the astragalus. The dorsal ligaments are then cut with the part of the edge of the knife near its point; and next the outer side of the joint is opened with the edge inclined a little forwards. The point is now introduced under the external and anterior side of the head of the astragalus, and, with the edge turned forwards, the interosseous ligament is cut in the direction of the articular surface of the os calcis.

The joint being thus freely laid open, the plantar ligaments are to be divided, and the knife conveyed close under the bones, to form a suitable flap. This is most expeditiously done, I think, by transfixion. In this part of the operation, care should be taken to avoid the protuberances of the navicular and cuboid bones, and beyond them, those of the first and fifth metatarsal bones.*

The plantar and dorsal arteries of the foot having been secured, the flap is to be brought over the astragalus and os calcis, and fixed

---

* See J. F. Malgaigne, Man. de Méd Opératoire, p. 347.

by means of adhesive plaster, with or without the aid of a couple of sutures.

I have seen cases, in which the remainder of the foot after this operation was so serviceable, that the patients walked with but a very trivial degree of lameness. Mr. Copland Hutchison sent one of his patients to my house, on whom the operation had proved thus successful. However, Dupuytren, Lisfranc, and some other eminent surgeons, prefer amputating at the junction of the metatarsal bones with the first phalanges of the toes, whenever the state of the limb will allow it, because, the whole of the tarsus being preserved, the anterior lever of the foot continues greater than the posterior; and the extensor tendons of the toes adhering to the cicatrix, aided by that of the tibialis anticus, inserted into the inner cuneiform and first metatarsal bones, prevent the foot from being displaced backward; a serious grievance, which, though not constant, is alleged to have sometimes followed Chopart's operation, and required a division of the tendo Achillis. This operation is not well suited for scrofulous disease of the foot; nor for mortification, which is either spreading, or has already reached on any side above the place of the incisions.
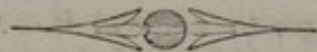
OPERATIONS ON ARTERIES.

LIGATURE OF THE COMMON CAROTID ARTERY.

THIS operation is occasionally necessary for the cure of aneurism; the stoppage of hemorrhage; and the cure of certain tumors, composed of vascular erectile tissue, growing within the orbit. It has also been undertaken in cases, where extensive tumors of this character were situated on other parts of the face and head, but, as I believe, without any decided success.* The operation has been sometimes resorted to for the prevention of hemorrhage in the removal of the lower jaw, and large swellings of the neck. This practice is not, however, usually adopted by the most judicious surgeons, who know, that a double operation is generally avoidable, either by pressing the common carotid artery against the transverse processes of the cervical vertebræ, if necessary, or by tying, or pressing on the mouth of every large artery, as soon as such vessel is divided.

The right common carotid, which arises from the innominata op-

---

* See Velpeau, Nouveaux, Elém. de Méd Oper. t. i. p. 539, where many trials of this practice are referred to. The result is very discouraging.

posite the sterno-clavicular articulation, is shorter, and, at its commencement, more superficial, than the left, which originates further back from the arch of the aorta. After emerging from the chest, each of them has at its inner side the trachea, and higher up the thyroid gland (which sometimes overlaps it), the pharynx, and the larynx, near which it continues up to its usual place of bifurcation, the upper edge of the thyroid cartilage. At its external side is the internal jugular vein, which partly overlaps it; while between the two vessels, and rather behind them, the pneumogastric nerve descends enclosed with them in the same sheath of condensed cellular tissue. Behind the sheath is situated the great sympathetic nerve, resting on the rectus anticus muscle; while the inferior thyroid artery also crosses from behind the lower portion of the same sheath in its course inwards and upwards towards the thyroid gland. The nervus descendens noni usually lies on the forepart of the sheath; though occasionally some of the twigs, derived from the arch formed by its junction with two filaments of the cervical plexus, are found within the sheath lower down the neck. The common carotid artery may be regarded as resting on the transverse processes of the cervical vertebræ, with the interposition of the longus colli and rectus capitis anticus muscles. On its outer side, and near its root, it is covered by the sterno-mastoid muscle, which gradually passes backward, so as no longer to conceal it. On its inner side, it is covered, first by the outer border of the sterno-hyoid and sterno-thyroid muscles, and then by the corresponding lobe of the thyroid gland, and several considerable veins of the face and neck, as they are proceeding towards the internal jugular vein. It is divided into two portions by the omohyoideus muscle which crosses over the anterior surface of the sheath, about the middle of the neck, or opposite the upper rings of the trachea. In fact, as Velpeau observes, this little muscle, as it ascends from behind the sterno-mastoideus to the os hyoides, divides the side of the neck into two very regular triangular spaces. In the lower one, the sides of which are formed by the trachea, the clavicle, and the omohyoideus, the artery is concealed by the inner border of the sterno-mastoid muscle, and is deeply situated; while in the upper triangular space, bounded externally by the margin of the sterno-mastoid muscle, above by a transverse line drawn across from the os hyoides, and below by the omohyoideus, the situation of the artery is more superficial.

1. *Operation below the Omohyoideus.*—The patient should lie on his back, with the neck extended, and the head turned towards the opposite side. The anterior edge of the sterno-mastoid muscle is the guide for the external incision, which should be about three inches in length, terminating a little way above the sternum. The first stroke of the knife divides the skin, superficial fascia, and platysma myoides. Thus the edge of the sterno-mastoid muscle is

exposed.   This is to be drawn to the outer side of the wound, and the sterno-thyroid and sterno-hyoid muscles towards the trachea, when the deep cervical fascia will be brought into view, and require to be carefully divided: for this purpose, a portion of it may be pinched up with the forceps, and cut with the edge of the knife kept horizontally, and close to the end of the forceps.   Into the opening thus made, a director is to be introduced, along which the further division of the fascia may be safely made.   The sheath is to be carefully opened in the same manner, and so as to avoid the internal jugular vein and nervus descendens noni, but only to the extent of half an inch, in order not to disturb the connections of the artery more than absolutely requisite for the passage of the aneurism needle and ligature under it, according to the principles advocated in the consideration of the subject of hemorrhage.

Were it necessary to tie the common carotid very low down, an incision might be made three inches in length, beginning at the sternal end of the clavicle, and carried obliquely upwards and outwards, over the interspace between the sternal and clavicular portions of the sterno mastoid muscle.   The skin, platysma myoides, cellular tissue, and fasca are then to be cautiously divided in succession, while the two portions of the muscles are held apart.   The jugular vein will now present itself, at the inner side of which will be found the artery, in front of the longus colli, the vertebral artery and vein, and the great sympathetic nerve, which last is in close relation to the posterior part of the sheath.   After the sheath has been opened, the surgeon should separate the artery, from the vein and nervus vagus, and apply the ligature according to the following rule, which is applicable to the ligature of great arteries in general:—The aneurism needle, eye probe, or whatever other instrument is employed for the conveyance of the ligature under the artery, is to be passed between the artery and vein, with the point turned away from the latter vessel, and guided closely round the artery, by which means the vein, together with the nervus vagus, in this instance, will not be endangered by the needle, and, at the same time, will be safely excluded, from the ligature.   The point of an aneurism needle, however, should never be so sharp as to be likely to wound either the artery or vein, yet fine enough to pierce with facility the cellular tissue connecting the interior of the sheath to the artery.

2. *Operation above the Omohyoideus.*—From the point where the common carotid is crossed by the omohyoideus, opposite the upper rings of the trachea, up to its bifurcation, the artery is covered only by the integuments, platysma myoides, and fascia, for the sterno-mastoid muscle has now diverged from it backwards in its course towards the mastoid process.   However, though this part of the carotid artery is thus superficial, it is frequently covered by a plexus of veins.

The chin being turned towards the opposite side, the first inci-

sion is to commence on a level with the os hyoides, and to extend downwards, about two inches and a half, near the inner border of the sterno-mastoid muscle. The skin, platysma hyoides, and fascia having been divided, and the sterno-mastoid muscle drawn a little towards the outer side of the neck, the sheath of the great vessels, with the nervus descendens noni in front of, or to the outer side of it, is seen immediately above the omohyoideus muscle. The surgeon, avoiding the nerve, now opens the sheath, and passes the aneurism needle with the ligature between the internal jugular vein and the carotid artery, from without inwards, and closely under the latter vessel, for reasons already explained.

By extending the incision upwards towards the mastoid process, the external carotid might be exposed as high up as the point where it reaches the tendon of the digastricus muscle, and a ligature applied half an inch above the bifurcation; but for various considerations, one of which is the nearness of the ligature to a collateral branch, and the danger of this interfering with the closure of the vessel, it is generally deemed more advantageous to take up the common carotid. Even in a wound, it might sometimes be difficult to ascertain positively, whether the bleeding proceeded from the latter vessel, or the external or internal carotid.*

LIGATURE OF THE ARTERIA INNOMINATA, OR BRACHIO-CEPHALIC TRUNK.

This, which is the first branch given off by the arch of the aorta, arises at the junction of the ascending with the transverse part of that arch; and is situated behind the first bone of the sternum; passing obliquely upwards to behind the right sterno-clavicular articulation, where it divides into the right subclavian and right carotid arteries. Above, it is separated from the first bone of the sternum by the sterno-hyoid and sterno-thyroid muscles; and below, by the left subclavian vein, which crosses it.† Its external side is in contact with the pleura, while its inner rests upon the trachea. It varies in length from one to two inches, and is sometimes wanting; in which case, the right carotid and subclavian arteries arise from the arch of the aorta separately. The pneumo-gastric nerve and internal jugular vein lie a good way external to it. Between the sterno-thyroid and sterno-hyoid muscles and the arteria innominata, a very loose cellular tissue intervenes, in which lie several veins descending from the thyroid gland to the left subclavian vein.

In the method of operating commonly advised, the skin, the superficial fascia, the platysma myoides, the sterno-mastoid, sterno-

---

* See P. J. Manec, Traité Théorique et Pratique de la Ligatures des Artères, fol. Paris, 1832. Also Alf. Velpeau, Nouveaux Elém. de Méd. Opératoire, t. i. p. 244.
† See Dr. Quain's Elements of Anatomy, p. 432. ed. 2d.

hyoid, and sterno-thyroid muscles, are the principal parts cut; but no vessel, nor nerve of importance, is injured. Yet if, instead of searching for the innominata from before backwards, and rather from above downwards, calculating from the sterno-clavicular articulation, the surgeon were to cut too far outwards, the pneumo-gastric and recurrent nerves, and the internal jugular vein, and principal branches of the subclavian artery, would be endangered.

First Method.—The patient is to be placed on his back, with his head considerably extended backward, so as to bring the innominata as high up as possible. The first incision is to begin immediately above the sternum, at the mid-point between the two sterno-mastoid muscles, and extend over the origins of the right sterno-mastoid muscle, three inches towards the right shoulder, at the distance of about half an inch above the clavicle. By this the skin, superficial fascia, and platysma myoides, are divided. Another incision, about two inches in length, is then made at the inner border of the right sterno-mastoid muscle, so as to join the inner end of the first. The next thing is to cut through the sternal origin and part of the clavicular attachment of the sterno-mastoid muscle, which may be safely done with the aid of a director. The flap is then reflected outwards. The operator has now brought into view the deep cervical fascia, and the outer portions of the sterno-hyoid and sterno-thyroid muscles, under which a director is to be passed, when they may be cut through with a probe-pointed bistoury. After this, a cutting instrument is not to be employed, but the artery separated from its connections with the aid of a director, or other blunt instrument; and, in detaching the vessel at its outer and posterior part, great care must be taken not to lacerate the pleura. The aneurism needle is then to be conveyed between the artery, the pneumogastric nerve, and the pleura on one side, and its point brought out between the artery and the trachea on the other. Manec considers the perpendicular incision superfluous, but Dr. Mott and Professor Graefe, who have had occasion to tie the innominata in the living subject, both made the incision at the inner side of the sterno-mastoid muscle. With regard to the fate of the patients, one died on the 26th day after the operation; the other on the 56th. A case under Mr. Lizars had a similar end.

Second Method.—An incision, between two and three inches in length, is first made near the lower part of the internal margin of the sterno-mastoid muscle, and parallel to it. With the fingers, or a director, the operator then separates the cellular tissue interposed between the sterno-mastoid and the sterno-hyoid and sterno-thyroid muscles, and then also separates that which intervenes between these two muscles and the trachea. On reaching the cellular tissue, in which the veins from the thyroid gland ramify, they are pushed aside, or cut through, after having been tied. The patient's head being now bent forward, the surgeon passes his forefinger be-

tween the trachea and the sterno-hyoid muscle, and feels the artery: with a blunt curved probe, it is separated from its connection, first on the right side, then on the left, and lastly below. The ligature is then applied, as already explained. This plan, which was suggested by the late Mr. King, has never been tried on the living subject.

LIGATURE OF THE SUBCLAVIAN ARTERY, WHERE IT PASSES OVER THE FIRST RIB.

The subclavian artery ought to be studied, first in the part, of its course before it reaches the scalenus[*]; secondly, where it is passing behind that muscle; and thirdly, from the outer border of the same muscle to the outer edge of the first rib.[†] In the first division of their course, the right and left subclavian arteries differ considerably. The right is larger and shorter than the left, which, as coming from the arch of the aorta, is more deeply placed. But, after reaching the internal edge of the scalenus anticus muscle, both arteries have nearly the same relations to other organs. In the latter, or third, division of its course, the artery lies deeply within a triangular space, bounded upwards and outwards by the omohyoideus; inwards by the scalenus anticus; and below by the clavicle. After passing from behind the scalenus, its direction is outwards and downwards over the pleura and a groove in the first rib. The left, however, lies more closely to the rib; the right being only in contact with its outer edge.[‡] The artery is necessarily beneath the clavicle and behind the subclavius muscle. Above, it is in contact with the dorsal nerve of the brachial plexus; while, in the direction forwards, and a little below the artery, is placed the subclavian vein, which reaches this situation by passing in front of the scalenus anticus, while the artery passes behind it. At this point, then, the scalenus anticus is interposed between the artery and the vein, with the phrenic nerve descending near the inner border of it. The cervical nerves, converging to form the brachial plexus, pass above and more backward than the subclavian artery, in front of the scalenus posticus, and consequently they and the artery must lie in the space between this muscle and the scalenus anticus. In the triangular space, already described, the artery may be got at by dividing the following parts:—1st, the skin; 2d, the superficial fascia; 3d, the platysma myoides; 4th, the deep cervical fascia; 5th, a quantity of cellular tissue, which is interspersed not only

---

[*] The right subclavian artery has been taken up in this place by Mr. Liston in two instances of subclavian aneurism, in University College Hospital. In one of the cases, the right carotid artery was also tied at its origin. In both examples, fatal hemorrhage ensued from the artery on the distal side of the ligature.

[†] See Dupuytren, Leçons Orales de Clinique Chir. t. iv. p. 528.

[‡] See P. J. Manec, De la Ligature des Artères.

with veins, and lymphatic glands, but pervaded by two arteries of importance, namely, first, the supra-scapular, which runs under the back edge of the clavicle towards the root of the coracoid process, and, secondly, the posterior scapular artery, which, after having arrived at the posterior angle of the scapula, descends along its base to its inferior angle. It is between these two arteries, then, that the surgeon has to make his way to the subclavian. When the attachment of the sterno-mastoid muscle to the clavicle is extensive, it is necessary to divide also a part of it. Within the above triangular space, the external jugular vein, as well as several of its branches, descends; and if it lie rather more towards the outer side of the neck than ordinary, and cannot be pushed sufficiently inwards, it may be indispensable to divide it after a double ligature has been introduced under it. In individuals whose necks are short, the first rib is situated very low, in relation to the clavicle, and consequently the depth of the subclavian artery is considerable. The same disadvantage may be produced by the aneurismal tumor pushing the clavicle upwards. In general, when the neck is long, the interspace between the clavicle and first rib is but moderate, and the subclavian artery is consequently less distant from the skin.† But one of the most essential points of surgical anatomy, with reference to the ligature of the third division of the subclavian artery, is the tubercle of the first rib, to which the scalenus anticus is attached, and close to the outer side of which the artery always passes.

Operation.—1. If the state of the disease will allow, the shoulder is to be depressed and pushed forwards. The situation of the external jugular vein having been ascertained in order that it may not be cut, if possible, an incision is made directly above the clavicle, and parallel to its posterior border, beginning one inch from the sternal end of that bone, and terminating at the insertion of the trapezius; or, I may say, that it should extend nearly to the anterior margin of the trapezius, about two thirds of the way along the posterior border of the clavicle. If the operator conceives that a freer division of the integuments will facilitate the operation, he may make a perpendicular cut an inch and a half long, which is to descend along the outer margin of the clavicular portion of the sterno-mastoid, and join the horizontal incision. 2. The skin, superficial fascia, and platysma myoides, having been divided, and the external jugular vein held to one side with a blunt hook, the surgeon may next divide a part of the sterno-mastoid muscle, if its extension outwards should render this proceeding advisable. 3. The omohyoideus, situated between the two layers of the cervical fascia, may now be seen crossing the outer extremity of the wound, and the deep cervical fascia is found to stop the surgeon's advance more deeply towards the artery; consequently it is to be cautiously divided with the aid of a direc-

---

† See Dupuytren, Leçons Orales de Clinique Chir. t. iv. p. 578.

tor, after which no further use of a cutting instrument should be made. 4. With a probe, or director, the surgeon now separates the cellular tissue, and searches for the external border of the scalenus anticus at the anterior and inner part of the wound,—a sure guide to the artery; for, by tracing it downwards with the left fore-finger, he is conducted to the tubercle of the first rib, immediately external to which, the artery will be felt pulsating. 5. Under the guidance of the same finger, the ligature is then cautiously introduced under the artery, by means of a common aneurism needle; or, if necessary, that invented by Weiss, or others expressly made to convey ligatures under arteries inconveniently placed for the use of common means. The point of the needle, which should never be too sharp, is to be passed under the artery, directed from before backwards, in order not to endanger the subclavian vein; and just at the moment when the needle is passing, the operator is to keep the artery down with his left fore-finger, so that the point of the needle may have room to be brought up, without getting hold of the lowermost nerve of the brachial plexus.

M. Blandin refers to an instance, in which the subclavian vein passed behind the scalenus anticus, between the muscle and the artery (Anatomie Topographique); and M. Manec saw an example, in which the subclavian artery was in front of the scalenus anticus, between that muscle and the vein. The possibility of such anomalies should be remembered.

LIGATURE OF THE SUBCLAVIAN ARTERY IN THE SECOND DIVISION OF ITS COURSE, OR BETWEEN THE SCALENI.

The operation is begun in the manner of the preceding one; and the tubercle of the first rib having been felt, a director, somewhat bent, is introduced behind the interior scalenus, and the lower attachment of this muscle divided with a probe-pointed bistoury. In this part of the operation, care must be taken not to injure the phrenic nerve, which descends along the inner margin of the scalenus anticus, and a little in front of it; nor the subclavian vein. The muscle, directly it is cut, is retracted, leaving the artery exposed, under which the director may then be passed in Dupuytren's way from without inwards, along the groove of which an eye-probe with the ligature is to follow. Thus, he avoided including the nearest nerve of the brachial plexus, and though the director and eye-probe were passed from without inwards, the subclavian vein was perfectly safe, because no instrument capable of puncturing it was employed.

LIGATURE OF THE BRACHIAL ARTERY IN THE MIDDLE AND UPPER PARTS OF THE ARM.

The brachial artery commences at the lower margin of the axilla, and terminates about three quarters of an inch below the bend of the elbow, its course corresponding to a line drawn from the centre of the armpit to the middle point between the condyles of the humerus. In the upper half of the arm, it lies near the inner margin of the coraco-brachialis, and then crossing over the insertion of this muscle, it becomes situated at the inner side of the biceps, which partly overlaps it, especially when the fore-arm is in the prone position. At first, the artery lies in front of the triceps muscle, but below the insertion of the coraco-brachialis: the muscle, on which it rests during the rest of its course, is the brachialis anticus. The median nerve, which, above, runs along its acromial margin, soon gets in front of it, and, crossing it about the middle of the arm, lies completely upon its inner side below. Two satellite veins accompany the artery, and sometimes even cover it, or separate it from the median nerve. The ulnar and internal cutaneous nerves, which run near the artery above, separate further and further from it, as they descend. In thin subjects, the artery is but a very little way under the fascia, which sends off a duplicature, for the investment of the artery, the accompanying veins, and the median nerve. In the lower third of the arm, the trunk of the basilic vein lies over the track of the artery. Amongst the anomalies deserving notice, is the high bifurcation of the artery, a frequent occurrence[*]; and the occasional passage of the median nerve under the artery[†], a rarer circumstance. In all ordinary cases, this nerve is the first cord met with behind the inner edge of the biceps, below the insertion of the coraco-brachialis.

In selecting the place for the external incision, four circumstances serve as our guide. 1. In the upper part of the arm, the inner border of the coraco-brachialis, which, in a muscular person, rather overlaps the vessel, but below the insertion of this muscle, namely, all along the lower half of the arm, the inner edge of the biceps denotes the best place for the external incision. 2. The oblique line drawn from the middle of the armpit to the middle of the space between the condyles of the humerus. 3. Placing the fingers of the left hand on the track of the median nerve, and making the incision just at its inner side, as directed by Lisfranc with reference to the lower half of the arm. 4. The pulsation of the artery.

---

[*] In a case of circumscribed false aneurism, Dr. Browne, of St. Mark's Hospital, tied both branches with success, the omission of which practice has in some other instances been followed by the death of the patients from hemorrhage. See Dublin Journ. of Med. Science, vol. viii. p. 253.

[†] See Velpeau, Nouveaux Elém. de Méd. Op. t. i. p. 212.

An incision, three inches in length, having been made through the integuments, the surgeon passes his left forefinger into the wound, and ascertains again the precise situation of the artery and median nerve. With the aid of a director, the fascia is next divided to the extent of the external incision. The median nerve is the first cord now met with at the inner margin of the biceps, and is easily known by its firm round feel and white color: it is to be separated with a probe or director from the sheath, and the artery will be found either directly under it, or, if the operation be done low down the limb, at its external side. Further inwards, lies the internal cutaneous nerve; and five or six lines backward, is the ulnar. The sheath having been opened, the ligature is to be passed under the artery, with the precaution of not including the veins.

In order not to mistake the ulnar for the median nerve, which would cause much confusion, it is advantageous to direct the incisions from the front towards the back of the limb.

In the upper part of the arm, the external incision is to correspond to the inner margin of the coraco-brachialis; and, very high up, the median nerve will present itself on the acromial side of the artery.

LIGATURE OF THE BRACHIAL ARTERY AT THE BEND OF THE ELBOW.

An incision is to be made, two inches and a half or three inches long, parallel to the radial edge of the pronator radii teres, beginning nearly an inch above the trochlea, and ending at the central point between the condyles of the humerus. Under the skin are situated the median and basilic veins, with the accompanying branches of the internal cutaneous nerve. An assistant holds these vessels aside with a blunt hook, or the end of a bent probe. The fascia is now arrived at, which should be divided on a director, as well as the aponeurosis coming off from the biceps. Then, having detached the artery from the adjacent cellular tissue and fat, and from the deep veins, as well as the median nerve, the surgeon should pass an eye-probe between the artery and the latter nerve. The artery will be found resting upon the inner portion of the brachialis anticus, between the biceps and the pronator radii teres. Pursuing its course downwards and forwards, and from within outwards, it crosses completely over the tendon of the biceps low down. A deep-seated vein runs near its radial margin; and the median nerve, which sometimes touches its ulnar edge, is often separated from it by a few fibres of the brachialis.*

---

* See Velpeau, Nouveaux Elém. de Méd. Opératoire, t. i.

LIGATURE OF THE EXTERNAL ILIAC ARTERY.

The aorta, having reached the body of the fourth lumbar verte-bra, bifurcates into the two common iliac arteries, which diverge from one another as they pass to the sacro-iliac symphysis. Here each of these trunks subdivides into the internal and external iliac arteries. From the sacro-iliac symphysis, where the external iliac artery begins, down to Poupart's ligament, where it terminates, it describes a gentle curve with the convexity outwards, which curve is greater in women than men, and always more marked the broad-er the pelvis is. The course of the artery is obliquely downwards and outwards, to the middle point between the anterior superior spinous process of the ilium, and the symphysis pubis. In its de-scent, it lies upon the inner border of the psoas muscle, with the external iliac vein at first behind it, and afterwards on its inner side, connected to it by a loose cellular tissue, that is readily torn. The anterior crural nerve is separated from the external iliac artery by the psoas muscle. The artery is connected behind to the iliac fas-cia by a cellular tissue, which adheres firmly to each side of the ves-sel. In front of this fascia is the peritoneum, loosely connected to it. The internal branch of the genito-crural nerve, in its descent from the lumbar plexus to the upper and internal part of the thigh, runs along the inner and front surface of the artery. Several lym-phatic glands are contiguous to the artery, as it passes down to Pou-part's ligament. The ureter crosses over the lower part of the common iliac artery, and the spermatic vessels cross in front of the external iliac artery. No branches are given off from the latter ar-tery until it has nearly reached Poupart's ligament, where the cir-cumflexa ilii arises from its outer, and the epigrastric from its inner side. The intestines, lying between the artery and the parietes of the abdomen, may readily be lifted up from that vessel, together with the peritoneum. For the purpose of applying a ligature to the external iliac artery, the following parts must be divided:—1. The integuments. 2. The superficial fascia. 3. The aponeurosis of the external oblique muscle. 4. The internal oblique muscle. 5. The transverse muscle. 6. The fascia transversalis. But the pe-ritoneum, which can be raised from the iliac fossa, should not be wounded. Care must also be taken not to injure the external iliac vein, and the epigastric artery, which ascends obliquely upwards and inwards, between the fascia transversalis and the peritoneum, at the inner side of the internal abdominal ring. In consequence of the situation of the origin of the internal iliac artery, a ligature cannot be applied more than three inches above Poupart's ligament, without great risk of failure.

Operation.—Abernethy's Method.—The incision is made through the integuments, beginning above Poupart's ligament, half an inch

on the outside of the abdominal ring, and extending obliquely upwards about three inches in the course of the artery. The skin, superficial fascia, and aponeurosis of the external oblique muscle having been divided, the left forefinger is introduced, at the lower angle of the incision, under the lower border of the internal oblique and transverse muscles, which are also to be divided with a probe-pointed bistoury to the extent of an inch and a half. The fascia transversalis having been cautiously opened with the aid of a director, the peritoneum and bowels are to be pushed upwards and inwards over the psoas muscle, so as to expose the external iliac artery, an inch and a half, or two inches, above Poupart's ligament. With a common aneurism needle, or that of Weiss, a ligature is then passed under the artery from within outwards, by which means the vein will not be endangered.

Sir Astley Cooper's Method.—A semilunar incision, three inches long, is made through the integuments, in the direction of the fibres of the aponeurosis of the external oblique muscle, with its convexity downwards and outwards. It commences a little way in front of the anterior superior spinous process of the ilium, and terminates near the abdominal ring. The aponeurosis of the external oblique muscle is next divided in the same direction. On raising the semilunar flap, the spermatic vessels are seen and these serve as a guide to the opening in the fascia transversalis, named the internal abdominal ring, a little to the inner side of which the epigastric artery runs. The finger being now passed below the cord, the external iliac artery will be felt pulsating directly behind the internal ring, where it may be easily taken up. The latter opening is placed nearly at the mid point of the crural arch. It is to be divided in the direction outwards with a probe-pointed bistoury, guided along a director.

Mr. Norman cuts in the direction of Poupart's ligament; but, in other respects, follows Sir Astley Cooper's plan. M. Roux begins the incision a little above, and half an inch from the spine of the ilium, and lets it terminate at the centre of the crural arch.

Velpeau's Method.—A slightly curved incision, three inches long, is made parallel to Poupart's ligament, but a little above it, the centre of which is to correspond to the place of the artery. By the first stroke of the knife, the skin and superficial fascia are divided. Then the aponeurosis of the external oblique, which is cut on a director. Next the fibres of the internal oblique present themselves, the lower portion of which are detached with the end of a probe, or director, and pushed with it upwards and backwards, while the lower margin of the wound is pressed downwards with the forefinger of the left hand. The fascia transversalis is torn in the same way as far as the spermatic cord, which is to be pushed in the same direction as the fibres of the internal oblique.

The cellular tissue, connecting the artery to the iliac fascia, is now ruptured with a probe or director, which instrument is then to

be conveyed to the inner side of the artery, and moved gently backwards and forwards, in order to separate the artery from the vein. The ligature is next conveyed under the artery with an eye-probe, or an aneurism needle. Care is taken to tie the artery sufficiently above the epigastric. Béclard lost his patient by placing the ligature below it; and hence, Bogros always looks for the epigastric, before he searches for the external iliac.

During the other steps of the operation, the abdominal muscles should be relaxed, and the patient make no efforts, for otherwise the bowels will force themselves against the wound, and the peritoneum be exposed to injury. Whatever method be preferred, the course of the epigastric artery at the inner side of the internal ring, between the peritoneum and the fascia transversalis, must be remembered. In one instance it was wounded by Dupuytren.

LIGATURE OF THE COMMON ILIAC ARTERY.

The bifurcation of the aorta generally takes place on the fifth lumbar vertebra, but sometimes on the fourth, which circumstance must make a difference in the length of that artery, in different subjects. The right common iliac artery is longer than the left, because the bifurcation of the aorta is situated rather to the left of the median line. The right common iliac artery descends obliquely over the last lumbar vertebra, from which it is separated by the common iliac veins in their passage to the vena cava. Its own corresponding vein is first behind it, and then internal to it; while, on the left side, the common iliac vein runs along the inner side of the artery, having first passed under the right common iliac artery. The common iliac artery lies behind the peritoneum, and is crossed by the ureter just before it reaches the sacro-iliac symphysis, where it divides. The left has the sigmoid flexure of the colon in front of it; and the right, a portion of the ilium.

In Dr. Mott's plan, an incision is begun on the outside of the abdominal ring, half an inch above Poupart's ligament, and extended, about eight inches, to a point above the anterior superior spinous process of the ilium, in a semicircular form.

Mr. Crampton's incision, the concavity of which was towards the navel, was seven inches long, and reached from the last rib to the anterior superior spinous process of the illium. The layers of the abdominal muscles, and the fascia transversalis, having been divided, the peritoneum and the bowels are then pushed forwards and inwards which will also lift the ureter off the lower portion of the artery. While an assistant holds the peritoneum and the bowels out of the way, the surgeon passes the ligature under the artery, with due regard to the situation of the vein.

LIGATURE OF THE INTERNAL ILIAC ARTERY.—MR. STEVENS'S METHOD.

An incision, five inches in length, is made six lines from the outer side of the epigastric artery, and parallel to the course of this vessel. The skin, muscles, and fascia transversalis, having been successively divided, the peritoneum is separated with the fingers, from the psoas and iliac muscles, and pushed inward as far as the bifurcation of the common iliac artery. The pulsations of the internal iliac may then be felt in the deep part of the wound.

LIGATURE OF THE FEMORAL ARTERY.

The femoral artery extends downwards along the anterior and inner part of the thigh, from the lower termination of the external iliac artery and the body of the os pubis, down to the upper part of the popliteal space; or we may say, that it begins at the crural arch, and terminates at the junction of the middle with the lower third of the thigh, where it passes through an opening in the adductor magnus, and then becomes the popliteal artery. The direction of its course corresponds to that of a line, drawn from the middle of Poupart's ligament, obliquely inwards round the thigh, to the popliteal space. But, as Dr. Quain has remarked, if the knee be semi-flexed, and the limb rotated outwards, the course of the vessel may be marked out by a line, drawn from midway between the anterior superior spine of the ilium, and the symphysis pubis, to the lower border of the patella. The femoral vein accompanies the artery through its whole course, being placed at first on its inner side, and on the same level with it, but getting behind, or under it, still a little inwards, about two inches below the os pubis, and maintaining this position to the end. The artery, as it descends, becomes gradually deeper. At first, it lies on the inner border of the psoas muscle, by which it is separated from the os pubis, the brim of the acetabulum, and the hip-joint. Lower down, it gets on the pectineus and adductor brevis; next on the adductor longus; and lastly on the united tendons of the latter and the adductor magnus. Externally, the psoas muscle is interposed between its upper portion and the anterior crural nerve, which, in the groin, is situated about three quarters of an inch to the outside of the artery. The sartorius crosses the artery very obliquely, being, above, completely to the outside of it: in the middle part of the thigh, covering the artery; and below, lying on its inner side. Two or three branches of the anterior crural nerve run for some way along the sheath of the artery; and the largest of them, the nervus saphænus, having entered the sheath, descends along the upper and outer side of the artery in the middle part of its course. In the upper third of the thigh, the femoral

artery is covered only by the integuments, the superficial fascia, the inguinal glands, and the fascia lata. In the middle third, it is additionally covered by the sartorius, directly under which is a fascia extended from the adductor muscles to the vastus internus, thin above, but dense lower down, and constituting another texture lying over the artery. In the Museum of University College is a fine specimen of a double femoral artery, the two divisions afterwards conjoining again into one trunk. Examples of a double femoral vein are also on record.*

OPERATION IN THE UPPER THIRD OF THE THIGH.

This part of the limb is preferred by Scarpa and many other excellent surgeons, on account of the artery being more superficial than in the middle third of the thigh. An incision, three inches in length, is made through the integuments and superficial fascia, in the track of the artery, as above specified, and the determination of which in the living body is rendered easy by the pulsations of the vessel, except in fat subjects. The centre of this cut should be nearly four inches below Poupart's ligament, unless circumstances were to compel the surgeon to take up the artery immediately below the crural arch—between the profunda and the epigastric arteries. The knife is to be carried down in the track of the vessel, but rather to the outer than the inner side of it, in order to avoid the vena saphena major, which enters the femoral vein in this part of the thigh. The fascia lata having been exposed, the surgeon previously to dividing it, is to remember, that, in the direction downwards, the inner edge of the sartorius separates it from the artery, which is not the case in the upper part of the inguinal triangle. The fascia having been opened nearly to the same extent as the integuments, a portion of the femoral sheath is to be lifted up with a pair of forceps, and divided, but only so far as to make room for the ready passage of an eye-probe, or aneurism needle, round the artery, in which step of the operation the instrument should be introduced on the pubic side of the artery, between this vessel and the vein, and with the point turned away from the latter, and brought up again at the external side of the artery. The branches of the anterior crural nerve should not be included in the ligature, one half of which, after a knot has been made, is to be cut off, so as to lessen the quantity of extraneous matter in the wound. The edges of the incision are then to be brought together.

OPERATION IN THE MIDDLE OF THE THIGH.

The limb is to be slightly bent, rotated outwards, and placed on

---

* See Dublin Journ. of Med. Science, No. xxvii.

its outside. An incision, three inches in length, is made through the integuments and superficial fascia, in the track of the artery, or rather in a line corresponding to the inner edge of the sartorius. The fascia lata having been next divided to nearly the same extent, the sartorius presents itself, and may be recognised by the direction of its fibres downwards and inwards. As soon as this muscle is raised, the fascia extending from the adductor muscles to the vastus internus is seen, and will require to be carefully divided, for the purpose of exposing the sheath of the femoral vessels.

For the purpose of more certainly avoiding the vena saphena major, Mr. Copland Hutchinson, and M. Roux, are advocates for making the incision on the outer side of the sartorius, which is to be pushed inwards. This is not, however, the common practice. The arterial sheath is opened, and the ligature applied, according to rules already given.

LIGATURE OF THE POPLITEAL ARTERY.

The patient is to lie upon his face with the leg moderately extended. When the *lower portion of the vessel* is to be secured, an incision, three inches long, is made in the median line of the limb, through the skin and subcutaneous fat and cellular tissue, care being taken to push the external saphænal vein outwards, if it should present itself. After the fascia has been divided, some surgeons lay down the knife, and, having separated the cellular tissue and fat with a director, and likewise the head of the gastrocnemius, take up the artery with the precaution of detaching it from the nerve and the vein with the director.

ABOVE THE CONDYLES.

Here the external saphænal vein may be more easily avoided. The incision should be longer, and rather nearer the inner, than the external margin of the ham, at least above; and it should descend in a slightly oblique direction to the point over the space between the condyles. Under the fascia is the nerve; more deeply and inwardly lies the popliteal vein; and quite towards the bone, and on the inner side of the vein, rather under it, the artery; which is generally separated with difficulty from the latter. In the instance of a sloughing ill-conditioned wound, attended with hemorrhage from the posterior tibial artery, however, where I had occasion to tie the popliteal artery in University College Hospital, the vein, which was soon recognised by its dark blue color, did not occasion any difficulty in getting the ligature round the artery, and the operation, which was completed with the utmost facility, did not occupy more than three or four minutes. As Dr. Duncan of Edinburgh, Mr. Chandler of Rotherhithe, the two house-surgeons, Mr. Wallace,

and others, well know there was none of the trouble experienced which has, somewhere or another, been very erroneously described. What is of more importance, the operation put a permanent stop to the hemorrhage. In this case, the fact of an artery not conveying the slightest sensation of throbbing, when exposed, and touched, was most unequivocally exemplified.

DIVISION OF TENDONS FOR THE CURE OF CLUB-FOOT, AND OTHER DEFORMITIES.

Synonymously with the term " club-foot," Dr. Little employs the word *talipes*, as a generic term to embrace all those deformities of the feet, which arise from the contracted state of certain muscles; and he uses the terms *varus*, *valgus*, and *equinus*, to designate the specific forms of such deformities.

The least complex is the *talipes equinus*, which consists in a simple extension of the foot, by which the heel is elevated, and the patient rests upon the toes and metatarsal bones, no part of the sole behind the latter touching the ground. By the habitual disuse of the limb, the full developement of its bones is impeded, and its muscles are small and flaccid.

The most frequent of these deformities is the *talipes varus*, combining extension with adduction of the foot; and, to these characteristics, a third may be added, viz. a rotation of the foot, somewhat analogous to supination of the hand, in a greater or lesser degree, according to the severity of the disease. The inner edge of the foot is thus raised from the ground, forcing the sufferer to walk entirely on the outer margin.

In the *talipes valgus*, which is comparatively rare, there is a partial bending of the ankle, with abduction and a rotation of the foot, by which the outer edge of the sole is raised from the ground. In a complete case, the patient treads entirely upon the inside of the instep, and upon the malleolus internus.*

Passing over the palliative treatment by means of friction, shampooing, electricity, the moxa, &c. applicable to some cases, it is certain that all these varieties of deformity may, and frequently do, require the knife. In most cases of talipes equinus, the section of the tendon of Achilles will restore the foot to its proper position. For this purpose Dr. Little prefers a small, curved, sharp-pointed bistoury, with a concave edge, the cutting part of the blade being seven tenths of an inch in length, and the greatest width one tenth, in order that the external puncture may be small. The patient being seated, an assistant supports the knee, whilst another, drawing down the patient's heel with his left hand, and pressing upwards the

---

* See a Treatise on the Nature of Club-foot, and Analogous Distortions, by W. J. Little, M. D. 8vo. Lond. 1839.

toes and front of the foot with his right, produces the necessary degree of tension in the tendon about to be divided. The bistoury is passed through the skin, one or two fingers' breadth above the malleolus internus, with one of its sides turned towards the tendon, and the other forwards. As soon as the point has passed beyond the external edge of the tendon, and nearly reached the skin of the opposite side, the knife is turned, so as to bring its edge against the anterior surface of the tendon, which is then divided by withdrawing the knife, and usually at one stroke.*

It is a matter of importance to let the external wound be small; and hence some operators use a sharp-edged needle. If a tendon be cut, and an extensive division of the skin over it be made, suppuration is likely to ensue; and, if this be protracted, a portion of the tendon may either slough, or become adherent to the integuments, so as to render the operation more or less a failure. The healing process should not be disturbed by premature attempts to extend the limb. The wound should be closed before extension is commenced; and, for this purpose, two or three days are generally sufficient. During this period, the limb may be laid on its outside on a pasteboard splint. The flexion of the foot is to be maintained with mechanical means. One of the most simple contrivances is a band, or strap, extending from the point of the shoe to the fore part of another band, or strap, placed round the limb above the knee. But various means are preferred by different operators. In some obstinate cases of talipes equinus, Dr. Little has found it necessary to divide the tendons of the tibialis posticus and flexor longus pollicis.

The treatment of talipes varus consists in dividing the tendon of the gastrocnemius; and, if the case be of long standing, it may also be requisite to cut the tendons of the tibialis anticus, and tibialus posticus, when the extensor and flexor proprius pollicis, as exemplified in cases recorded by Dr. Little.

In the talipes valgus, Dr. Little refers the deformity chiefly to the peronei muscles; though it is usually necessary to divide also the tendo Achillis, and even the tendon of the tibialis anticus, before the foot can be restored to its natural position.

Stromeyer, by means of a small boot, with a long spring operating in a direction opposed to the abnormal eversion, succeeded in a few months in curing a talipes valgus in a very young infant.

The youngest patient, in whom Dr. Stromeyer divided the tendo Achillis for talipes varus, was eight months old. Dr. Little operated on one child of twenty months; and Mr. Whipple on another aged fourteen months. With regard to the other extreme, Dr. Little narrates a case, (No. xxxiv. p. 258.) of non-congenital distortion from contraction of the gastrocnemii and other muscles,

---

* Little, Op. cit. p. 30.

converted by exercise into a deformity, resembling talipes varus: the cure was accomplished by dividing the tendo Achillis, though the disease had existed forty-eight years.

Just as I was closing this volume, I had a consultation with Dr. Little on a gentleman, who, in consequence of an extensive necrosis of the tibia, now cured, for which I formerly attended him, with Mr. Earle, is unable to bring his heel to the ground. The patient, who was referred to us for an opinion by Mr. Wood, of Rochdale, Lancashire, after having long had recourse to mechanical contrivances in vain, has been recommended to try what benefit will result from the division of the tendo Achillis. As the case, on account of its origin from the effects of necrosis, is very interesting, I trust that Mr. Wood will take an opportunity of letting the profession hear the result of the proposed treatment.*

STRABISMUS.

[*Strabismus*, or *squinting*, is a loss of the proper parallelism of the eyes, so that the two do not act in harmony in vision.

The affected eye may turn inward, and then it is denominated strabismus *convergens;* or it may turn outward, when it is called *divergens:* these are the two most common deformities. At times, however, both of the eyes are turned inward, and then we have what has been called *double convergens.* Now and then, cases are met with, in which the affected organ is thrown upward, or downward, from the parallelism.

The divergent form of squinting is very rare, when compared with the convirgent. Mr. Duffin reports to have seen only *three* cases of divergens, in upwards of four hundred. Mr. Estler of Bristol mentions to have seen, in one hundred cases, ninety-two of convergens, and eight of divergens. Mr. R. C. Hall, of Manchester, operated on two hundred cases, thirty-two of which were divergens. My own experience would lead me to say, that this variety is not met with oftener, than five or six times in a hundred cases.

It is difficult to assign any positive reason for the more frequent occurrence of the convergent form of the disease. The internal rectus is somewhat larger than the external, and this last has a nerve distinct from that of either of the other recti. The sixth pair of nerves, or abducentes, have their origin just below the pons varolii, and may on that account, be more exposed to any influence, produced by fluctuations in the actions of the vascular system, and thus be the cause of weakness in the external rectus.

In nearly all cases of squinting, there is some impairment of vision.

---

* The reader should consult, in addition to Dr. Little's valuable work, Bieträge zur Operativen Orthopädik. 8vo. Hanover, 1838. Whipple, Lond. Med. Gazette, vol. xx. p. 826, who differs from Stromeyer and Dr. Little in having recourse to flexion of the foot, directly after the tendon has been cut. M. Bouvier, Mém. sur la Section du Tendon d'Achille, &c. 4to. Paris, 1838. Also a judicious account of the subject in British and Foreign Med. Review, No. 16, art. 5.

Whenever the sound eye is closed, the other will come into its proper axis, but the patient cannot see as well as with the other ; though I have found in several instances, that after using the squint eye stead-ily for a time, it would recover its power, and the strength of the other would decrease from want of exercise. Sometimes one eye is permanently fixed, while the other turns to take in objects within its field of vision ; then we have what has been termed *luscitas.*

It has been stated, that the disparity in the power of the two eyes was the cause of Strabismus, the mind taking cognizance of the im-pressions upon one eye only, and the other turning aside, that it may not interfere and produce confusion. I doubt the correctness of this opinion, believing the deficiency of power to be the effect, rather than a cause, of the squinting. The deformity comes on very suddenly, as a general thing ; whereas if it depended upon previous weakness, it ought to make its appearance more gradually. The Strabismus may be single or it may be double, and varies much in degree, and often when both eyes are concerned, the patient is very near sighted. Com-monly, when both eyes are affected, the vision of one eye is better than the other : this however is not always so. In a recent case, the patient complains of double vision, but this passes away in a few days. Squinting though generally permanent, is at times temporary, espe-cially in children who are suffering from abdominal irritation. Drunkenness, will also produce a temporary variation in the parallel-ism of the two eyes.

The *causes* of squinting are numerous, such as congestion of the brain, and convulsions ; hydrocephalus ; blows upon the head ; irrita-tion in the alimentary canal, from dentition or indigestible substances. Rubeola, variola, and scarlatina, are often followed by strabismus. Pertussis is often accounted a cause of this deformity, and inflamma-tion of the eye itself may produce it. Children are believed to pro-duce the difficulty, by *imitating* the deformity in others, or by looking steadily at the tip of the nose, or at a patch or scar.

As to the condition of the muscles, the proper balance of power is lost between the internal and external recti : still, except in a very few cases, there is no paralysis of the latter. This is demonstrated by the success of the operation, for if there were paralysis, the cutting of the contracted muscle, would avail nothing ; for the eye would remain stationary. Again if we cover the sound eye, the other will pass at once into the direct axis of the orbit, and move in obedience to the will, in order to observe objects in any position.

In a few of the cases of divergens which I have seen, the difficulty depended upon loss of power, or paralysis of the adductor muscle ; while in *all* the cases of convergens, the deformity seemed to arise from an undue contraction of the internal rectus.

Before proceeding to the proper treatment in these cases, nothing can be more essential, than that the anatomy, exterior to the globe of the eye, be well understood. We first notice the conjunctiva ; and this, when the strabismus is of long standing, has adapted itself to the position of the eye : and that of itself when the convergence is strong, will prevent the eye from reaching the direct axis of the orbit. Below this membrane is the sub-conjunctival fascia, which is less

yielding than the conjunctiva. Beneath these two layers are the muscles, included in a fascia, which stretches over both their orbital and ocular surfaces, and extends so as to form a firm membrane between their margins. In this way we have a firm coat, composed of muscles and fasciæ, which extends from a few lines behind the cornea, and stretches backward so as to cover most of the globe of the eye. Between this musculo-fascial layer, and the sclerotic tunic, is another thin fascial lamina, which comes up in that anatomy of the eye which is concerned in the treatment of strabismus.

When we come to the treatment in a case of strabismus, it is absolutely necessary that we comprehend its nature, and the cause upon which it depends. If there be paralysis of one of the muscles, which may be ascertained by covering the well eye, and observing whether there be motion of the other, in obedience to the will; we can anticipate but little good from an operation. If the squinting be recent, and connected with some temporary abdominal irritation, some undue fulness of the vessels of the brain, or some strong mental excitement, we have only to attend to the exciting cause, and probably when that is removed, the eye will assume its normal position. Sometimes we meet with cases of strabismus, which have arisen from some opacity of the cornea, resulting from inflammation, and where the change in the position of the eye, has been for the purpose of admitting light to the retina. In such a case an operation is to be deprecated. Again when an eye is amaurotic, it often assumes an abnormal position: when such is the case nothing will be gained by an operation.

An operation is indicated, then, when the strabismus depends upon a loss of balance between, and not on a loss of power in, the muscles; and when the squint eye, (the sound one being covered,) moves in accordance with the will. In such a case we can promise much to the patient, if the operation be carefully and judiciously performed. Soon after the introduction of the operation, many who dared not touch a knife on other occasions, sought out cases and operated for squinting. The result has been that very considerable injury has been done to patients, and much discredit brought upon the operation. It is one of the most beautiful operations in surgery, and there is none more successful, or more happy in its result, when the case is properly selected, and the operation is understandingly performed. It obviates a very striking and unpleasant deformity, and gives the patient another eye *for use*. It is one of the triumphs of modern surgery.

Before proceeding to the details of the operation, I would mention that it was first suggested by Dr. Stromeyer of Hanover, the pioneer in the operation for talipes, in 1838; but that to Prof. Dieffenbach, of Berlin, belongs the honor of having first *performed* it. This was done by him in 1840. The same year, the operation was repeatedly performed in England, France, and America.

There are several methods of operation laid down by different surgeons, depending upon the instruments employed, the position of the patient, or the manner in which the parts are cut. With these methods we have connected the names of Dieffenbach, Ammon Liston, Guthrie, Lucas Velpeau, Guerin, Gross, Paucoast, Port, &c. Each

of these gentlemen claims a preference for his own operation, as we should expect; still there is not much choice among them; some adopt a more, and some a less complicated procedure. My own preferences are always in favor of the more simple course. In order to perform the operation, we require *three* instruments: a pair of delicate pointed thumb forceps, a pair of small scissors, (it matters but little whether they be straight, or curved on the side or edge, blunt, or pointed,) and a blunt hook to pass under the muscle. We require one assistant, if the patient be an adult, and two, if it be a child. The patient may either sit or lie as is most agreeable. If it be a child we are about to operate upon, he must be held firmly in the lap, the hands being secured. An assistant supports the head, and at the same time separates the palpebræ. The well eye may, or may not be covered, it matters but little. The operator now takes his thumb-forceps and scissors in hand, and while the patient turns the eye outward as far as he well can, he seizes the conjunctiva one line outward from the caruncula, this enables him to hold the eye steady, while with the scissors he makes an opening in the conjunctiva, in a vertical direction, about three quarters of an inch long. He then lays his scissors one side, still retaining his hold with the forceps, and takes up the blunt hook, which he introduces from below upward, under the muscle; when the muscle is secured upon the hook, the forceps are dispensed with, and the scissors again taken in hand, and the muscle freely divided. The steps of the operation are, properly speaking, four: First, the seizure of the conjunctiva with the forceps, so as to control the eye; Second, the cutting of the conjunctiva with the scissors; Third, the introduction of the blunt hook; And fourth, the division of the muscle.

When the operation is completed according to the above process, it rarely happens that the eye at once resumes its proper parallel axis. It will be found necessary to carry the incision further. A few filaments of the muscle being left, they will turn the eye in, and defeat the operation. The blunt hook must be introduced again, and the remainder of the muscle cut. When it is entirely divided, the sclerotic tunic can be distinctly seen, and beside, if the fibres are all divided, the patient will have no power to turn the eye strongly inward toward the nose. Notwithstanding all this, the eye sometimes does not assume its proper parallelism; then the operator should proceed to divide the conjunctiva and fasciæ, upward and downward, two lines distant from the cornea, and when these membranes, which are too short to allow the organ to turn outward sufficiently far, are divided, the eye will assume its proper position. We cannot exercise too much care in this last part of the operation. We should divide but a little at a time, for there is danger of inducing the strabismus divergens, which is worse than the convergens. There is another difficulty which sometimes occurs, if we are incautious, and divide the conjunctiva and its fascia too far; the eye suddenly protrudes and causes a bad deformity.

I have often operated and divided the muscles, and other parts, and still the eye did not turn out sufficiently. By directing the patient

to accustom himself to turn the eye outward as far as possible from time to time, in a few days I have had the satisfaction of seeing the organ brought to its proper parallel axis ; probably in consequence of the increase of power in the external rectus, from diminishing the over extension of the muscle, and from the exercise. I have never found it necessary to divide either of the oblique muscles.

When we have operated, we sometimes find the eye slightly divergent. Our patient should then be directed to look inward, instead of outward, and we may calculate, that the contraction from cicatrization, will restore the organ to a right position.

It often happens after an operation, that the patient complains of double vision. We may give every assurance, that it will pass away in a few days.

There is generally but little after treatment required. I advise that the eye be not exposed to strong light, and that it be kept wet with cold water ; and rarely, very rarely, have I had any inconvenience from inflammation. Frequently after the lapse of two or three weeks, the patient will call our attention to a fungus in the inner canthus : this should be removed with the scissors, and the part touched with the nitrate of silver, and nothing more will be required.

There is another mode of operation which is called the sub-conjunctival, which was introduced by Guerin. It will do to talk about, but I am confident it can never succeed in practice. The operation is simple, the muscle can be divided, but there will still be left the conjunctiva and the fasciæ, which will retain the eye inward, and certainly defeat the object of the operation.

There is also another objection to the sub-conjunctival method, it often permits a troublesome amount of extravasated blood.—Ed.]

THE END.