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THE

INSTITUTES AND PRACTICE

OF

SURGERY:

BEING THE

OUTLINES

OF

A COURSE OF LECTURES,

BY

WILLIAM GIBSON, M. D.

PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA, SURGEON AND CLINICAL LECTURER TO THE ALMS-HOUSE INFIRMARY, &C.

Segnius irritant animos demissa per aurem,
Quam quæ sunt oculis subjecta fidelibus.—*Hor.*

SECOND EDITION, WITH ADDITIONS.

VOL. II.

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THE

INSTITUTES AND PRACTICE

OF

SURGERY.

CHAPTER I.

DISEASES OF THE BONES AND JOINTS.

After having detailed, under the heads of fracture and dislocation, the particular *injuries* to which the bones and joints are exposed, it will be proper to speak of the peculiar *morbid* affections to which these parts are liable. The diseases of the bones most commonly met with, perhaps, are caries, necrosis, and exostosis; on the contrary, spina ventosa, osteo sarcoma, mollities and fragilitas ossium and rachitis, are rarely seen. The principal diseases of the *joints* are coxalgia, fungus articuli, hydarthrus, anchylosis, and the growth of cartilaginous bodies within the articular surfaces. Each of these will be noticed in regular succession.

Section I.

Caries.

By the older surgeons this disease was often confounded with necrosis; it differs from it, however, in the same way that ulceration differs from sphacelus—caries being the result of an inflammatory action which alters the texture of a bone without destroying its vitality—necrosis the consequence of a peculiar influence that involves the complete or partial death of the original bone, and, at the same time, repairs the injury by the formation of a new one.

The bones are all liable to caries, though the soft or spongy ones, such as the vertebræ, sternum, head of the thigh bone, the bones of the carpus, tarsus, &c. more frequently suffer than any others. Sometimes the disease may be traced to local injury; at other times it appears to result from constitutional indisposition, such as scrofula, syphilis, &c. However induced, it is rendered manifest by pain and swelling in the affected part, by a softening or dissolution of the bony fabric, which crumbles away upon the slightest touch, by the discharge of a fetid blackish matter, and by the luxuriant growth of pale fungous granulations. If not arrested by an operation or by appropriate remedies, the disease generally proceeds until one or more bones are destroyed. Sometimes the patient dies from constitutional irritation; in other instances a cure is effected by the absorption of the diseased part, and a

deposition of healthy bony matter in its place. But this seldom happens without being followed by more or less deformity. Among delicate females, I have met with several cases of caries of the wrist, brought about by slight injuries, which have proved very obstinate and sometimes altogether intractable.

Treatment of Caries.

When caries depends upon a syphilitic, scrofulous, or scorbutic taint, or upon any constitutional disorder, general remedies must be resorted to. When it arises from local injury, the chief indications in the cure, are to combat inflammation, to keep the parts perfectly at rest, and to remove any diseased portions of bone as soon as they become loose. The second indication is a very important one, and will be most effectually accomplished by the use of splints adapted to the shape of the diseased part. If, for instance, the bones of the carpus are affected, a splint should be carved out of some light wood, and made to support the fingers, hand, and fore-arm. In addition, the fore-arm, placed in a sling, should be carried across the chest, and the hand made to rest nearly upon the opposite shoulder. This will serve to drain the blood from the limb, and to diminish the inflammation. By these means cures are sometimes effected, after the failure of all other remedies. Many surgeons, particularly the French, are in the habit of removing carious bones by the actual cautery, and by cutting instruments. So far as I have observed, little benefit appears to result from the practice ; indeed in several instances I have witnessed very injurious effects from this mode of treatment ; so much so, that I make it a rule never to attempt the removal of a carious bone unless

I find it, sua sponte, nearly detached.* In numerous cases, I have experienced *partial* benefit from the ancient practice of touching the diseased bone with some of the *mineral acids*, which serve to dissolve the earthy particles, and to hasten the removal of the morbid mass. Gastric juice of some of the inferior animals, especially that of the hog, has been found sometimes useful, by Dr. Physick, as a local application, and no doubt acts upon the same principle as the nitric or muriatic acids. Blisters, issues, setons, and steady purging, are highly serviceable in many cases of constitutional caries.

Consult *Monro's Works, 4to.—Hey's Practical Observations in Surgery—Callisen's Systema Chirurgicæ Hodiernæ, vol. 1. p. 557—Wilson on the Structure, Physiology, and Diseases of the Bones—Dictionnaire des Sciences Medicales, tom. 4. p. 78—Boyer's Treatise on Surgical Diseases, by Stevens, vol. 2. p. 142.*

* These remarks apply particularly to caries of the spongy bones. Superficial caries of a long bone may often be destroyed by the trephine, chisel, or saw, or by the actual cautery.

Section II.

Gibbositas, or Caries of the Spine.

This is a very common affection, and often dependent upon scrofulous diathesis. It is generally met with among young children, though adults are by no means exempt from it. Long before any curvature or deformity appears, the disease is often evinced by the following symptoms. The patient complains of a numbness or uneasy sensation in his lower extremities, is languid, soon tired by exercise, and very apt to trip or stumble in walking. While seated, his legs are usually drawn up under the chair and crossed. Generally, there is flatulence, sickness at the stomach, headach, derangement of the digestive organs, and a peculiar tightness at the scrobiculus cordis. After these symptoms have continued a few weeks or months, the lower extremities become completely paralysed, and the patient is unable to leave his bed. More or less protuberance may then be observed at some particular portion of the spinal column. Commonly one or more of the *dorsal* vertebræ are affected, the spinous processes of which project backwards and create considerable deformity. Sometimes the disease is seated in the lumbar, but rarely in the cervical vertebræ.

From this disease few recover, without permanent deformity, and many die from hectic fever and irritation. Upon dissection, the bodies of one or several vertebræ are found destroyed by caries, and so great a vacuity created,

as to cause the spine to give way, and in fact to produce a species of dislocation, which indeed is the immediate cause of the deformity. In some instances, the intervertebral cartilages have been found in part or wholly destroyed, while the bodies of the vertebræ remained nearly entire; but in cases of long standing, both are commonly diseased to a great extent. Occasionally, large collections of matter take place in the neighbourhood of the carious bones, and are so extensively effused in the abdomen, as to form externally a perceptible tumour. From what has been said, it will appear obvious that the paralysis of the lower extremities, and the disturbance of the functions of the thoracic and abdominal viscera, must depend upon pressure on the spinal marrow, and upon a diminution of the cavities in which the viscera referred to are seated.

Treatment of Caries of the Spine.

Spinal caries often exists long before any deformity is visible; it is important, therefore, when other symptoms are present, to make an accurate examination of the whole of the vertebræ, by running the fingers over the spinous processes, and pressing firmly upon each. In this way, the precise seat of the disease may be ascertained, inasmuch as the patient will complain when pressure is made upon the affected vertebræ. If called in the very commencement of the disease, the surgeon may perhaps derive benefit from leeches and blisters; these are seldom so efficacious, however, as issues or setons. *Caustic* issues, in particular, when made on each side of the spine, and in the immediate vicinity of the diseased vertebra, will always

be found highly beneficial, and indeed are more to be relied on than any other remedies ; but in many instances it will be necessary to continue them for months or years. Besides this local treatment, great attention must be paid to the patient's diet, and especial care taken to open the bowels two or three times a week, by some mild laxative. To take off the weight of the head and upper part of the body, and thereby to diminish the irritation about the diseased part, the recumbent position will be found the most effectual, but the patient should not be confined to a close room, or kept constantly in bed ; on the contrary, exercise in the open air, on a mattress laid on a small carriage or wagon, may be used during favourable weather to great advantage. When the patient begins to recover the use of his limbs, and there is reason to believe that the carious bone has been removed, and its place supplied by new matter, or that bony depositions have been thrown out in the neighbourhood of the diseased vertebræ, in the form of splints or ledges,* sufficient to support the spinal column, gentle exercise by walking may be allowed. To support the body and head during such efforts, various mechanical contrivances have been resorted to. The common stays and steel rod, invented by Levacher, drawings of which may be seen in most systems of surgery, are in very general use, though I prefer the machine of Eagland, made upon the same principle of Levacher's, but, I think, superior to it, inasmuch as the pressure, necessarily made by the stays on the hips, is divided between these and the lower extremities, which are supported by sheet iron splints, connected with each other by hinges at the hip,

* Several specimens of the kind, both in the human subject and in inferior animals, may be seen at the Wistar Museum.

knee, and ankle joints, having shoes attached to the lowermost, and worn by the patient.

Consult *Pott's Works, by Earle, vol.* 3. *p.* 229 *and* 257—*Earle's Observations on the Cure of Curved Spine, London,* 1803, 8*vo.*—*Bradley's Observations on a Stridulous Affection of the Bowels, and on some Varieties of Spinal Disease, London,* 1818, 8*vo.*—*Brodie's Pathological and Surgical Observations on Diseases of the Joints, p.* 259, *London,* 1818, 8*vo.*—*Copeland's Observations on the Symptoms and Treatment of Diseased Spine, London,* 8*vo.*—*Wilson's Lectures on the Structure and Physiology of the Skeleton, and on the Diseases of the Bones and Joints, p.* 395, *London,* 1820, 8*vo.*—*Crowther's Practical Observations on the Diseases of the Joints, commonly called White Swelling, p.* 216, 8*vo. London,* 1808.—*On the Nature and Treatment of the Distortions to which the Spine and the Bones of the Chest are Subject, with an Inquiry into the Merits of the Several Modes of Practice, which have hitherto been followed in the Treatment of Distortions. Illustrated by plates, in folio, by John Shaw, Surgeon, &c. London,* 1823.—*Further Observations on the Lateral or Serpentine Curvature of the Spine, and on the Treatment of Contracted Limbs, with an Inquiry into the Effects of Various Exercises, and other means which are used to Prevent or Cure these Deformities: being a Supplement to the Work on Distortions of the Spine and Bones of the Chest, by John Shaw, &c.* 8*vo.* 1825.—*An Essay on Curvatures and Diseases of the Spine, including all the Forms of Spinal Distortion: to which the Fothergillian Gold Medal was awarded by the Medical Society of London, and presented at a special general meeting, on the* 3*d of May,* 1824; *with some additions, by R. W. Bampfield, Esquire, &c.*

Section III.

Necrosis.

This, in a pathological point of view, has always been considered the most interesting disease to which the bones are subject, and many theories have been framed, to explain the cause of the death of the old bone, and the reproduction of the new. So far as opportunities have been afforded me of ascertaining this point, I have no hesitation to express the belief, that the *periosteum* is the chief agent in both processes. If from any cause the periosteum inflame, and matter is poured out between it and the bone, so as to separate one from the other, all vascular intercourse must cease, or at least the bone then depends exclusively for its support upon the internal periosteum and marrow; but these being inadequate to furnish the requisite supply, a part or the whole of the bone will necessarily perish. It generally happens, however, that the shaft alone suffers, whilst its heads remain unimpaired—owing to their possessing an independent vascularity. Thus deprived of its vitality, the bone soon becomes a source of irritation, and according to the laws of the animal economy, must be removed by the absorbents. Before this process is accomplished, however, the inflamed periosteum becomes thickened and covered with granulations, which soon ossify and form a complete bony case, enclosing the old dead bone within its cavity, and forming a junction with its epiphyses, if they happen to remain uninjured. But the old bone, thus enclosed, is not always absorbed—owing sometimes to

its magnitude or to want of activity in the absorbents. In this case it continues a source of irritation for years together, and sometimes destroys the patient, or else fragments of it, or *sequestra*, are from time to time discharged through ulcerated openings formed in the new bone. After the whole are discharged, these openings gradually fill up, the bed or cavity formerly occupied by the old bone becomes obliterated by the deposition of ossific granulations, and the patient generally recovers without any deformity, except that arising from the augmented size of the new bone, and the cicatrices left in the soft parts corresponding with the holes through which the sequestra were removed. Necrosis sometimes, though rarely, arises from inflammation and suppuration of the *internal* periosteum, and produces effects nearly similar to those just described. No better evidence need be adduced in support of the doctrine, that the periosteum is the chief agent in the production of the new bone, than the circumstance of the tendons retaining the precise situation which they occupied before the destruction of the old bone.*

The cylindrical bones are most subject to necrosis, and the tibia is more frequently affected than any individual bone. Patients of all ages are liable to the disease, but it is seldom met with except in children and young subjects. In every stage of the complaint the pain is deeply seated, long continued, and often excessively severe.

* For a full account of this doctrine, see M'Cartney's Letter, in Crowther's Practical Observations on Diseases of the Joints, &c. p. 183; also, Allan's Surgery, vol. 2. p. 21.

Treatment of Necrosis.

General remedies are of little service in this disease, and local applications, though they may assuage the pain, rarely prove of much utility. It is true that Abernethy and Crowther have extolled the use of blisters, kept open by savin cerate, as calculated to promote the absorption of the old bone ; but from several trials of the kind, which I have made, I am much inclined to question the efficacy of such remedies, and therefore of late years have been contented to let nature take her course, until the old bone has been so far loosened as to appear externally, or to be easily moved by the probe. In either case, the opening in the new bone may be enlarged by Hey's saw, or by the trephine, and the sequestra removed by forceps. In four or five instances, I have in this way drawn out portions of the femur and tibia upwards of six inches long. After the fragments are all carefully extracted, the fistulous openings in the new bone and integuments speedily close.

See *Russell on Necrosis, 8vo. Edinburgh, 1794—Boyer's Surgery, by Stevens, vol. 2. p. 135—Hutchinson's Practical Observations in Surgery, p. 180—Thomson's Lectures on Inflammation, p. 39.—The most original and complete works on Necrosis, are Weidman's elaborate publication, De Necrosi Ossium, et de Necrosi Ossium Annotatio, and the Thesis of Dr. M'Donald, " De Necrosi ac Callo." Both are extremely scarce.*

Section IV.

Exostosis.

This term has been applied by some writers to every bony tumour, whether originating from the cancellated structure or from the external periosteum. It should be restricted, however, to such simple enlargements as resemble natural bone in structure. As regards external character, there are three or four varieties of exostosis observable. These I have pointed out circumstantially in the Philadelphia Journal of the Medical and Physical Sciences.* The first I have denominated *circumscribed*, the second *lamellated*, the third *tuberculated*, and the fourth *spinous* exostosis. Every bone of the body appears to be more or less subject to this disease, and instances are even related of universal exostosis. The bones commonly affected, however, are those of the cranium, lower jaw, sternum, ribs, and extremities. It seldom happens that the tumour involves the whole circumference of a bone; on the contrary, it is usually confined to one side of it.

When examined by dissection, an exostosis will commonly be found to consist of a body of cartilage firmly adhering to the inner surface of a thickened periosteum, and enclosing within its substance a new bone, furnished with a cancellated structure, and closely connected with the surface of the old bone. In other instances, no vestige

* See Vol. 2. p. 121.

remains of the original line of separation between the tumour and old bone, but the cancellated structure extends from one into the other, so as to resemble in every respect the natural formation.

Treatment of Exostosis.

So long as an exostosis remains small and free from pain, it will seldom be necessary to attempt its removal either by general or local means. When, however, it increases rapidly, and is so situated as to encroach upon an important organ or interfere with the motion of a joint, we must endeavour to lessen or get rid of it. In many instances general remedies alone, or combined with low diet, will prove quite sufficient for its removal. In other cases nothing less than extirpation will answer. This may often be done conveniently by the knife and Hey's saw, by the trephine, or by the gouge or chisel. Sometimes the *spring saw** will be found to answer a better purpose than any other instrument.

* See Chapman's Journal, vol. 2. p. 147.

Consult *Cooper and Travers' Surgical Essays, part* 1—*Wilson's Lectures on the Diseases of the Bones and Joints, p.* 269—*Boyer's Treatise on Surgical Diseases, by Stevens, vol.* 2. *p.* 159—*Gibson on the History and Treatment of Bony Tumours, in the Philadelphia Journal of the Medical and Physical Sciences, vol.* 2. *p.* 121.

Section V.

Spina Ventosa.

Sir Astley Cooper and some other writers have, improperly it appears to me, described this disease as a species of exostosis. It differs from it in many respects. The exostosis is small, firm, solid, and incompressible. Spina ventosa, on the contrary, usually attains a much larger bulk than exostosis, involves the whole circumference of a bone, and, when dissected, is found to consist of a mere osseous shell perforated with numerous holes, and containing sometimes a thin sanies mixed with loose portions of lymph or of a substance resembling cheese. It is to this disease Mr. John Bell* alludes when he says, "The solid bone, whether radius or thigh bone, is annihilated, and a mere shell of osseous matter substituted in its place, and that in a manner so peculiar, that it must seem to the unintelligent observer, as if the small and solid bone had been expanded into an extensive and flat plate of osseous substance, whereas the process is in truth very simple and very intelligible. The bone dies piecemeal of ulceration, or what, in technical language, is termed caries, and is conveyed away by absorption; but the bone being dead, the surrounding membranes—viz. the periosteum and tendinous expansions, which once formed a part of its system of circulation, continue still alive, and ready to secrete new bone; and thus it happens, that while carious abscess pre-

* Principles of Surgery, vol. 3. p. 59.

serves a large cavity full of foul matter, the surrounding membranes continue secreting bone, which, like a shell, thin and expanded, covers this cavity, and forms the walls of the tumour, of which some part is composed of thin expanded bone, resembling a cranium, some of cartilage, some of thickened membrane; and this shell is formed in proportion as the original fabric of the bone is destroyed."

The cylindrical bones are commonly the seat of spina ventosa; though I have met with the disease, in two or three instances, among the flat bones. The finest specimen I ever saw, was sent to me a few years ago by Professor Stevens of New York. It occupied the radius of the left arm, and the bone, nearly from the elbow to the wrist, was expanded into one or more irregular shells, the size of a cocoanut, and contained a thin steatomatous matter. (See Plate I.)

Treatment of Spina Ventosa.

When the smaller bones, such as the phalanges of the fingers and toes, are affected with spina ventosa, a cure may sometimes be produced by moderate long continued pressure directly over the tumour; at other times, I have succeeded by making an opening into its cavity, and by stimulating injections, or by cutting instruments, exciting such a degree of irritation, as to cause it to fill up with granulations. In this way I once cured an obstinate spina ventosa of the lower jaw, about the size of an egg. Should any of the large cylindrical bones be involved, and the

tumour attain a large size, nothing less than amputation will be likely to answer. This was successfully resorted to in the case of Dr. Stevens's patient.

See *Boyer's Treatise on Surgical Diseases, vol.* 2. *p.* 167—*J. Bell on Tumours, vol.* 3.—*Boyer's Lectures on the Diseases of the Bones, by Farrell, vol.* 1. *p.* 364—*B. Bell's System of Surgery, vol.* 1. *p.* 305.

Plate. I. V.

SPINA VENTOSA.

Drawn & Engd by F. Kearny.

Section VI.

Osteo Sarcoma.

Osteo Sarcoma appears to be a more malignant disease than spina ventosa; indeed there is reason to believe that it is closely allied to cancer; for after several operations performed for its removal, the tumour has speedily reappeared, and finally proved fatal. In other cases, the disease seems to have been transferred to the lungs, and the patients have died of phthisis pulmonalis. The bones are all subject to osteo sarcoma; but those of the extremities, as far as I have observed, are peculiarly so. The bones of the face also, as well as those of the pelvis, are frequently affected. The form of the tumour varies very much. Sometimes it is circumscribed and smooth, at other times irregular or studded with inequalities or projections, the apices of which are apt to inflame and ulcerate. Commonly the pain attending every stage of the complaint is deep seated and lancinating. When dissected, the tumour usually exhibits the following appearances. A dense, pearl-coloured membrane covers its surface, and adheres so closely, as to be with difficulty separable from the subjacent bony tissue. Above this membrane the muscles and tendons are thinned and spread out so as to cover an extensive surface. The vessels and nerves of the part also are forced to change their position, and are distributed over the surface of the tumour. Immediately beneath the investing membrane, the bony tissue will be found either disposed in lobulated masses of different sizes, or

perfectly smooth on the surface, and regular. Upon penetrating the substance of the tumour, numerous cells composed of thin bony plates are displayed, containing a thick cheese-like or fleshy matter, or a thin, gelatinous fluid. When these are discharged, a complete bony network is left, resembling in appearance certain vegetable productions, and composing the great mass and bulk of the tumour.

Treatment of Osteo Sarcoma.

In the early stages of this disease constitutional remedies have been known to exert considerable influence. The oxymuriate of mercury, conjoined with the compound decoction of sarsaparilla, has been highly praised by Sir Astley Cooper, and is, as far as my experience goes, more useful than any other medicine. Local means must likewise be resorted to—especially leeches, blisters, &c. How far an operation will prove serviceable must depend upon the size of the tumour, the bone it may occupy, and several other circumstances. In general, amputation is more to be relied on than extirpation ; but both often fail, and the disease afterwards falls upon some of the internal organs. To guard against such an event, it is highly important to continue the constitutional treatment for several months after the operation, and to establish an issue near the part whence the tumour was removed.

Within the last few years, several operations have been performed in this country and in Europe, for the removal of osteo sarcomatous and other tumours, situated on the upper or lower jaw. The practice may, perhaps, be said

to have originated with *Dr. Deadrick* of Tennessee. This gentleman, in 1810, had a child brought to him fourteen years of age, with a tumour occupying the left side of the lower jaw. The tumour gradually increased and finally attained such a size, as to require the removal of the bone upon which it was seated. "An incision was commenced," says Dr. Deadrick, "under the zygomatic process, and continued on the tumour, in the direction of the bone, to nearly an inch beyond the centre of the chin. A second incision was begun about midway, at right angles with the first, and extending a short distance down the neck. The integuments were now separated from their connexion with the tumour, and the bone was sawed off immediately at the angle and centre of the chin. The wound was united in the usual manner, and the boy had a speedy and happy recovery."

Dupuytren, whilst on a visit fifteen years ago to the hospital of invalids, remarked, that several of the soldiers had recovered after having large portions of the lower jaw swept away by bullets, grape-shot, &c. This circumstance induced him to attempt the removal of part of the jaw, in cases where tumours occupied its surface or substance in such a way, as to render their extirpation impossible or unavailing. The first case upon which the experiment was tried, was that of a man whose lower jaw was occupied by an enormous tumour of many years standing, and to get rid of which, several severe operations had been performed without effect, by other surgeons. Dupuytren, on the 30th of October 1812, divided the jaw at the symphisis, and cut away a large portion of the jaw, together with several of the molares teeth. In six weeks the patient recovered perfectly. The same surgeon has now performed the ope-

ration seventeen times, and in fifteen of the cases successfully. It is not stated, however, whether in the cases alluded to, the tumours were of the osteo sarcomatous kind or not. About the year 1817, I had occasion to remove a considerable portion of the lower jaw, and under the following circumstances. A poor woman had a tumour partly fungous, partly bony, the size of a large orange, which sprang from the symphisis of the lower jaw, on the inner side, pushed before it several teeth, and so filled the mouth as nearly to prevent swallowing, and render articulation almost unintelligible. In presence of several medical gentlemen, I divided with a strong curved knife the alveolar processes (softened by caries,) on each side of the symphisis, nearly to the base of the jaw, separated the tumour from its attachments, and controlled the hemorrhage by ligatures and the actual cautery. Upon examining the cavity or bed occupied by the tumour, I was surprised to find how much of the jaw had been absorbed; a small portion only of its base remaining on each side of the symphisis. Great as the vacuum was, however, it was soon filled by granulations and ossific depositions, and in a few weeks the patient entirely recovered.

Dr. Mott of New York, in the year 1821, performed an extensive operation on the lower jaw of a young lady, for the removal of an osteo sarcomatous tumour, which involved all the right side of the bone. The carotid artery was first tied, and on the following day, "feeling for the condyloid process, an incision was commenced upon it, opposite the lobe of the ear, carried downwards over the angle of the jaw, in a semicircular direction along the lower part of the tumour, as it rested upon the thyroid cartilage, and terminated about half an inch beyond the angle of the

mouth, on the chin. The termination of this incision upon the chin, was just above the attachment of the under lip to the bone, and the mouth was thereby laid open. I now extracted the second incision tooth of that side, as it was in a sound part of the bone, and, after separating the soft parts from the side of the chin, and laying bare the bone, I introduced a narrow saw, about three inches long, similar to a key hole saw, from within the mouth through the wound, and sawed through the jaw bone from above downwards. The lower part of the tumour was then laid bare, by cutting through the mylo-hyoid muscles, and the flap of the cheek carefully separated and turned up over the eye. This exposed fully to view the whole extent of the tumour as it run upwards to the os malæ. After the integuments were carefully dissected from the parotid gland, the masseter muscle was detached from its insertion until it came to the edge of this gland; then separating a thin plane of the fibres of this muscle, I now readily raised the parotid, without wounding it at this part. The maxilla inferior was now laid bare just below its division into two processes, and it appeared sound. To facilitate the sawing of the bones it was necessary to make a second incision about an inch long, down to the lobe of the ear and terminating at the edge of the mastoid muscle; then, with a fine saw made for the purpose, smaller and more convex than Hey's, I began to saw through the bone obliquely downwards and backwards, and finished with one less convex. The latter part of the sawing was done with great caution, to avoid excruciating pain from the laceration of the inferior maxillary nerve. When the bone was sawed through, the two processes were observed to be split asunder, and the coronoid to be drawn up by the action of the temporal muscle. An elevator was now introduced, where the bone was di-

vided at the chin, by which the diseased portion was raised, when, with a scalpel passed into the mouth, the tumour was separated from the side of the tongue, as far back as the posterior fauces from the velum pendulum palati, and pterygoid processes. This loosened it very much, so that it could be turned upon the side of the neck. It was then separated from the parts below the base of the jaw, and also from the pharynx, and detached at the posterior angle, carefully avoiding the trunk of the natural carotid and deep-seated jugular vein, both of which were exposed." Since the publication of this case, Dr. Mott has thrice performed the operation for partial removal of the jaw, and in all the cases except one, with success.

A very interesting case of excision of part of the lower jaw, occurred in the practice of Professor Lallemand of Mont-Pellier, in the year 1823. The patient was in great danger of suffocation from asphyxia, and also from loss of blood. Under these trying circumstances, the operator first determined to arrest the hemorrhage, in which he succeeded, and then opened with a bistoury the membranous space between the thyroid and cracoid cartilages, immediately after which the patient breathed freely, opened his eyes, raised himself upon his seat, and recovered entirely in the course of a short time. Several other cases of partial amputation of the lower jaw have been published, particularly by Lizars, Bachelder, Wagner, &c., the particulars of which it is unnecessary to detail in a work of this description.

From the success which it appears attended many of the operations just referred to, it may, perhaps, be inferred that the position I have laid down in relation to osteo sarcoma,

—that it is probably of a cancerous nature, and that operations often fail in removing it, is erroneous. It will be recollected, however, that many of the operations performed on the jaw, were for diseases very different from osteo sarcoma; and I think, too, from close observation of the details of some of the cases considered by the operators as osteo sarcomatous, that such in reality was not the nature of the disease. In addition, moreover, to the testimony I have adduced in another publication, of the liability of osteo sarcoma to return after operations, I might, if necessary, furnish additional cases from authors, to substantiate the fact. It need only be remarked, however, at present, that the very interesting case detailed by Dr. Naudain of Delaware, of a very large osteo sarcomatous tumour of the os frontis, upon which an operation was performed by Dr. Webster, an enterprising and intelligent young surgeon of this city, goes far to show that it is very seldom we can calculate upon success, in a malady so inveterate in its nature as osteo sarcoma is generally acknowledged to be.

Consult *J. Bell's Principles of Surgery, vol.* 3.—*Boyer's Treatise on Surgical Diseases, vol.* 2. *p.* 172—*Cooper & Travers' Surgical Essays, part* 1*st, p.* 169—*Gibson on Bony Tumours, in Philadelphia Journal of the Medical and Physical Sciences, vol.* 3. *p.* 86.—*On Excision of the Jaw,* see *a case of removal of a portion of the lower maxillary bone, by W. H. Deadrick, M. D. of Rogersville, Tennessee, in American Medical Recorder, vol.* 6. *p.* 516—*On the subject of Dupuytren's first case,* consult *Dictionnaire des Sciences Medicales, tom.* 29. *p.* 430—*Gibson on Bony Tumours, in Philadelphia Journal of the Med. and Phys. Sciences, vol.* 2. *p.* 145—*Mott's Case of Osteo Sarcoma, in which the right side of the Lower Jaw was removed successfully, after tying the Carotid Artery, in New York Medical and Physical Journal, vol.* 1. *p.* 386—*Mott's second Case, in which the left Carotid Artery was tied, and a portion of the Lower Jaw*

Bone removed successfully, Ibid. vol. 2. p. 157—Mott's case of Osteo Sarcoma, in which the Lower Jaw was removed, at the articulation on one side, after tying the Carotid Artery, Ibid. vol. 2. p. 401—Lallemand's case of Amputation of the Lower Jaw, in Johnson's Medico-Chirurgical Review, vol. 5. p. 213—Lizars' case of Excision of the Lower Jaw, in Edinburgh Medical and Surgical Journal—Bachelder, in Boston Medical Intelligencer—Wagner, in New York Medical and Physical Journal.

Section VII.

Mollities Ossium.

There is a manifest distinction between mollities ossium or softening of the bones, and rachitis. In the one the bony tissue loses its natural firmness—in the other the earthy matter is originally deficient. Hence rickets is peculiar to infancy, and mollities ossium confined almost exclusively to adults. Bones affected with mollities ossium are not, however, merely deprived of phosphate of lime. Both the animal and saline parts appear to diminish until mere shells are left, which are so soft as to be easily cut with a knife. These shells have large cavities, communicating with each other, and containing coagulated blood or an oily matter. In some cases all the bones of the body are simultaneously affected. Fortunately, however, the disease is exceedingly rare.

Treatment of Mollities Ossium.

This disease is seldom cured, and never, perhaps, unless very limited in extent. In general, little more can be done than support the patient's strength by tonics and nutritious diet. By some, the internal use of phosphate

of lime has been extolled—by others condemned—as at least useless.

Consult *Wilson's Lectures on the Bones, p.* 252—*Gooch's Works, vol.* 2. *p.* 393—*Bromfield's Chirurgical Observations, vol.* 2. *p.* 50—*Allan's Surgery, vol.* 2. *p.* 44—*Bostock in Medico-Chirurgical Transactions, vol.* 4.

Section VIII.

Fragilitas Ossium.

Extreme brittleness of the bones from old age, syphilis, scurvy, and other constitutional diseases, is sometimes met with. Bones thus affected, however, do not upon examination always present the appearances we should be led to expect ; for instead of the usual proportion of earthy and a deficiency of gelatinous matter, upon which fragility is commonly supposed to depend, they appear to be completely saturated with oil, and can never afterwards be entirely divested of it.

Treatment of Fragilitas Ossium.

Fragilitas, like mollities ossium, may generally be considered incurable. Some advantage, however, is occasionally derived from internal medicine when the disease proceeds from syphilis, &c.

See *Boyer's Treatise on Surgical Diseases, vol. 2. p.* 180—*Wilson's Lectures on the Bones, p.* 258—*Cooper's Dictionary of Surgery, p.* 504, *4th edit. London,* 1822.

Section IX.

Rachitis, or Rickets.

Rickets was formerly a very common disease in Europe, and is said to have prevailed to a great extent in England during the seventeenth century. It is now, however, comparatively rare, and in this country almost unknown. Children between the age of six months and two years, are most subject to it. The symptoms are disorder of the digestive organs, swelling of the abdomen, emaciation of the limbs, dryness and discolouration of the skin, blackness of the teeth, &c. These are soon followed by distortion of the limbs, spine, and ribs, which sink under the weight of the body, and bend from muscular action. In the end, every bone will be found more or less affected, and in bad cases the patient is sure to be horribly deformed.

A deficiency of phosphate of lime, arising in all probability from want of power in the arteries to secrete a sufficient quantity of this earthy material, is the immediate cause of rickets. The disease is apparently often connected with scrofula; generally, however, it occurs at that period of life at which the marks of scrofulous diathesis are scarcely manifest.

Treatment of Rachitis.

The chief indications in the treatment of this disease, are to strengthen the system by tonic medicines, and to keep the stomach and bowels free from acidity by gentle purgatives frequently repeated, and to place the patient upon a nutritious diet, consisting wholly of animal food. Together with these constitutional means, local remedies may prove highly serviceable—especially frictions with stimulating oils, and frequent ablution with salt water. After the patient has attained a sufficient age, and acquired the requisite strength, the apparatus formerly commended in the treatment of curvature of the spine, may be sometimes employed with advantage, but great care must be taken not to exert undue pressure upon the hips, chest, or limbs. The late Mr. Wilson condemned machinery of every description in this disease, and relied very much in cases of lateral curvature of the spine, a very common consequence of rickets, upon pressure on the head by means of a weight equal from four to ten pounds, "on the principle of producing frequent and equal action of the vertebral muscles." I have no experience of this practice, but full confidence in the practical skill of the writer who has sanctioned it.

See *Wilson's Lectures on the Diseases of the Bones, &c. p.* 159—*Stanley, in Medico-Chirurgical Transactions, vol.* 7. *p.* 404—*Richerand's Nosographie Chirurgicale, tom.* 3. *p.* 142—*Delpech's Précis Elémentaire des Maladies Chirurgicales, tom.* 3. *p.* 739. *Paris,* 1816—*Allan's System of Pathological and Operative Surgery, vol.* 2. *p.* 38.

Section X.

Coxalgia, or Hip Disease.

Numerous appellations have been employed to denote this affection—such as morbus coxarius, ischias, spontaneous luxation of the os femoris, scrofulous caries of the hip, abscess of the hip joint, &c. The term coxalgia, invented by the late Dr. Albers of Bremen, seems to me the most appropriate.

Persons of all ages are liable to the disease, which is exceedingly common, especially among weak and scrofulous children. The symptoms in the commencement are not always strongly marked. Often the first evidence the surgeon has of its presence, is a slight pain in the knee, and a perceptible emaciation of the whole limb. In a short time pain is felt about the trochanter and groin, to relieve which the patient supports his whole weight upon the sound thigh and leg; hence the diseased limb is commonly directed forward and bent at the knee, and appears considerably elongated. This apparent increase of length is altogether owing to an inclination of the pelvis and a corresponding change in the vertebræ. Many children suffer comparatively little for months together, whilst others are scarcely free from pain about the hip or knee during the whole course of the disease. In a few instances anchylosis is established, and a cure effected without, so far as can be observed, the formation of pus; generally, however, this fluid becomes manifest after the complaint has made some

progress, and is sometimes secreted so copiously as to surround the head and upper extremity of the thigh bone, forming a large abscess, which may remain stationary for months, and at last discharge itself by one or more openings about the hip and groin. In the mean time the acetabulum and head of the femur undergo important changes. Their cartilaginous coverings are first destroyed by ulceration, then the bones are rendered carious and crumble away, the head of the thigh bone is partially or entirely destroyed, and being removed from the socket, the shaft is drawn upwards by the action of the muscles, and the limb shortened by several inches. During these different changes the constitution is gradually undermined by hectic, and not unfrequently the patient dies; at other times, he slowly recovers strength, anchylosis takes place, the fistulous openings heal up, and a cure is accomplished, but seldom without considerable deformity.

Treatment of Coxalgia.

One of the most important measures in the treatment of coxalgia, is to correct as speedily as possible the habit the patient acquires of bending the thigh on the pelvis and the knee on the thigh. This may be accomplished generally by extending a splint from the hip to the heel. Should the surgeon be called in the commencement of the disease, which seldom happens, blisters may be applied behind and before the great trochanter, and kept open for a considerable time by savin cerate or by the caustic potash. Issues or setons, however, generally answer a better purpose, inasmuch as they are less liable to dry up. But none of

these local means prove of much service, unless conjoined with steady purging,* a low vegetable diet, and perfect rest. Should the disease, notwithstanding these proceedings, continue to increase, and at last terminate in suppuration, the abscess ought never to be opened, and if it break spontaneously, must be healed as soon as possible. During the suppurative stage great pains should be taken to support the patient's strength.

* The practice of purging in this disease was introduced many years ago by Dr. Physick, and unquestionably has proved immensely serviceable.

Consult *Ford's Observations on the Disease of the Hip Joint—Crowther's Practical Observations on the Diseases of the Joints, p.* 256—*Brodie's Pathological and Surgical Observations on the Diseases of the Joints, p.* 101—*Wilson on the Bones, p.* 379—*Dorsey's Surgery, vol.* 2. *p.* 277.

Section XI.

Fungus Articuli, or White Swelling.

Under the name of white swelling, it has been usual to comprehend several diseases which differ in many respects from each other. These are, according to the arrangement of Brodie, which is now generally adopted: 1st, *Inflammation of the synovial membrane;* 2d, *Morbid change of structure in the synovial membrane;* 3d, *Ulceration of the cartilages of joints;* 4th, *Scrofulous disease of the joints, having its origin in the cancellous structure of the bones.*

Inflammation of the synovial membrane, in many European countries, Britain especially, is a very common complaint. In America it is sometimes met with, and is generally the result of cold or of some constitutional affection. Adults are much more liable to the disease than children. Although all the joints are more or less exposed to attacks of this inflammation, the knee is the most frequent seat of it. In the commencement the pain is not commonly severe, and the inflammation is rather of a chronic than active kind. A general swelling is soon perceptible about the articulation, the form of which varies according to the particular joint that may happen to be attacked. The swelling at first is the result of a collection of fluid within the cavity of the joint; but in a short time this fluid is partially or totally removed, and its place occupied by masses of coagulable lymph, which are poured out

by the vessels of the inflamed synovial membrane, and adhere to its internal as well as external surface. In this state the disease may continue for weeks or months, and then subside spontaneously, or by the use of appropriate remedies. It is very liable, however, to return, and should the patient be so unfortunate as to have frequent attacks of it, there will not only be great risk of anchylosis, but every prospect, eventually, of suppuration within the joint, and ulceration and destruction of the articular cartilages.

Morbid change of structure in the synovial membrane, unlike the disease just described, is seldom met with except in patients under the age of puberty. In almost every instance the knee joint is the seat of the complaint. At first the pain is very inconsiderable, or rather there is a sense of uneasiness accompanied by slight swelling and stiffness. In a few weeks the swelling increases irregularly, and always imparts a deceptive sensation of fluctuation. After a time the motion of the joint is nearly destroyed. The patient, however, until abscesses form, does not commonly experience much pain. If suffered to proceed, several years will often elapse before the disease terminates. In such cases, the patient dies, worn out by hectic. Upon dissection, the synovial membrane will be found converted into a pulpy substance, of a reddish or light brown colour, mixed with whitish lines, varying from a quarter of an inch to an inch in thickness. The cartilages, ligaments, and bones of the joint, moreover, are partially or wholly destroyed and bathed in matter.

Under the head of "*ulceration of the cartilages of joints*," Mr. Brodie has included *coxalgia*, of which I have treated in the tenth section, and likewise an analogous

affection of the cartilages of the knee. With respect to this latter affection, it may be remarked, that it is not always easy to distinguish it from inflammation of the synovial membrane. In general, however, the pain in ulceration of the cartilages is unaccompanied by swelling in the early stage of the disease. But the swelling makes its appearance in a few weeks, and continues gradually to increase; the pain likewise becomes more and more severe, and at last is exceedingly acute. Sometimes, though rarely, a sensation of fluctuation is apparent; when this occurs, it is generally owing to an accumulation of synovia, in consequence of inflammation of the synovial membrane, which will then be found to be a secondary affection.

"*Scrofulous disease of the joints,*" according to some writers the only genuine white swelling, is met with chiefly in young subjects. Although all the joints are more or less liable to it, that of the knee seems peculiarly so. It is characterized by a general swelling of the knee, a deep seated pain in the head of the tibia or about the centre of the joint, by emaciation of the thigh and leg, and by want of discolouration of the skin. These are the early symptoms, but as the disease advances, others show themselves. The skin covering the knee becomes tense, is covered with varicose veins, has a shining aspect, and imparts when felt a sensation of heat. After the lapse of several months or years, a considerable tumour is formed, not by the expansion of the bones, as was formerly supposed, but by a thickening of the soft parts; but oftentimes, long before the knee attains any considerable magnitude, it becomes stiffened and permanently bent. In the end, matter collects within the cavity of the joint, whence it is discharged by ulcerated openings and sinuses; the bones are rendered carious,

and the patient, if not relieved, dies from constitutional irritation.

Treatment of White Swelling.

Inflammation of the synovial membrane will commonly require both general and local remedies. The former, however, are chiefly to be relied on. In the early or acute form of the disease, blood-letting will prove eminently useful. After full benefit has been derived from this, a small blister should be applied repeatedly.* The affected part should be kept in a state of perfect quietude, and elevated, if possible, in order to take off the force of the circulation. After the inflammation has *subsided*, stimulating liniments may be employed three or four times a a day, together with moderate exercise of the joint. Care must be taken, however, not to excite *too much* irritation, lest the inflammation be renewed. As internal remedies, mercury and sarsaparilla are sometimes employed with advantage.

For a "*morbid alteration of structure in the synovial membrane*" there is, unfortunately, in the generality of cases, but one remedy—amputation—and this does not always succeed.

The remedies that have been found most useful in "*ulceration of the cartilages of joints*" are caustic issues,

* Dr. Physick condemns blisters and stimulating frictions in this disease.

kept open by savin cerate, blisters, setons, and absolute rest of the affected part. It is not often, however, that we succeed, even if by these means the disease be gotten rid of, in preserving the motion of the joint. On the contrary, anchylosis commonly takes place, and indeed may be considered as the safeguard of the patient.

To relieve or remove the "*scrofulous disease of the joints*" will generally be found very difficult, inasmuch as little impression can be made upon the local affection, unless we succeed in eradicating the constitutional one. This should be attempted by those means formerly pointed out under the head of scrofula.* The local remedies that have been found most serviceable, are perfect rest of the diseased joint, (which is best accomplished by the use of splints) and moderate long continued pressure by adhesive straps. Blisters are sometimes beneficial, at other times injurious. The same remark will apply to issues and setons. In the advanced stages of this disease, the internal use of opium will be found greatly to mitigate the patient's sufferings. Amputation will often, on account of the constitutional disturbance, prove necessary. It should be remembered, however, that the removal of a limb affected with this disease, will occasionally give rise to pulmonary complaints, and other constitutional disorders, which may afterwards carry off the patient.

In every variety of white swelling where matter has formed within the joint, the surgeon ought carefully to abstain from letting it out, as such an operation has been found by experience only to aggravate the symptoms, and

* See vol. i. p. 208.

indeed in some instances to produce most alarming and even fatal effects.

See *Brodie's Pathological and Surgical Observations on the Diseases of the Joints*, 8vo. *London*, 1818—*Crowther's Practical Observations on the Diseases of the Joints, commonly called White Swelling, &c. London*, 1808—*Russell on Morbid Affections of the Knee Joint, p.* 20. 8vo. *Edinburgh*, 1802—*Lloyd on the Nature, &c. of Scrofula*, 8vo. *London*, 1821—*Wilson's Lectures on the Bones and Joints—Boyer's Treatise on Surgical Diseases, by Stevens, vol.* 2. *p.* 347.

Section XII.

Hydarthrus, or Dropsy of a Joint.

The synovial, like other serous membranes, sometimes pour out a thin fluid, which, by collecting within the cavities of joints, gives rise to dropsy. The disease, however, is seldom met with, and when it does occur, the knee joint is commonly the seat of it. Oftentimes the cause of the complaint is very obscure, but generally it may be traced to cold, to rheumatism, or to the growth of cartilaginous bodies within the articulation. Occasionally, it follows typhus fever, and in a few instances is apparently derived from syphilis or scrofula.

When the knee is attacked, there is a swelling on each side of the patella; this swelling is not painful to the touch, and imparts a decided sensation of fluctuation. The skin always retains its natural colour, even although the tumour should acquire uncommon magnitude. Sometimes the bursæ mucosæ are distended by fluid, so as to resemble in some respects dropsy of the joint. In such cases, two circumscribed swellings are usually observed—one under the ligament of the patella, the other above that bone and immediately beneath the tendons of the extensor muscles.

Treatment of Hydarthrus.

This disease seldom admits of a perfect cure. Now and then the accumulated fluid is spontaneously absorbed, but it is very apt in a short time to be regenerated. Various local applications are usually resorted to, such as mercurial frictions, stimulating embrocations, dry rubbing, &c. But these are seldom productive of much benefit, and the surgeon must rely chiefly upon *blisters*, and well regulated *pressure*, by the adhesive strap and roller. Some practitioners advise tapping of the joint, but no prudent or sensible man would incur the risk of violent inflammation, suppuration, and perhaps death, when it is well ascertained that there is no certainty of a radical cure being effected by the operation.

See *Russell's Treatise on the Morbid Affections of the Knee Joint, p.* 63 *and* 191—*Boyer's Treatise on Surgical Diseases, vol.* 2. *p.* 339—*Allan's Surgery, vol.* 2. *p.* 145.

Section XIII.

Ecphyma Cartilagineum, or Moveable Cartilage.

The articulations of the lower jaw, elbow, knee, and ankle, and perhaps all other similar structures, are liable to be injured by the formation of cartilaginous or osseous bodies within their cavities. The knee joint, however, is commonly the seat of these excrescences, for such they may be called, inasmuch as it has been well ascertained that they derive their origin from the synovial membrane, which from taking on partial inflammation, throws out portions of coagulable lymph—afterwards rendered vascular and organized, and finally converted into cartilage and bone. In proof of this being the case, it need only be stated that these bodies are often found attached closely to the synovial membrane, or else connected to it by a pedicle; and that so long as this attachment continues, they increase in size or grow, but upon the pedicle being broken, as generally happens sooner or later, by the movements of the articular surfaces, the cartilaginous bodies escape and move freely throughout the joint, and afterwards do not acquire additional bulk. In consequence of moving thus throughout the joint, and sometimes gliding between the extremities of the bones, violent pain is created, and if the accident be often repeated, inflammation, with increase of the synovial fluid, is at last induced, and the patient suffers extremely. There are cases, however, in which the patients experience very little inconvenience from the complaint, even although the moveable bodies be numerous and large.

When removed from the joint and examined, these productions will be found to vary in size, consistence, number, and shape. Some are not larger than a pea, whilst others nearly equal in size the knee pan. In general, they are partly cartilaginous, and partly bony—the bone occupying the centre, and the cartilage the surface. In such cases, they are smooth and polished, and resemble closely an articular cartilage. Sometimes like ligament, they are soft, tough and tenacious. The number varies exceedingly, from a single one to twenty or thirty. They are commonly concave on one side, and convex on the other, and are longer than they are broad. If the knee joint be the seat of the complaint, these bodies may be readily felt to move from one part of the joint to another, and the capsular ligament is generally distended so much by the synovia, as to create an evident fluctuation.

Treatment of Moveable Cartilage.

The danger of cutting into the cavity of a joint under any circumstances, is commonly imminent; such an operation should, therefore, if possible, be always avoided. But if the surgeon has tried ineffectually, in the cure of moveable cartilage of the knee, *bandages*, a *laced knee cap*, &c. —which, if properly applied, sometimes retain fixed the cartilaginous body, and prevent it from exciting irritation —and the patient has been apprized of the consequences that may possibly arise from an attempt to extract it, and under these circumstances is willing to encounter the risk, the operation may be performed—provided the accumulation of synovia and the pain and inflammation be such as to

endanger eventually the loss of life or limb, or to subject the sufferer to great inconvenience by interfering with or destroying his occupation.

Should the operation, under this view of the case, be determined on, an incision may be made through the integuments and capsular ligament, the accumulated synovia discharged, and the moveable body extracted by a small pair of forceps, or turned out by the handle of the knife. The incision should never be larger than barely to admit of the passage of the cartilage, and ought always to be made in such a way, that the openings through the capsule and skin do not correspond when the lips of the wound are brought together. Care must also be taken, never to commence the incision until the surgeon feels that he has fixed the body securely by his fingers at the spot at which he intends to extract it; for if it should slip from his grasp, he may find it impossible afterwards to bring it again into the same situation. With regard to the particular spot best adapted to the removal of the cartilage, a difference of opinion prevails; this must, however, always depend, in a measure, upon the situation which the body commonly occupies. As a general rule, the upper and inner side of the knee should be selected, in preference to any other part.

In several instances, I have performed this operation with complete success, and the patients have experienced little or no inconvenience from it; in other cases, two especially, most violent nervous symptoms, resembling those of tetanus, followed by high inflammation and profuse suppuration within the cavity of the joint, have speedily come

on and nearly proved fatal.* Ford and Kirby both relate cases in which death has actually ensued from these operations.

* It may be proper to remark, that in both these cases, the moveable bodies were of uncommon magnitude, so that considerable difficulty was experienced in getting them out. In one of the cases, that of Mrs. Deering, upon whom I operated in the University before the class, during the winter of 1822, two bodies were extracted, each as large as a common sized patella. In the other case—that of Mr. John Lichtenwalter, of Lehigh county, the cartilage was equally large and of very solid consistence. Both patients were relieved by *very large* doses of opium, administered a few hours after the operation, and by keeping the limbs elevated upon inclined planes, and promoting the discharge of matter from the knee by poultices. Under this treatment, in a few weeks, both recovered—though with great difficulty.

I have great pleasure in acknowledging the assistance I derived during the treatment of Mr. Lichtenwalter's case, from Dr. William Baum, a most intelligent and respectable practitioner of Philadelphia, who, whilst a student, resided in the house with my patient, and by his great skill, attention, and care, contributed very much to his recovery.

See *Hey's Practical Observations in Surgery, p.* 342, *edit.* 3, 1814—*Desault's Treatise on Fractures and Luxations, p.* 316—*Russell on the Knee Joint, p.* 81—*Home, in Transactions for the Improvement of Medical and Chirurgical Knowledge, vol.* 1. *p.* 229—*Boyer's Treatise on Surgical Diseases, vol.* 2. *p.* 333—*Ford, in London Medical Observations and Inquiries, vol.* 5. *p.* 329—*Abernethy's Surgical Works, vol.* 2. *p.* 213, *edit.* 1819—*Brodie's Pathological and Surgical Observations, p.* 297—*Kirby's Cases, p.* 75.

Section XIV.

Anchylosis.

This disease has usually been divided by writers into *complete* and *incomplete*—a distinction, in a practical point of view, of some importance. It is for the most part symptomatic of other affections, and is particularly apt to follow injuries or inflammatory diseases of joints. In incomplete anchylosis, the ligaments, tendons, and surrounding cellular membrane are generally involved, and the joint admits of partial movement; but in complete anchylosis, the extremities of the bones, in many instances, become perfectly united and identified. There are a few beautiful specimens of this description in the Wistar Museum.

Incomplete anchylosis is apt to follow sprains, dislocations, fractures, &c. Complete anchylosis is seldom met with, except as the consequence of abscess of a joint, or caries of the bones. The ginglymoidal articulations, from their complicated structure, are more subject to anchylosis than those by enarthrosis or ball and socket.

Treatment of Anchylosis.

By friction with stimulating articles, such as soap and volatile liniments, and gentle, often repeated, judicious

movements of a joint, the *incomplete* anchylosis may frequently be cured in a few days or weeks. The operation, however, should never be entrusted to the patient himself, or to an inexperienced person. *Complete* anchylosis does not admit of cure by the foregoing means ; indeed any attempt to overcome the stiffness by friction or by movement of the joint, would prove hurtful by exciting inflammation or by breaking up adhesions, the formation of which had perhaps become essential towards the cure of some formidable disease—such as coxalgia, or white swelling. Indeed, in these and some other similar cases, the termination by anchylosis may be looked upon as a favourable result, and, in fact, as the cure. Whenever the surgeon finds complete anchylosis inevitable, and considers such an event desirable, he should always place the limb in such a position as will be afterwards most useful to the patient.

To supersede the necessity of amputation in certain grievous diseases of the joints, Mr. *Park* of Liverpool long ago suggested the idea of extirpating the heads of bones, and then placing their extremities above and below the joint as nearly as possible in contact, in order to procure re-union and anchylosis, or in other words, so to speak, to convert two bones into one—thereby shortening the patient's limb, but saving him the inconvenience of an artificial one. The operation was performed, too, by the same surgeon upon the knee and other joints, and with some success, though not without great suffering and long confinement on the part of the patients. About the period that Park performed his operations in England, Moreau was also engaged in similar projects in France, and without the knowledge, it seems, of Park's experiments. The practice,

however, never obtained many advocates in either country, and gradually sunk into oblivion, notwithstanding the efforts of Professor Jeffray* of Glasgow, to revive it in 1806.

An operation, founded upon a different principle, has lately been suggested and successfully executed by an ingenious surgeon of this city, Dr. John R. Barton, for the relief of certain cases of *anchylosis.* It is well known that many patients have the misfortune to lose the use of a joint from injuries and the inflammation consequent thereto, from specific diseases, scrophula in particular, and from keeping the limb too long a time in the relaxed or extended positions. A case of this description presented itself to Dr. Barton, that of a sailor, in whom the hip joint had been injured by a severe fall, and from which (by long confinement and bad treatment in a foreign hospital) anchylosis, great deformity, and loss of the use of the limb ensued. After trying various expedients to straighten the limb, (for it was bent both at the hip and knee, and consequently shortened, and so inclined towards the sound limb as to interfere with its movements,) ineffectually, it occurred to Dr. Barton, that an artificial joint might possibly be established by sawing through the femur "at the lower part of its cervix, a little above its root." The section was accordingly made, by a narrow saw, forged for the purpose, the limb readily straightened, and so continued by being placed in the apparatus of Desault for the fractured thigh. The operation was

* Cases of the excision of carious joints, by H. Park, Surgeon in the Liverpool Hospital, and P. F. Moreau, De bar-sur-ornain, M. D. de l'Ecole de Paris, with observations by James Jeffray, M. D. Professor of Anatomy and Surgery in the College of Glasgow.—1806.

severe, but did not last many minutes, and it was found unnecessary to secure any blood-vessels. For the few first days the patient was extremely ill, but soon recovered, and was so well by the sixtieth day as to be able to stand, with the aid of crutches, upon his feet, ("both of which reached the floor,") and finally so far recovered as to be able to walk about without assistance and to execute many useful movements of the limb.

Dr. Barton does not pretend to recommend this operation in *every* case of anchylosis, but expressly states, he believes it "justifiable *only* under the following circumstances, *viz.* where the patient's general health is good, and his constitution is sufficiently strong; where the rigidity is not confined to the soft parts, but is actually occasioned by a consolidation of the joint; where all the muscles and tendons that were essential to the ordinary movements of the former joint are sound, and not incorporated by firm adhesions with the adjacent structure; where the disease, causing the deformity, has entirely subsided; where the operation can be performed through the original point of motion, or so near to it, that the use of most of the tendons and muscles will not be lost; and finally, where the deformity or inconvenience is such, as will induce the patient to endure the pain, and incur the risk of an operation."

Consult *Boyer's Lectures on the Diseases of the Bones, vol. 2. p,* 253—*Boyer's Treatise on Surgical Diseases, vol.* 2. *p.* 366—*Russell on the Knee Joint, p.* 222—*Barton on the Treatment of Anchylosis, by the Formation of Artificial Joints, &c. in the North American Medical and Surgical Journal, vol.* 3. *p.* 279.

Section XV.

Deformity of Joints.

All the joints are more or less subject to deformity or derangement of their articular surfaces. Thus the head, owing to the indulgence of an awkward habit, sometimes projects unnaturally forward or to the right or left side; in either case, there is a corresponding change in the vertebræ of the neck. In like manner, one or both shoulders are sometimes preternaturally elevated or depressed; *round* shoulders, also, as they are called, are exceedingly common, and generally arise from the habit acquired by children of throwing their arms forwards and supporting them on the front of the chest. Deformities or curvatures of the spine, unconnected with caries of the vertebræ, are very frequent amongst growing girls or boys, and usually proceed from carelessness or from indulgence in unnatural attitudes. Again—the joints of the hip and knee may be deformed. The latter is most frequent, and the inclination may be either inwards or outwards. In the former case, the patient is said to be *knock-kneed*—in the latter, *bow-legged.* But the most common and important deformity usually met with is that denominated *club-foot*, of which it will be proper to give a more detailed account.

Loxarthrus or club-foot is congenital or acquired. The former is most frequent. In either case the foot may be turned inwards or outwards, though the distortion inwards

occurs in nine cases out of ten. This variety of the disease is characterized by the following appearances. The point of the foot is not only turned inwards but upwards, so as to form, in bad cases, a very acute angle with the tibia. The external malleolus projects unnaturally, and appears to be placed too far back, while the internal malleolus is scarcely perceptible. The heel is drawn somewhat upwards, towards the calf of the leg, and seems very much diminished. The sole of the foot is uncommonly hollow; the back on the contrary is remarkably convex. The toes generally assume a vertical position, and the great toe separates from the rest and points upwards and inwards. The weight of the body is sustained chiefly by the external edge of the foot and the outer ankle. Both feet are usually deformed in a similar manner, and the patient finds it very difficult to walk, in consequence of the toes striking against each other.

Treatment of Club-foot.

The deformity arising from club-foot, when attended to soon after birth, may often be effectually removed. In several slight cases of the kind, I have succeeded with the apparatus employed by Dupuytren, for fractures of the fibula.* When used for club-foot, however, as it is commonly met with, the splint and cushion must be applied to the outer instead of the inner side of the leg. If the deformity be not relieved or obviated by the time the child arrives at an age when it should learn to walk, a different

* See vol. i. p. 354.

kind of apparatus will become necessary. One of very simple construction is represented in the work of Dr. Dorsey; another is described by Boyer, and a third by Scarpa. They all operate nearly upon the same principle, and are so contrived, that in time, by means of an iron sole, covered with leather, straps, buckles, a rod extending up the leg, &c. the worst deformities, if judiciously managed, may be completely removed.*

* These different machines may be procured at any time of Mr. Schively, a most ingenious and excellent cutler of Chesnut Street.

See *Sheldrake's Observations on Distortions*, 8vo. 1794—*Boyer's Treatise on Surgical Diseases, vol.* 2. *p.* 381—*Dorsey's Elements of Surgery, vol.* 2. *p.* 453—*Scarpa's Memoir on the Congenital Club-Foot of Children, and the Mode of Correcting that Deformity, translated by J. H. Wishart,* 4to. *Edinburgh,* 1812—*Delpech's Précis Elémentaire des Maladies Reputées Chirurgicales, tom.* 3. *p.* 141, *article Entorse—Dictionnaire des Sciences Medicales, tom.* 42. *p.* 406, *article Pieds Bots.*

Section XVI.

Hydro-Rachitis, or Spina Bifida.

This is a congenital deformity or imperfection occasionally met with. There is a deficiency of some particular portion of the spinal column, through which the medullary sheath projects beneath the integuments, in the form of a tumour, and contains in most instances a thin transparent serum. Commonly the opening is situated in the lumbar region, occasionally in the dorsal, and rarely in the cervical region. Sometimes the sacrum is the seat of the disease. In almost every instance, the spinous processes of the vertebræ are deficient, and consequently the tumour occupies the posterior part of the spine. The size of the opening varies according to the number of the vertebræ involved, and hence the tumour is proportionally large or small. It rarely exceeds in magnitude the size of the fist, and is seldom smaller than that of an egg. The skin covering the tumour is generally extremely smooth, delicate, and thin ; and sometimes single venous and arterial branches irregularly occupy its surface. The sheath of the spinal marrow, too, is often very much attenuated, and hence the fluid can be distinctly seen through the coverings, and fluctuates upon the slightest pressure. I have met with a few instances in which the skin retained its natural thickness, and with others in which it was rugose and thicker than natural. In these cases the fluid, of course, could not be seen. Sometimes the fluid instead of possessing transpa-

rency is thick, flocculent, and turbid. In almost every case the swelling can be made to disappear by steadily pressing upon it, but returns as soon as the pressure is discontinued. The patient, however, always suffers more or less, and symptoms resembling those of compression of the brain, have been induced to an alarming degree by any attempt of the kind.

This disease is often connected with hydrocephalus; sometimes it is followed by extreme debility, diarrhœa, ischuria, paralysis of the lower extremities. Some patients, on the contrary, are healthy and vigorous. Few, however, survive for many months, though I have met with four or five instances in which the patients lived to the third or fourth year, and one case I remember to have seen with Professor Henderson, of Georgetown, in which the patient had attained her sixteenth year, notwithstanding spina bifida had occupied the greater part of the sacrum, and had attained an enormous size.

Treatment of Spina Bifida.

Many fruitless attempts having been made by Ruyisch and some others among the older surgeons, to effect a cure of spina bifida by pressure, and by acupuncturation, the disease was universally considered as beyond the reach of surgery, until within the last few years, when, by the means referred to, Sir Astley Cooper was enabled to furnish two instances of successful termination. In the first instance the tumour was gradually obliterated by pressure kept up

in the commencement by a common roller, and afterwards by a regular truss, made expressly for the purpose. In the second case, the fluid was evacuated repeatedly and for months together, with a fine needle, care being taken to draw it off in small quantities at a time, and afterwards to prevent the punctures from taking on ulceration. Each of these patients, it is stated,* have now arrived at their fifteenth year, and are stout and healthy. Two other cases of a similar character have since been cured under the management of Sir Astley Cooper. Hickman and Pearson, two English surgeons, and Probart of Hawarden, have each succeeded in curing a patient by the same means, so that in all, the lives of seven patients have been saved through the medium of compression and acupuncturation. Under these circumstances, no doubt can be entertained of the value of the remedy; yet it must be confessed, that there is hardly a possibility of its succeeding except in cases of the most favourable description—where the tumour is small, the limbs free from paralysis, the intestinal and urinary functions undisturbed, the absence of hydrocephalus, &c. But it is proper to state that even under very favourable circumstances, acupuncturation has been tried in many instances without effect, and sometimes with a fatal result, owing to ulceration being induced by irritation from repeated introduction of the needle. Several cases of this description have come under my notice, and others have been reported to me.

It would seem almost superfluous to state, that the sudden evacuation of the whole of the fluid contained in the cyst of a spina bifida, would be followed speedily by con-

* Bampfield on the Spine.

vulsions and death. Three cases of the kind I have witnessed—the physician having, in each case, mistaken the nature of the complaint, and plunged a lancet into the tumour.

See *some Observations on Spina Bifida by Astley Cooper, in Medico-Chirurgical Transactions, vol. 2. p. 322—Cooper's First Lines of the Practice of Surgery, vol. 2. p. 360—Dictionnaire des Sciences Medicales, tom. 22. article Hydrorachis—Bampfield on Curvatures and Diseases of the Spine—Vacca, in the Edinburgh Medical Journal, vol. 17, p. 251.*

CHAPTER II.

DISEASES OF THE ARTERIES.

The arteries, like most other textures, are supplied with blood-vessels, nerves, exhalants and absorbents, and are made up of coats or coverings, differing from each other in structure, consistence and tenacity. Hence they are subject to many diseases to which other soft parts are liable; whilst, at the same time, they possess powers of resisting disease peculiar to themselves. To understand their diseases, an accurate knowledge of their structure and conformation is very necessary—though the study is commonly much neglected by students.

There are three coats to an artery—an external, middle, and internal coat. The external coat is composed of condensed cellular membrane, is remarkably elastic and tough, of a pure white colour, smooth on its inner surface, and rough on its outer, where it is in contact with a cellular sheath or an additional investment. The *middle* coat is uncommonly thick, and appears to consist of muscular fibres arranged in a circular direction. There is every reason to believe, however, that these fibres are not muscular, for they are compact and solid, but they readily break; whereas muscular fibres are soft, and bear extension, and are with difficulty broken. In several other respects, also, these fibres differ from the muscular and approach to the fibrous texture. The third, or *internal* coat, is re-

markable for its extreme delicacy, and is so exceedingly thin as to appear nearly transparent. It is of a very white colour, and its internal surface is covered by an unctuous fluid. Externally it is connected slightly to the middle coat, though not by intermediate cellular membrane. Notwithstanding the tenuity of this coat, it is possessed of considerable strength longitudinally, but tears readily when force is applied in the circular direction.

The *vasa vasorum*, with which all arteries are supplied, are commonly derived from the adjoining trunks or branches. They first penetrate the cellular coat, upon which they are abundantly distributed, then send numerous ramifications to the surface and throughout the substance of the middle coat, and finally terminate, there is reason to believe, upon the inner surface of the third coat. According to Bichat,* however, these vessels do not reach the internal coat; but as this coat is evidently vascular, as may be distinctly seen after careful maceration, the supply of blood is probably derived from the vasa vasorum, and perhaps also from some other source.

Arteries are subject to inflammation, suppuration, ulceration and sphacelus. They are also liable to have their texture subverted by the formation of calcareous concretions, by uniform enlargement or dilatation of their different coats, or by rupture of the internal and middle coats, in which last case the disease *properly* termed *aneurism* is produced.

* General Anatomy, translated by Hayward, vol. i. p. 317.

The internal coat is more subject to inflammation than either the middle or external coat. This is evinced by the effusion of lymph, which is often poured out in large quantity upon the inner surface of an artery, in consequence of inflammation of contiguous parts, from the application of ligatures, from wounds, from the pressure of tumours, and from many other similar causes. Sometimes the inflammation thus excited travels along the vessels as far as the heart, and proves fatal. Chronic inflammation of the arteries is frequently met with, and is very apt to follow or precede calcareous depositions. An appearance similar to that produced by inflammation is often presented upon the internal surface of arteries—a vivid redness or scarlet tinge. This is not, however, always the result of inflammatory action, for it is seldom accompanied by an effusion of lymph. Arteries likewise that have been exposed for a few days to the air in the dissecting room, invariably assume the same colour.

Although arteries resist for a long time the *ulcerative* action, they are liable eventually to be destroyed. So long, however, as they continue *sound*, the risk of ulceration is diminished; hence the process rarely takes place except in arteries that have been tied by ligatures of an improper form or size, or have been compressed by blood, which has injected the cellular membrane around the vessel and destroyed its vasa vasorum, and thereby deprived it of its nourishment. Ossified arteries, also, as they are called, sometimes ulcerate and give rise either to hemorrhage or to aneurism. Extensive ill-conditioned ulcers, by penetrating deeply and laying waste the soft parts, may occasion fatal hemorrhage by opening large arteries.

It is unusual for arteries to *mortify* and slough, and when the process does take place, it is seldom followed by hemorrhage; for during the progress of the mortification among the surrounding parts, the vessels become filled with coagula to a considerable extent, which seal their extremities for a time and prevent hemorrhage; these coagula are afterwards absorbed and the mouths of the vessels permanently closed through the medium of adhesive inflammation.

But the most common disease of arterial trunks and branches is the deposition of *calcareous* matter. So common, indeed, is this condition of the arteries in the advanced periods of life, that the vessels of few old subjects are exempt from it. It is not peculiar, however, to old age, but has been occasionally met with even in the arteries of infants. The *outer* surface of the internal coat is the most frequent seat of the calcareous deposit. From this surface it extends gradually through the coat and projects into the area of the vessel, being for a time still covered with a fine pellicle or membrane. At last this membrane gives way, and the concretion is then brought in contact with the blood. It is seldom that we find an artery completely encrusted with this earthy matter, so as to form an entire rigid cylinder; the depositions, on the contrary, are scattered in irregular patches, varying in shape, number and size, over the surface, and throughout the substance of the internal coat. Sometimes they are intermixed with a curdy, pultaceous, or steatomatous matter. It is this condition of an artery which generally lays the foundation of aneurism, as will hereafter be explained; from this cause, also, it often happens, that arteries are unable to bear the

operation of the ligature, which, when applied, either produces rupture of the vessel or excites ulceration. There are several other diseases, moreover, that seem to result from this earthy degeneration of the arterial tubes.

An uniform dilatation of the arterial coats is not so unfrequent as some modern writers have imagined ; and although distinct in many respects from aneurism, is often conjoined, or exists simultaneously, with that disease. From aneurism, however, it differs chiefly in the circumstance of the vessel being enlarged throughout its circumference—whereas in aneurism, the dilatation is commonly on one side. Besides this, a dilated artery seldom if ever contains a coagulum, which an aneurismatic artery always does. The larger arteries are most subject to dilatation ; hence the disease is very common in the aorta ; also, where vessels divide, or where they form angles, dilatation is very apt to ensue. From this cause the arch of the aorta, the iliacs and carotids at their division are oftentimes greatly expanded beyond the natural size. Very urgent symptoms, and even fatal consequences, not unfrequently follow an enlargement of the great vessels in the vicinity of the heart.

Section I.

Aneurism.

Aneurism has been defined "a pulsating tumour formed of arterial blood;"* and to this there can be no valid objection, provided the explication be restricted to the form of the disease usually met with. Different appellations, also, have been given to certain varieties of the disease—such as true and false, circumscribed and diffused. Again—we have varicose aneurism and aneurism by anastomosis. By the term *true* aneurism, is commonly understood a simple dilatation of all the coats of an artery—by *false* aneurism, a rupture or wound of the three coats, so that the blood is extravasated among the surrounding parts. The terms *circumscribed* and *diffused*, relate merely to the form of the swelling or the extent of the extravasation. I shall deviate so far from common authority, as to restrict the meaning of *true* aneurism to that condition of an artery in which all its coats are uniformly dilated, or else the internal and middle coats ruptured while the cellular coat remains entire. By *false* aneurism, I understand that arising from a wound or division of an artery. *Varicose* aneurism, and aneurism by *anastomosis*, will be noticed hereafter.

In the incipient stage of aneurism, the tumour is small, free from pain, and easily made to disappear by pressure;

* C. Bell's Operative Surgery, vol. i. p. 70.

but returns as soon as the pressure is discontinued. For a long time the skin preserves its natural colour; as the swelling augments, however, it becomes pale, and finally œdematous. The strength of the pulsation in the tumour, is greater during the early than the advanced stages of the disease, for in proportion as the swelling augments, the coagulated blood which fills the sac is interposed in such a way as to diminish the stroke of the artery in which the aneurism is seated. When the tumour attains a large bulk, the integuments covering it become painful and livid, and crack in different places; through the fissures a bloody serum is distilled, ulceration follows, which extending to the sac, opens a communication with its cavity, from which fluid blood issues in a stream, mixed with coagula; as the ulceration extends, the opening enlarges, the hemorrhage becomes more and more frequent, and if not arrested, destroys the patient. Sometimes the tumour, by pressing upon a contiguous bone, causes its removal; this is effected through the medium of the absorbents; the bone, however, is not rendered carious, nor does the formation of pus accompany the process.

Disputes have arisen, at different periods, respecting the formation of aneurism, or the mode by which the disease is induced—some contending that there is an uniform dilatation of the three coats—others that the internal and middle coats are ruptured or ulcerated, and the tumour formed by a distention or dilatation of the external or cellular coat. Both opinions seem to be well founded, and the error committed, as correctly remarked by Hodgson, appears to have been, that the advocates for each doctrine took too limited a view of the subject. There can be no question, however,

I think, that the theory broached by Sennertus, and supported with so much ingenuity by Scarpa, will be found to afford the true explanation of the phenomena usually met with in the generality of aneurismal tumours—that the internal and middle coats are ruptured or destroyed, and that the sac is formed by a dilatation of the external coat. In proof of this being the true explanation, it will only be necessary to state, that in most aneurisms the tumour will be found upon dissection to occupy one side of the artery, whereas if all the coats were regularly dilated, it should embrace the whole circumference of the vessel. Again—if a careful separation of the different coats be made, the external coat may be traced throughout, while the internal and middle coats, at the place where the entrance of the aneurismal sac communicates with the artery, will be perceived to terminate by an abrupt or fringed margin. On the other hand, there can be no doubt whatever that a regularly dilated artery, and such as is commonly considered an aneurismal artery, is sometimes met with, independently of a rupture of the internal coats; that in other instances, these coats, after having expanded to a certain extent, ulcerate or are ruptured and give rise to the common form of the disease—the latter being thus engrafted, as it were, upon the former. It must not be supposed, however, from these observations, that every dilated artery can be considered an aneurismal artery, for there are many instances to the contrary. The arteries, for example, of the impregnated uterus, become greatly enlarged beyond their natural size; the collateral branches, also, after a main trunk is tied, are dilated in a similar manner. The distinction then should be drawn between the dilatation of a sound and a diseased artery; and perhaps it may with propriety be stated, that *true* aneurism

is never produced without a previous morbid condition of the coats of the vessel in which it is seated. This morbid change of structure has been already noticed, as connected with calcareous deposition, or with the formation of atheromatous matter between the internal or middle coats. Arteries thus situated are very liable to give way even under ordinary muscular exertion; hence in nine cases out of ten, external aneurism is the result of sudden and violent extension or flexion of a limb, while the internal is produced by lifting heavy weights, &c.

False aneurism differs essentially from the true, inasmuch as the blood is not contained within the entire walls of the artery, or within its cellular coat, but poured into the cellular membrane adjoining the wounded vessel, where it is either confined within a narrow space, or else spread over an extensive surface—hence the origin of the terms *circumscribed* and *diffused* aneurism. When a considerable artery is cut across, or punctured, and the blood does not find a ready outlet by the external wound, it flows internally, and may inject the cellular membrane of a whole limb, and so separate the vessels from their surrounding connexions, as to cause them afterwards to ulcerate upon the application of a ligature, and the patient to perish from secondary hemorrhage; or gangrene may ensue from the general pressure occasioned by the extravasation. If a *moderate* quantity of blood be effused, it seldom passes far beyond the boundaries of the wounded vessel, where it forms a coagulum which gives a temporary restraint to the hemorrhage; in the mean time, the external wound heals, and the loose cellular membrane around the coagulum also closes up and forms a sac, which invests the clotted mass. A tumour

is thus formed on the side of the wounded vessel, the cavity of which communicates with that of the artery, constantly receives small portions of fresh blood, and at last comes to resemble the most common variety of true aneurism, differing from it only in this—that the sac is formed not by the dilated external coat of the artery, but by the loose cellular membrane exterior to that coat.

Treatment of Aneurism.

Spontaneous cures of aneurism, although reported by writers, must be considered extremely rare. Such an event may be brought about by two or three different causes—by the formation of a large and firm coagulum, which fills not only the entire sac, but, perhaps, a portion of the artery above it—from the tumour, by change of position, pressing upon and obliterating the superior or inferior portion of the artery—by inflammation and sphacelation of the sac and whole tumour. The first is the most frequent, the second seldom met with, and the third, when it does occur, usually attended with distressing symptoms, and sometimes followed by fatal consequences. A fourth mode by which a spontaneous cure may be effected, has been noticed by some writers—the stoppage of the caliber of that part of the artery, immediately below the tumour, by the accidental separation of a fragment of the coagulated mass lining the cavity of the sac. It appears to me, however, that this conclusion is gratuitous, or at least not altogether supported by well attested facts.

Much may be done towards mitigating the symptoms of aneurism and arresting the progress of the disease—by frequent and repeated blood-letting, by rigid abstinence, by confinement to bed or to the horizontal position, by the internal use of digitalis, and the external application of various astringents and refrigerants. Such remedies cannot, however, be depended on in the generality of cases; although many examples have been cited by Valsalva, Morgagni, and other old writers, and more recently by Pelletan, of perfect cures having been effected under various circumstances by the foregoing means. On this account, the practice should always be pursued whenever the tumour is so large and so situated as to render the operation by the ligature impracticable; but success cannot be calculated upon unless the depleting system be carried to the utmost extremity.

There are two modes, in the shape of an operation, practised for the cure of aneurism—*compression* and the *ligature.* Compression is now seldom resorted to—experience having proved its general inefficacy. The process has been found, moreover, even when successful, so extremely painful and tedious, that few patients can be induced to submit to it, or to persevere sufficiently long to accomplish a cure. That it operates, partly, upon the principle of the ligature, when it does succeed, there can be no doubt—by compressing the sides of the vessel, causing the effusion of lymph, and finally, obliteration of the channel, so as to force the blood to abandon the sac, and pass off by the collateral branches. When applied to the sac itself, such an effect, owing to the interposition of the coagulated mass, can rarely, if ever, be produced. Dif-

ferent machines for compressing aneurismal arteries or tumours, may be found in most systems of surgery.

The *ligature*, then, may be considered as the only mode of operation upon which any great reliance can be placed in the treatment of aneurism, and this, too, frequently fails. From the numerous and diversified experiments of Dr. Jones and others, it appears that a ligature, when applied to an artery with sufficient force, divides the internal and middle coats, leaving the external coat entire. The blood, arrested in its passage by the approximation of the sides of the vessel, soon coagulates and forms a plug extending as high as the first collateral branch. This serves as a temporary barrier, and takes off the force of the circulation from the ligature and the extremity of the artery. In the mean time, the divided edges of the artery pour out lymph, which is not only effused in the cavity of the vessel, but between its coats; the irritation, also, excited by the ligature, gives rise to an accumulation of lymph on the outer surface of the artery. At last, the external coat, continually irritated by the ligature, sloughs, or ulcerates, and the ligature is detached, leaving the mouth and edges of the vessel filled and surrounded by a bed of lymph, into which vessels shoot, and by uniting the sides of the artery form a permanent closure. After a time, the coagulum is absorbed, and the channel of the artery as high as the first anastomosing branch is obliterated and converted into a solid cord. Long before this process is completed, however, the blood forsaking the main route passes through the collateral vessels, which vessels gradually enlarge in proportion to the force of the column driven into them, until at last they equal or exceed in the aggregate the size of the

original trunk, and the circulation becomes fully re-established.

But, instead of a cure being always accomplished in this happy manner, it sometimes happens that *secondary hemorrhage* results, and the patient either dies or is with difficulty saved. Such an event may be referred to several different causes—to the improper form, mode of application, and premature removal of the ligature—to a morbid condition of the aneurismal artery—to a deficiency of coagulum within the caliber of the vessel—to an unnecessary denudation of the coats of the artery, and perhaps to some other causes.

If a ligature, instead of being round and small, is flat and large, and twisted or irregular in shape, it is not well calculated to divide the internal coats, or it does not divide them throughout their circle. Upon the same principle, if a large portion of the surrounding cellular membrane, or a contiguous nerve, be included in a ligature, the coats are partially divided or not divided at all. Again—even if the ligature be of a proper form and well applied, if through the officiousness of the surgeon it is pulled away before the adhesive process is perfectly accomplished, and lastly, if from an ill formed knot, the ligature be forced by the impetus of the circulation from the mouth of the artery, hemorrhage results. In most of these instances, the coats of the artery inflame from irritation, or the vasa vasorum being compressed or destroyed, the vessel is deprived of its nourishment, and ulcerates or sloughs, either at its mouth or above the ligature.—An artery is sometimes, in *false* aneurism, so separated from its surrounding connex-

ions by extravasated blood, as to be completely insulated. Under such circumstances, it is soon, for want of support, reduced to a diseased state, and ulcerates if a ligature be applied to it. In cases of *true* aneurism, an artery is often ossified, or at least covered at the place it is tied, with calcareous depositions. Such an artery is extremely prone to ulceration, and there is nothing better calculated to excite it than the irritation of a ligature.—Although it has been stated that a coagulum is formed after the application of a ligature, it must be understood that under *particular* circumstances, this does not happen—as for example, in cases when a vessel is tied *immediately below* a large anastomosing branch. There is no opportunity in such a case for a coagulum to form; consequently, the ligature and the new formed tender lymph along the extremity of the artery, sustain the whole force of the circulation; hence, it sometimes happens, after the ligature is detached, that the lymph, unable to resist the current of blood, gives way and hemorrhage ensues.—With respect to the "unnecessary denudation" of the vessel, it may be remarked, that the surgeon, from ignorance or want of dexterity, may mangle the parts adjoining the artery, and cut off all communication between them, so as to render the vessel unfit afterwards to bear the ligature.

It must not be supposed, however, that ulceration or sloughing, and secondary hemorrhage, will *necessarily* result from these causes; nor should it be inferred, that an artery cannot be permanently closed, unless the *internal* coats be divided by the ligature, nor that an ossified or denuded artery will *never* heal. Experience proves the contrary, but it also proves that the failure of the opera-

tion, in most cases, is owing to the circumstances pointed out.

Previous to the time of the celebrated Hunter, the practice of tying the vessel immediately above the tumour, and afterwards opening the sac and clearing it of the coagulated blood, was universal; but the operation so frequently failed, and the death of the patient so often followed, that this great pathologist was induced to investigate the subject in a particular manner. He found that the artery immediately adjoining the tumour was commonly in a diseased state, and therefore unable to bear the ligature; that the practice of opening the sac and removing its contents, excited a great deal of constitutional irritation, accompanied by sloughing of the tumour and of the contiguous parts; and that from these causes many patients lost their lives. Mr. Hunter at once conceived the ingenious idea of tying the artery at a distance from the sac, and of leaving the latter untouched; the result was highly satisfactory, and proved most decidedly the value of his theory—that the artery should be tied in a *sound* part, and the sac and its contents removed by the absorbents. During Mr. Hunter's time, the operation was confined, almost exclusively, to popliteal aneurism; it has been extended by many surgeons of the present day to every other aneurismal tumour upon which an operation is admissible. An objection, however, has been made to the Hunterian operation, which seems not altogether destitute of foundation—the occasional return of the blood into the sac through those anastomosing vessels, which happen to communicate with the main trunk somewhere intermediate to the sac, and the place

where the ligature is applied. But this so seldom occurs, that it can scarcely be considered an objection.

In performing the operation for aneurism, in general, it is only necessary for the surgeon to remember that he is to cut for a sound part of the artery, at a greater or less distance above the sac, that he is to penetrate cautiously with the knife, (not extending the incision an immoderate length, and tearing the surrounding parts by his fingers or by instruments,) until he observes the pulsation of the vessel, when he should endeavour to detach it only to such an extent from its connexions, as to enable him to pass a common aneurismal or crooked needle, armed with a small round ligature, beneath it. The ligature should then be firmly tied, and one end being cut off near the knot, the other should be left hanging from the wound, the edges of which must be closed by adhesive straps.

Many surgeons follow the practice of Mr. Abernethy, and apply two ligatures—afterwards dividing the artery between them. I am disposed to think, that few if any advantages are gained by this proceeding, and in certain cases that it will be attended with imminent peril.

Brasdor, and afterwards Desault, conceived that under particular circumstances—where the tumour for instance is so large or so situated that the artery cannot be tied *above* it—a ligature applied to the vessel *beneath* the tumour might effect a cure, by causing the blood to coagulate in the sac and upper part of the artery, as high as the first anastomosing branch. The experiment was tried by Deschamps and by Sir Astley Cooper—but without success, owing to

one or more anastomosing vessels passing off between the sac and ligature, in such a way as to keep up a constant stream of blood through the sac.* At the Alms-house Infirmary, during the last winter (1827), in a case of femoral aneurism extending a considerable distance above Poupart's ligament, in a patient nearly 70 years of age, in presence of Professor Mussey, of New Hampshire, and several other medical gentlemen, I cut down upon the femoral artery im-

* It is said that within the last two or three years, four cases have been reported, in which this operation of tying the artery below the tumour was performed; that three of the cases terminated fatally, and that the fourth, or successful one, was not a case of aneurism. Two of these cases occurred in the practice of Mr. Wardrop,* of London. Mr. Shaw in reference to these operations remarks: "Although it was reported that the tumour had subsided, and that the distressing symptoms were relieved by cutting down on the carotid, the fatal issue of both cases in so short a time, might lead to the supposition that the principle of tying the artery beyond the tumour, was radically bad: but happily for the credit of the operation, the bodies were examined after death. In the first case, no aneurism of the carotid, nor of any of the great vessels was found, but the heart was in that condition which is called hypertrophy. This is nearly the substance of the account published, and the statement was corroborated by a gentleman who had an opportunity of examining the parts carefully. But what is still more extraordinary, the carotid, which had been supposed to be tied, was found entire, and without any marks of a ligature having ever been applied to it. The blood to the day of the patient's death appears to have passed as freely through it as through any other vessel. In regard to the latter case, of which a most favourable report was given on the 24th of March, I have only heard that the patient died of hemorrhage since the date of that report." *London Medical and Physical Journal, vol.* 2. *No.* 12. *p.* 512.

* *Case of carotid aneurism successfully treated by tying the artery above the aneurismal tumour, by James Wardrop, Esq. in Medico-Chirurgical Transactions, vol.* 13. *part* 1. *p.* 217.

mediately below the tumour, and compressed the vessel for some time between two fingers with a view of ascertaining whether the pulsation in the tumour could be diminished, intending in that event to apply a ligature. So far, however, from any favourable change being produced by the compression, the pulsation continued without interruption, so as plainly to indicate that anastomosing vessels passed off between the ligature and sac. Under these circumstances, and particularly as the patient had long laboured under an obstinate cough, and some apparent disease of the great vessels within the chest, I resolved not to apply the ligature, but bring the edges of the wound together, and suffer it to close, which it did, though not without difficulty, in two or three weeks.

Whatever mode may be selected for the operation of aneurism, there is one point upon which most surgeons entertain the same opinion—that little danger is to be apprehended of *gangrene*, from want of collateral branches, or free distribution of blood, except amongst arteries of the *largest* class.

Section II.

Aneurism of the Aorta.

There is no artery more subject to aneurism than the aorta; and, unfortunately, the disease, when thus situated, is seldom, if ever, cured. Owing to the rapidity with which the blood issues from the heart, and its forcible propulsion against the arch of the aorta, where it first meets with resistance, this portion of the vessel is particularly apt to suffer, and here the aneurism will be found, usually, to commence, either in the form of a general dilatation of the coats, or, as is most frequent, by rupture of the internal and middle coat, with distention of the cellular, in which case the tumour will be situated on one side of the artery—as explained in some of the preceding pages.

The *symptoms* of aneurism of the *thoracic* aorta, are more or less difficulty of breathing, a sense of uneasiness and constriction about the chest, palpitation of the heart, severe pain shooting from the sternum towards the arms (compared by some patients to that produced by a rope drawn tightly around the chest,) a troublesome hacking cough, difficulty of deglutition, feeble and intermitting pulse. In the advanced stages of the disease, or in proportion as the tumour acquires bulk, all these symptoms are aggravated, and others often superadded, such as tremendous pulsation in the tumour and large vessels adjacent to it, or about the heart. Frequently it happens, that a part of the

swelling rises above the sternum, in which case the disease is liable to be mistaken for aneurism of the innominata, carotid, or subclavian arteries. When the tumour attains a great magnitude, its pressure upon the sternum, ribs, or clavicles causes their absorption; every barrier is then removed except the integuments; and the tumour, whose dimensions are sometimes enormous, projects beyond the chest. At last, the integuments, the sac, and its immediate coverings inflame and ulcerate, and masses of coagulated blood are discharged. Pressure for a time, perhaps, arrests their progress, but the ulcerated opening continues to enlarge, and finally the patient, oftentimes without a moment's warning, is destroyed by hemorrhage. In many instances, however, and long before the aneurism acquires any considerable bulk, it bursts into the chest, into the cells of the lungs, or into the pericardium, and instantaneously proves fatal. In some rare instances, communications have been established between the aneurismal sac and the pulmonary artery, or the œsophagus, or trachea, and of course with a fatal result.

There are several diseases about the chest, whose symptoms bear a similitude to those of aneurism of the aorta; such as enlargements of the bronchial glands, collections of serum or pus, which by pressure on the heart force it towards the right side of the chest, where it may be felt pulsating strongly, morbid thickening of the parietes of the heart, &c. On the other hand, aneurism of the thoracic aorta, from its pressure on the lungs, will sometimes give rise to symptoms resembling those of phthisis pulmonalis. For these reasons, the surgeon should be very cautious not to pronounce too hasty a prognosis.

The *abdominal* aorta is often the seat of aneurism. Generally, the tumour is situated immediately below the diaphragm, and owing to the little resistance it meets with from the loose and yielding textures surrounding it, soon acquires considerable bulk, and pulsates most awfully, and so distinctly and forcibly, as in some instances to elevate the bed-clothes, of which the patient and bystanders are very sensible. When the tumour becomes very large, there is not only dropsy of the belly and limbs, from pressure on the thoracic duct, but destruction of the lumbar vertebræ, followed by paralysis of the legs, and eventually by the death of the patient, which for the most part is occasioned by a rupture of the sac, the blood of which is poured into the duodenum, stomach, or cavity of the belly.

Treatment of Aneurism of the Aorta.

Although Sir Astley Cooper has been adventurous enough to tie the abdominal aorta in a case of aneurism of that vessel, I trust that there are in this country but few surgeons, if any, disposed to follow his example; for certainly there is reason to believe, that independently of the great irritation which must necessarily follow such an operation, gangrene would in every instance be the result,—from the want of an *adequate* supply of blood. This observation is made with a perfect knowledge of the fact, as stated by Scarpa, Hodgson, and others, "that if the aorta be tied in the dead subject immediately below its arch, and a thin injection be thrown into the upper portion of the

vessel, it will pass into the arteries of the lower extremities."

All that we can hope to accomplish, then, in most cases, is to arrest the progress of the disease, or save the patient's life for a time. This may undoubtedly be done by strict abstinence, repeated blood-letting, the internal use of digitalis, the external application of astringents and cold, and in the advanced stages, by supporting the tumour with leaden compresses, adhesive straps, &c. Many instances, indeed, of *perfect* cures having been accomplished by these means, are related, and upon most respectable authority. Few patients, however, can be brought to submit for any length of time to so rigid a system as the advocates of this practice have enjoined.

Section III.

Aneurism of the Carotid.

Carotid aneurism, whether from a wound or from disease in the coats of the vessel, may be considered comparatively rare. It is met with chiefly in hard working people, especially those accustomed to carry heavy burdens upon their heads or shoulders. The tumour may occupy either the common trunk, or else the internal or external carotid. Generally it is situated near the angle of the jaw, at the place where the artery divides. Like aneurism in most other situations, it may be known by its strong pulsatory motion, by its rapid enlargement, by the cough and difficulty of respiration and of deglutition, occasioned by pressure of the tumour upon the larynx and œsophagus. It is sometimes, however, extremely difficult to distinguish between this disease and other tumours about the neck and in the immediate vicinity of the artery. Common glandular or sarcomatous tumours, for example, if they happen to lie in contact with the carotid, have a pulsation communicated to them. In such cases, if the tumour can be elevated or removed from the vessel by the fingers, the pulsation will cease, and the true nature of the disease become manifest. Again—if pressure be made upon an ordinary tumour, or upon the carotid running near it, the tumour is not diminished, whilst aneurism treated in a similar manner is sensibly decreased. Several cases are recorded of aneurisms of the aorta having ascended so high upon the neck as to be mistaken for carotid aneurism.

Treatment of Carotid Aneurism.

The fact that the carotid of one or both sides might be obliterated by disease, without curtailing the supply of blood destined for the brain, has been long known. Several instances, too, are mentioned by the older writers of wounds of the carotid terminating favourably, after the application of the ligature; but Sir Astley Cooper was the first, I believe, to tie this vessel in a case of aneurism; though the propriety of such a measure had been strenuously insisted upon by Mr. John Bell, as the following passage, (referring to the case of a woman who had been suffered to perish for want of an operation) will evince. "Nothing could more tempt us to a daring experiment, than the desperate condition of such a patient, nor is there any thing in the relative situation of these parts to deter us: had this woman been under my care, or should ever such a case recur, I should never hesitate one moment, conscious that the most absolute bungler in surgery, might lay aside the muscle with a few strokes of his scalpel, open the common sheath of the carotid and its accompanying nerve, and separate the vein, nerve and artery, so as to tie the latter without let or hindrance."*

Since Sir Astley Cooper's operation, which was first performed in eighteen hundred and five, the experiment has been very frequently repeated, and has now become an established practice. To perform the operation to advantage the patient should be placed in the recumbent posi-

* Principles of Surgery, vol. 3. p. 254.

tion, with his head somewhat raised by a pillow, and slightly inclined towards the affected side. The surgeon then makes an incision two or three inches long on the inner edge of the mastoid muscle, commencing immediately below the tumour. An assistant pulls to one side the mastoid and sterno hyoid muscles. This will bring into view the internal jugular vein, the omohyoideus muscle, and sometimes the descendens noni, all of which should be avoided. The next step of the operation is to expose and open the sheath of the artery, which is easily done by pinching up the sheath with a pair of dissecting forceps, and making a horizontal cut into it. The sheath being opened, an aneurismal needle or flexible silver probe, armed with a ligature, is passed around the artery; taking especial care before tying the ligature, to exclude the par vagum. Having tied the artery fairly, and secured the ligature by two or three knots, its ends are left hanging from the wound, the lips of which should be closed by adhesive straps. A single ligature, in case of carotid aneurism, should always be employed; for if two ligatures be applied, and the artery divided between them (as advised by Abernethy) the patient would inevitably perish by hemorrhage, if from any cause the ligature should be detached.

Section IV.

Axillary Aneurism.

Aneurism of the axillary artery is sometimes met with. It may arise either from a morbid condition of the coats of the vessel, or from a wound. In whatever manner produced, the tumour enlarges with great rapidity, soon fills the armpit, and, not unfrequently, extends above the clavicle. The characters of the disease are so well marked, as to be seldom mistaken; yet instances are related of such tumours being opened by ignorant surgeons, under the impression that they were abscesses.

Treatment of Axillary Aneurism.

If the aneurism be small, and seated low in the axilla, which seldom happens, the surgeon may possibly find sufficient space between the sac and clavicle, to enable him to include the axillary artery in a ligature; on the contrary, should the tumour be large, and occupy the commencement of the vessel, it will be necessary to tie the *subclavian* artery. The two operations differ materially from each other, on which account it will be necessary to describe them separately.

To tie the *axillary* artery, the surgeon should make an incision, (the patient being seated in a chair with his shoulders thrown a little backwards, and supported by an assistant) two or three inches in length, commencing near the sternal extremity of the clavicle—running downwards in a semilunar direction and terminating near the edge of the deltoid muscle. Following the course of the external incision, the fibres of the pectoralis major should be next divided, until the pectoralis minor is exposed. Between the clavicle and the superior edge of this last muscle, the axillary artery will be found. Here the vessel is encompassed by the axillary vein, and by a plexus of nerves. The surgeon must, therefore, proceed very cautiously, lest he divide some of these parts with the knife, or include them in the ligature. The vessel being fairly exposed, and separated to such an extent as barely to permit the aneurism needle, with its ligature, to pass beneath it, should be tied, when the pulsation in the tumour and at the wrist will immediately cease.

When it is necessary to take up the *subclavian* artery, (the operation commonly practised for axillary aneurism) the *position* of the patient will be found a matter of immense importance. He is seated on a low stool or bed, with his head thrown backwards and inclined towards the sound side, and the posture steadily maintained by an assistant. Another assistant keeps the arm close to the chest, and at the same time pushes the shoulder downwards and forwards as low as possible. The surgeon makes an incision through the skin above the clavicle, commencing near the sternal extremity of that bone, and terminating at the anterior edge of the trapezius muscle. The fibres of the

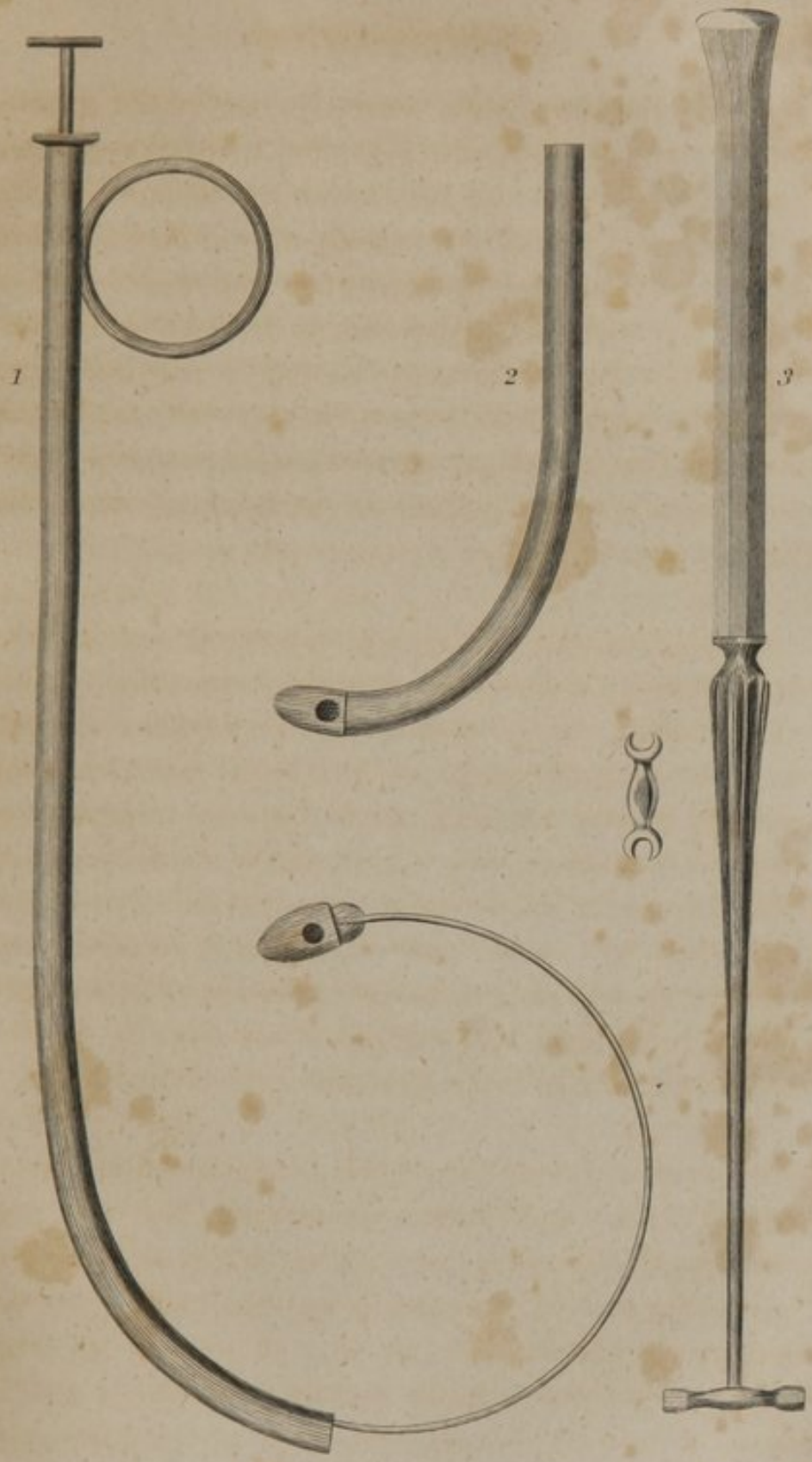
platysma myoides, and cervical fascia, are next carefully divided, until the external jugular vein is exposed. An assistant holds aside this vessel with a curved spatula or blunt hook, while the operator separates, with the *handle* of the knife, the loose cellular membrane, until he reaches the acromial edge of the anterior scalenus muscle. Near the origin of this muscle from the first rib, the artery may be found. Owing, however, to the great depth of the vessel, it cannot be easily reached, (if the tumour is large) by the common aneurismal needle; on this account, particular instruments have been invented by Deschamps, Bellocque, Desault, Ramsden, Watt, and others. I prefer that of Bellocque, and the common artery forceps of Dr. Physick,* to any I have seen. Bellocque's instrument consists of a silver canula, six inches long, straight at the upper extremity, and slightly curved at the lower, containing within its cavity a watch spring, which, by means of a silver stilet attached to it, may be pushed forward or retracted at pleasure. The lower extremity of the spring is covered by a small silver bulb, which not only serves to render the end of the cannula obtuse, but, from being perforated, to convey the ligature. A ring at the superior portion of the cannula, enables the surgeon to hold the instrument steadily. *Two different views of this instrument may be seen in Plate II. fig.* 1 and 2. Having laid bare the subclavian, the surgeon will experience no difficulty in passing beneath it this instrument, with the spring retracted, which being done, it only remains to push forward the stilet, when the spring ascends from the bottom of the wound, and a ligature being passed through

* See vol. i. p. 70.

the eye of the silver bulb, the whole instrument is withdrawn, carrying along with it the ligature, and depositing it beneath the vessel. It may sometimes be found, owing to the great depth of the wound, very difficult to close completely the knot of the ligature. In that case I would employ the ingenious contrivance of Dr. Alexander Hosack of New York, which, by holding the first knot firm, enables the surgeon to tie a second or third with the utmost facility. This instrument is so simple and so easily understood, as to render a description of it superfluous. *See Plate II. fig.* 3.

Although both the axillary and subclavian arteries have been repeatedly tied in cases of axillary aneurism, yet it is to be lamented that the operation has very seldom succeeded. This may perhaps be ascribed to the operation being generally delayed too long, or to the same disposition to disease in the vessel, which gave rise to the aneurism itself. The operation, however, has proved, very satisfactorily, that there is no want of collateral branches, and consequently no danger of gangrene from want of a supply of blood. The honour of having first *successfully* tied the subclavian artery is due to Professor Post of New York.

The project of tying the *arteria innominata*, in certain cases of axillary and subclavian aneurism, has been suggested by different surgeons ; and my friend Dr. Mott, of New York, was bold enough, a few years back, to try the experiment—but without success. A similar operation has since been performed in Sweden, and with a similar result. I have no disposition to condemn these attempts, because every effort towards saving the life of a fellow



Drawn by Bridport.

creature, when he must necessarily perish without relief, should be deemed praiseworthy; but I cannot help thinking that the chance of success must necessarily (owing to the great size of the innominata, its contiguity to the heart, and the probable diseased condition of its coats) be so very limited, in most cases, as not to justify the practice. Another objection, and a very strong one, that might be urged against tying the innominata, is this—that subclavian and axillary aneurisms have sometimes been cured spontaneously.

Section V.

Brachial Aneurism.

It is remarked by Hodgson, that he has "never seen an aneurism in the arm which was not produced by accidental violence."* The experience of other surgeons confirms the statement, and proves a diseased condition of the coats of this vessel to be a very rare occurrence. The most frequent cause of the aneurism, is a wound of the artery at the bend of the arm from the common operation of blood-letting. The external wound having healed, the blood is gradually diffused in the cellular membrane around the artery, and beneath the fascia; a tumour is thus formed, which, in proportion as it augments, causes the fingers and forearm to contract, (owing to the unyielding nature of the fascia or the firm aponeurotic expansion of the biceps) the limb to diminish, and the patient to experience very considerable numbness and pain.

Treatment of Brachial Aneurism.

Surgeons are unaccustomed, now, except under particular circumstances, to lay open the aneurismal sac at the bend of the arm, and evacuate the clotted blood; experience having proved that the Hunterian operation is as

* Diseases of the Arteries and Veins, p. 389.

well calculated to succeed here as in other parts of the body. The aim, therefore, of the operator, in brachial aneurism, is to cut for the trunk of the artery at some distance above the sac. The tourniquet being loosely applied, chiefly with a view to render the subcutaneous veins conspicuous and to prevent the surgeon from wounding them, an incision should be made, through the integuments, about two inches and a half in length, along the inner edge of the biceps muscle, and about the middle of the arm. The fascia being next divided, the cellular sheath, containing the artery, veins, and radial nerve, will be brought into view; and upon opening this, the artery may be readily found and tied; without risk, if the surgeon is at all careful, of including nerves or other contiguous parts. A common aneurismal or curved needle will be sufficient to convey the ligature; and this being tied, the wound is dressed in the ordinary way.

Section VI.

Inguinal Aneurism.

When a true aneurism forms at, or near, the bend of the groin, a small circumscribed pulsating tumour is perceived, which, from the femoral artery being closely surrounded by dense cellular membrane, and covered by the unyielding fascia of the thigh, increases very slowly, and sometimes so insensibly that neither the patient nor surgeon are aware of its nature, or, perhaps, mistake it for an enlarged inguinal gland or a hernia. In time, however, these doubts are dispelled by the increase of the tumour, by the general swelling, numbness, coldness, and insensibility of the limb, and finally, if the disease is permitted to run its course, by the inflammation and perhaps sphacelation of the sac, when the patient will either perish from hemorrhage or from irritation, or else obtain, as has sometimes happened, a spontaneous cure.

Treatment of Inguinal Aneurism.

Although Guattani and Mr. John Bell had amply demonstrated the existence of very large and numerous inosculations, calculated, as they believe, to afford a full supply of blood to the thigh in case the femoral artery should be obliterated, or tied, above the origin of the pro-

funda, it remained for Mr. Abernethy to prove by an operation on the living subject, the correctness of their views. This distinguished surgeon, in a hopeless case of femoral aneurism, was induced, in seventeen hundred and ninety-six, to tie the *external iliac* artery, and though the patient did not recover, he lived long enough to evince the propriety of repeating the operation in subsequent cases. Mr. Abernethy's second attempt was alike unfortunate; but his third and fourth were crowned with complete success, and served to establish the operation, which has since been repeatedly executed by different surgeons, and often with the happiest effect. In America, the operation was performed, for the first time, by the late Dr. Dorsey, in eighteen hundred and eleven, and with a result that usually followed the efforts of that accomplished surgeon.

Mr. Abernethy's operation for inguinal aneurism, which I prefer to that of Sir Astley Cooper, or any other I am acquainted with, is executed in the following way. The patient being laid upon a table, an incision should be made in the course of the external iliac, commencing about an inch and a half from the anterior superior spinous process of the ilium, and extending within half an inch of Poupart's ligament. The tendons of the external oblique muscle being cut through to an extent corresponding to the wound in the integuments, a finger should be carried beneath the margins of the internal oblique, and transversalis, to prevent the peritoneum from being injured while the surgeon is dividing these last mentioned muscles. As soon as this stage of the dissection is completed, the finger can be readily passed behind the peritoneum as far as the inner edge of the psoas muscle, where the external iliac artery,

and its corresponding vein will be found. The vein, running along the inner side of the artery, should be gently separated from that vessel by the finger nail, or handle of the knife; a ligature may then be passed around the artery, by means of the aneurismal needle, or Bellocque's instrument, and tied; and the wound being dressed, the patient must be put to bed, and the muscles of the limb kept in a relaxed position.

The *common* iliac artery has never been tied, that I know of, in a case of aneurism of the external or internal iliac, but I had occasion several years ago, to tie the left trunk of that vessel, about half an inch below the bifurcation of the aorta, in a case of gun-shot wound. The patient lived fifteen days after the operation, and then died from peritoneal inflammation, and from ulceration of the artery. The circulation in the limb of the injured side was re-established about the seventh day after the artery was tied.*

* "*Ligature of the Arteria Iliaca Communis at its Origin.*"—Professor Mott of New York has recently performed this operation for the cure of an aneurism, which occupied the whole extent of the vessel from within the ligament of Poupart to some distance above the origin of the internal iliac artery. The tumour was of large size, protruding the belly considerably at the iliac region; the patient suffered most excruciating pain, which appeared to increase as the tumour enlarged. Dr. Mott's incision extended from the external abdominal ring, to one or two inches above the crest of the ilium, dividing the tendon of the external oblique, and cutting through part of the origins of the internal oblique and transversalis. He then cautiously raised the peritoneum with his fingers, and succeeded in detaching it entirely from the tumour and vessels, without doing it the slightest injury.

"The artery was then examined, and the aneurismal dilatation was found to cease at about half the distance between the bifurcation of the

aorta and the origin of the internal iliac branch. The ligature was passed from the outside of the vessel, by the aid of the excellent instrument devised by Drs. Parrish and Hewson, carefully avoiding the iliac vein. The protrusion of the intestines rendered this part of the operation the most difficult. After the ligature was passed around the vessel, the wound was held open in such a manner as to allow the medical gentlemen present to see, and satisfy themselves of the exact situation of the ligature, which was just below the bifurcation of the aorta into the primitive iliacs, and on the side of the sacro-vertebral promontory. The ligature was then drawn tight and secured; the pulsation of the tumour ceased; its size was much diminished, and the patient was relieved from the agonizing pain, previously unremitting.

"The wound was lightly dressed, and patient put to bed; the limb of the side operated on was cold, as might be anticipated; it was wrapped in cotton, and covered up to preserve the temperature until the circulation should be restored. To the great surprise and satisfaction of the surgeon, in a little more than half an hour after the operation, the circulation and temperature were entirely restored, and all fear respecting the supply of blood to the limb effectually dissipated.

"No untoward circumstance occurred after the performance of the operation. The patient complained of no inconvenience, except a peculiar sensation of fulness or tension in the limb, as if the small vessels had not yet become accustomed to their new office in sustaining the great mass of the circulation for the support of the member."—*Philad. Jour. of the Med. and Phys. Sci. for May.*

This is the second time, the bold operation of tying the common iliac artery has been performed; and in both instances by American surgeons. It was first resorted to fifteen years ago, by Dr. Gibson, Professor of Surgery in the University of Pennsylvania.

During the riots in Baltimore, in the year 1812, a man received a wound from a musket ball. As the accident occurred near to where the professor was standing, he promptly examined the wound, which he found bleeding with great profuseness. He thrust his finger into the wound, and with it compressed the bleeding vessel, until the patient was carried home. From the direction of the wound he supposed the injured artery to be the common iliac near its bifurcation.

Though the patient was much exhausted by the hemorrhagy, yet he determined to make an effort to save him by securing the artery. The

integuments of the abdomen above and below the wound were divided. "The peritoneum was next cut through, the intestines were turned to one side, until the artery was exposed, and slightly detached from the parts in its immediate vicinity." Ligatures were now applied around the left common iliac artery above and below its division. He next turned his attention to the intestines, which were opened in two convolutions. The apertures in the intestines were drawn together with a fine ligature, upon the plan suggested by Sir Astley Cooper. The clotted blood was removed from the abdomen, and the external wound closed.

As might be expected, coldness of the left limb followed the injury and operation, but the following day the temperature increased, and continued to increase, until it rose to nearly the heat of the opposite leg.

On the fourth day, symptoms of peritoneal inflammation supervened.

On the ninth day, the patient was seized with secondary hemorrhagy, which, at intervals, continued until the thirteenth day, when the patient expired.

On opening the abdomen after death, the folds of the intestines were united to each other in every direction by inflammation. "The upper ligature was found detached from the vessel, which projected and preserved the circle of its mouth entire." No union whatever had taken place between the sides of the artery. The impaired vitality of its coats, arising from contusion, was sufficient to prevent their union by adhesive inflammation.

The bullet was found imbedded in the upper part of the sacrum.

The result of this operation satisfactorily proved, as Dr. Gibson very properly stated, "that the largest artery in the body, except the aorta, may be tied without cutting off permanently the supply of blood to the lower extremity, inasmuch as the operation may possibly become necessary *in cases of aneurisms of the external or internal iliacs.*"—*North Am. Med. and Surg. Jour. July*, 1827.

Section VII.

Popliteal Aneurism.

The popliteal artery is peculiarly subject to aneurism; so much so, that many surgeons consider the disease nearly as frequent as that of aneurism of the aorta. It may arise either from a wound, or from a diseased condition of the coats of the vessel; but the latter is by far the most common. It is difficult to assign very satisfactory reasons for the extraordinary frequency of this complaint; for although there can be no doubt that the almost incessant motion of the knee joint, the great weight it is accustomed to bear, the shocks it is liable to, and the resistance which the blood must often encounter from the acute angle formed by the artery when the leg is bent upon the thigh, will contribute more or less to the rupture of the coats of the artery; yet the same causes should operate to a certain extent, upon the arteries of the axilla and elbow; true aneurism, however, of the axillary artery, is rather uncommon, and that at the bend of the arm almost unknown.

However induced, popliteal aneurism may be known by the situation which the tumour occupies between the ham strings, by its distinct pulsation in the early stages of the disease, by its gradual increase, by the great pain and numbness in the ham and calf of the leg, occasioned by pressure on the branches of the sciatic nerve, by the

general swelling and œdema of the limb, from the veins and lymphatics being obstructed, by coldness of the whole limb, from diminished supply of arterial blood, by want of pulsation in the tumour, after it has attained a large size, and by the contraction and injury of the knee joint—which is almost sure to follow the disease when of long standing.

Treatment of Popliteal Aneurism.

So few patients recovered, after the old operation of opening the sac of the popliteal aneurism and tying the artery immediately above it, that many intelligent surgeons abandoned the practice altogether, and in place of it amputated the thigh. How much we owe to the illustrious Hunter for his discovery of the true mode of managing the disease, may easily be estimated when I state that any surgeon who should now venture to amputate, except under very particular circumstances, in any case of aneurism, must encounter the severest censure and disgrace.

The operation, upon the Hunterian principle, as now usually performed, is as follows. An incision is made, while the patient is in the recumbent position, along the inner margin of the sartorius muscle, commencing about two inches and a half below Poupart's ligament, and extending downwards between three and four inches, through the integuments of the thigh. Having reached the sartorius, its inner edge may be gently separated from the surrounding cellular membrane, and being held to one side by

an assistant, the surgeon next proceeds to divide, to the extent of an inch, the fascia lata of the thigh, beneath which he will find the femoral artery and vein and the saphena nerve inclosed in their sheath. The sheath being opened, and care taken to exclude the nerve and vein, the ligature is passed, by the aneurismal needle, around the artery and tied. The wound is afterwards dressed in the usual way.

Section VIII.

Aneurism from Anastomosis.

This variety of aneurism was first particularly noticed by Mr. John Bell,* and denominated by him aneurism from anastomosis, on account of the tumour being formed of an assemblage of small arteries and veins, with an intermediate cellular structure. "The tumour," says he, "is a congeries of active vessels, and the cellular substance through which these vessels are expanded, resembles the cellular part of the penis, the gills of a turkey cock, or the substances of the placenta, spleen, or womb." Aneurism from anastomosis often arises from some slight injury; the tumour at first is scarcely perceptible; gradually, however, it enlarges, and acquires a thrilling, pulsatory, or jarring motion, which, together with its evident vascularity, forms its chief characteristic. In the early stages, the skin is seldom discoloured, but in the latter it has a mottled or purple hue, arising apparently from numerous small sacs of blood distributed throughout the tumour. These sacs towards the surface are apt to fret and take on ulceration; when this occurs, troublesome and very profuse hemorrhagies ensue. Frequently the disease seems closely allied to those vascular specks or growths, so common on the head and other parts of new born children, known by the name of *nævi materni.*

* See Principles of Surgery, vol. 1. p. 456.

Treatment of Aneurism from Anastomosis.

I have never known more than one instance of *spontaneous* cure of aneurism from anastomosis; this happened five or six years ago, in the child of a distinguished lawyer of Maryland. The patient was under the care of an able and accomplished physician—Dr. William Bradley Tyler, of Fredericktown—who consulted me respecting the case. The tumour filled up the hollow behind the angle of the jaw, involved a part of the ear, was very large and vascular, and pulsated with such violence as to appear, when the child cried, ready to burst. I advised the speedy removal of it, by the knife, as the only mode of saving the child's life, and it was resolved, for this purpose, to bring it to Philadelphia. The journey, however, was delayed, in consequence of a fever with which the patient was attacked, and which continued for a considerable time. From that period the tumour diminished, and shortly afterwards disappeared—leaving in its place only a loose bag or fold of skin. The records of surgery do not furnish, I believe, a similar termination.

Two operations have been proposed for the cure of aneurism from anastomosis—*Compression*, and *excision* of the tumour. The first seldom answers, but, on the contrary, generally aggravates the disease; the second is always hazardous, and never succeeds unless every vestige of the tumour be completely eradicated. Mr. John Bell laid it down as a rule never to be deviated from—"not to cut into the tumour, but cut it out." This, however, if it be a large aneurism, cannot always be done at once, or so

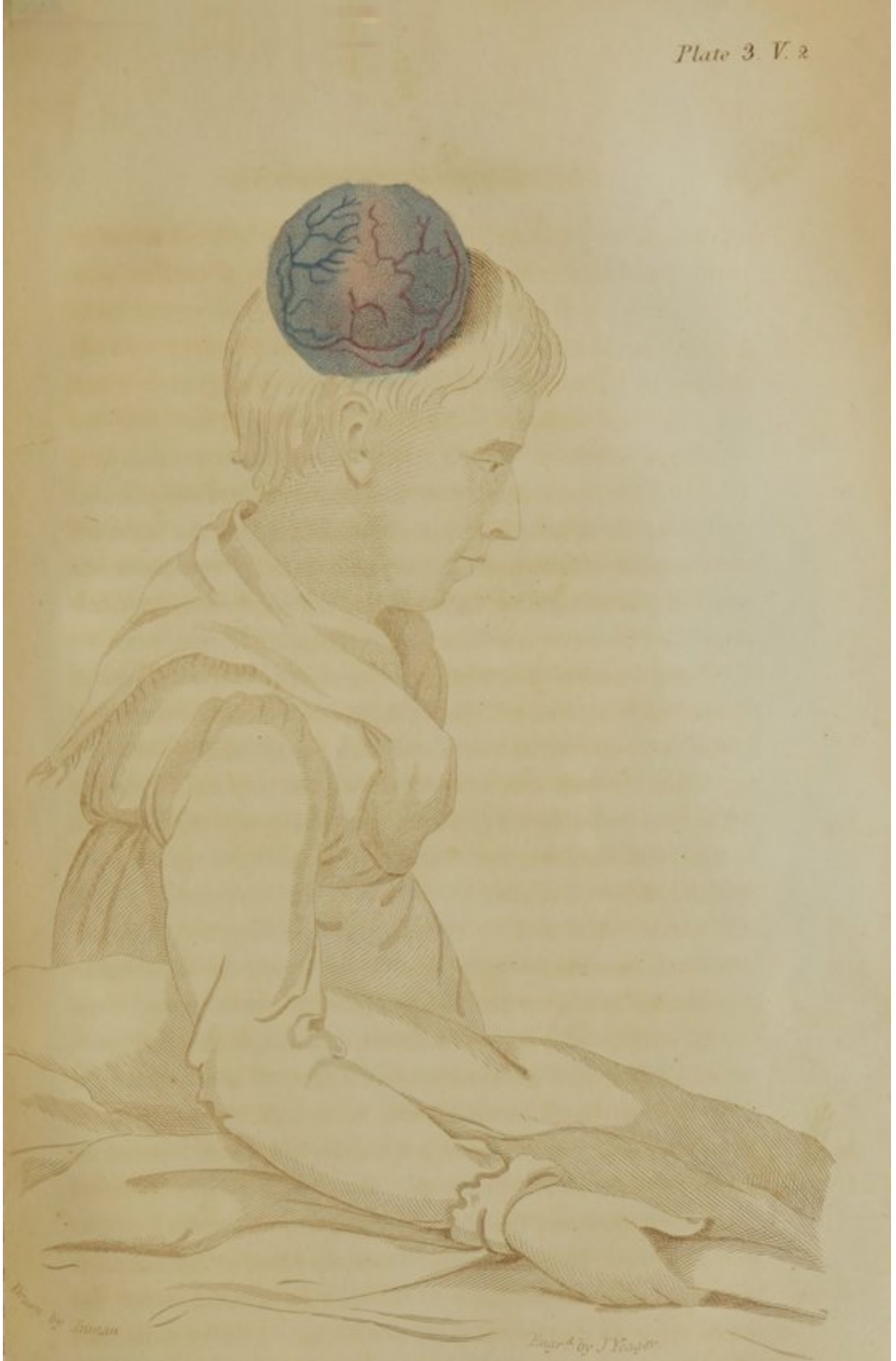
readily as might be imagined. At all events, it is easier said than done. Very small tumours of this description, especially if seated over a bone, may, no doubt, be removed by one or two sweeps of the knife ; but to point out what I conceive to be the true mode of managing this disease after it has attained an inordinate bulk, I relate the following case.

Elizabeth Loush, a married woman, twenty-five years of age, residing in the neighbourhood of Reading, came to Philadelphia in the month of April, 1823, anxious to obtain relief for a very large pulsating tumour, which nearly covered the right side of her head, and sometimes bled so profusely from numerous ulcerated spots on its surface, as frequently to endanger her life. This tumour had existed from infancy, but its increase was so gradual, and the pain attending it so inconsiderable, that it gave her little uneasiness. After her marriage, however, and especially during her second pregnancy (in which she was advanced four months at the time I saw her), the growth of the swelling was so rapid, its pulsation so alarming, and the hemorrhagies from it so frequent and debilitating, that she was prepared to submit to any operation I might propose for her relief. I was aware at once of the nature of the disease, and saw plainly the necessity of acting promptly and decidedly. To have dissected off a tumour of such magnitude, and so extremely vascular, at a *single* operation, would have been little better than madness. I resolved to proceed in a very different manner, and having placed my patient in a private department of the Alms-House Infirmary, I commenced without delay a series of operations. My first object was to cut off temporarily the chief supply

of blood to the tumour. With this view, I made several incisions, each about an inch long, through the scalp and at some distance from the margin of the tumour, and tied the chief branches of the occipital and temporal arteries, many of which were enlarged to the size of the common carotid. Having in this way encircled the diseased mass, I had the satisfaction to observe the pulsation diminish, and the tumour partially to shrink ; the hemorrhage, also, from the surface had ceased. A slight erysipelas of the scalp followed the operation. This occasioned a week's delay ; in the mean time, the blood was evidently finding its way again through the anastomosing vessels to the tumour. An incision was made about two inches long, by a single stroke of the knife, through the integuments to the bone, commencing near the back part of the ear, and midway between the edge of the tumour and the line at which the arteries were taken up in the first operation. An incredible quantity of blood issued in a moment from every part of the wound ; in a few moments, however, every vessel was secured. The cut was then repeated to the extent of three inches more, and the vessels in like manner secured. By this time the patient was so extremely faint, as to render it impossible to proceed further ; indeed, many of the spectators supposed her to be dying. Without delay, therefore, she was conveyed to bed, and the wound dressed, by interposing lint between its edges to prevent their re-union. In ten or twelve days the patient had so far recovered her strength, as to enable her to submit to a further incision of the scalp, commencing at the place where the last operation had terminated. This operation was also continued as long as the patient could bear it, or as was deemed prudent. Lint was then placed in the wound,

and the patient put to bed, and carefully nourished for a fortnight, at which time the third and last operation was performed—by dividing the remaining portion of the integuments, and removing the tumour from the bone. This was accomplished with comparative facility, the tumour being by the preceding operations nearly drained of its blood, and almost insulated. Care was taken in separating the diseased mass not to remove the pericranium; the bones, therefore, notwithstanding a great portion of the parietal and occipital was exposed, did not exfoliate, but were covered in a few days by florid and healthy granulations, the edges of the wound gradually approximated, and were so far closed in four or five weeks, as to enable the patient to return to the country, where in a little time longer her health was perfectly re-established, and at the end of the usual period, she was delivered of a promising son. An idea may be formed of the magnitude and appearance of this tumour, by an examination of the drawing in *Plate III.*

Some surgeons may possibly feel inclined to imagine that a ligature upon the *carotid* would have saved both myself and patient a great deal of trouble, and have answered all the purpose of the apparently complicated operation I have described. I have the most perfect conviction, however, that such an expedient would have proved at least abortive, if not hazardous, and that, whatever benefit may have resulted from the practice in the cases detailed by Travers, Dalrymple and others, where the tumours were small, no prospect of advantage can be held out from such an operation, when the disease is far advanced and the swelling large.



Section IX.

Varicose Aneurism.

Varicose aneurism is that variety of the disease, in which a communication is established directly or indirectly between an artery and vein, in consequence of a simultaneous wound in both vessels. Dr. William Hunter was the first who gave any regular account of the disease, though cases of it had been previously recorded by Sennertus and others. The disease is comparatively rare, but is generally met with at the bend of the arm, in the usual place of venesection, by which operation it is commonly produced. Three or four instances are related of its having occurred in the ham and thigh, from gun-shot and other wounds. It may take place in any situation where a large artery and vein are in contact, or near each other, and happen to be punctured at the same moment. Under these circumstances it usually happens, that there are two wounds in the vein and one in the artery, that the external wound in the vein heals, while the internal remains open and receives a stream of blood from the corresponding orifice of the artery, that the edges of these openings and the sides of the vein and artery to a certain extent become united by the adhesive inflammation, by which an unnatural route is established for the circulation in that portion of the body which happens to be the seat of the injury. Instead, however, of the artery and vein being always thus united, so as to afford a *direct* passage to the blood, it occasionally happens, that they are

separated some distance from each other, so that when wounded, the blood is poured from the artery into the adjacent cellular membrane, out of which a sac is formed, and this sac being placed between the two vessels, the blood is first discharged into it and afterwards into the vein. Mr. Hodgson is of opinion that these varieties of the disease are entitled to different names. The former he calls *aneurismal varix*, the latter *varicose aneurism*, without, as I conceive, sufficient reason; for the only difference* between them is, that in the one case the circulation between the vessels is *direct*, in the other *indirect*. The symptoms, moreover, are commonly the same. These symptoms are an unnatural distention, or varicose enlargement of the injured vein and of the veins in its vicinity, which is particularly conspicuous at the immediate seat of the disease, and communicates to the finger a peculiar, pulsatory, thrilling sensation, or vibratory motion, that may be compared to the forcible separation of the fibres of a quill, or, as remarked by Dr. Hunter, to the noise "produced in the mouth by continuing the sound of the letter R in a whisper." Not only is there an enlargement of the vein, but of the artery also, and in some instances to a considerable distance above the seat of the wound. The limb beneath the tumour is frequently emaciated from being defrauded of its due proportion of blood.

An exceedingly well marked case of varicose aneurism I met with in eighteen hundred and thirteen. The subject of it was upwards of sixty years of age, and had been

* The two diseases, however, may *terminate* in a very different manner, or require a different treatment, as will be explained presently.

Engraved by J. Kidgell

wounded by a bayonet, at the bend of the arm, during the rebellion in Ireland, which, no doubt, transfixed the artery and vein, for from that moment a tumour, possessing all the characters I have described, began to form, and gradually increased until it attained the size of a large egg. The veins communicating with it were uncommonly large, varicose, and very tortuous. Enlargements, also, of the artery, at the bend and middle of the arm and above the clavicle, were very manifest; all of which possessed a strong pulsatory, and, at the same time, oscillatory or tremulous motion. Although the patient had been, after his wound, and indeed up to the period I met with him, a hard working creature, little or no inconvenience was experienced from his disease, and he applied to me on account of another affection unconnected with his aneurism. The case was in every respect so strongly marked, that I was very anxious to possess an exact resemblance of the original. With this view I took an impression of the arm in plaster, nearly as high as the shoulder, and from it a cast* in wax, from which the drawing in *Plate IV.* has been copied.

Treatment of Varicose Aneurism.

The most common form of varicose aneurism—that in which the artery and vein communicate directly with each other—very seldom requires any other treatment than

* This preparation is still contained in my cabinet, and illustrates, most satisfactorily, the appearances presented by varicose aneurism.

moderate compression. Indeed even this is not always necessary, and may sometimes prove injurious, by obstructing the passage of the blood into the vein and forcing it into the cellular membrane, thereby causing the second variety of the disease. In most cases it will be sufficient for the patient to abstain from violent or laborious exertions of the limb in which the aneurism is seated. But even this does not always cause the tumours in the vein and artery to enlarge, for in the case I have detailed, the patient had been accustomed to laborious employments for twenty or thirty years without any material alteration in his disease. If an operation is performed for this disease, it should be done in the early stage of it.

When an aneurismal sac is formed out of the cellular membrane between the artery and vein, it frequently attains so large a size, as by pressure to injure the surrounding parts, or by bursting or taking on ulceration, endanger the patient's life. To guard against or obviate such consequences, an operation may possibly become necessary. There are only two cases on record, I believe, where this has been practised—one by Mr. Park* of Liverpool, the other by Dr. Physick.† In both these instances, the brachial artery was tied above and below the sac, and the patients recovered. I should imagine that a single ligature above the tumour would generally answer every purpose, and supersede the necessity of opening the sac.

* Medical Facts and Observations, vol. 4.

† Coxe's Philadelphia Medical Museum, vol. 1.

On Aneurism, consult *J. Bell's Principles of Surgery, vol.* 1—*Abernethy's Surgical Works, vol.* 1, *p.* 272, *edit.* 1819—*Scarpa on Aneurism, by Wishart,* 1819—*C. Bell's Operative Surgery, vol.* 1. *p.* 70—*Pelletan Clinique Chirurgicale, tom.* 1 *and* 2.—*Richerand's Nosographie Chirurgicale, tom.* 4. *edit.* 4—*Burns' Observations on some of the most important Diseases of the Heart, on Aneurism of the Thoracic Aorta, &c. p.* 203—*Burns' Observations on the Surgical Anatomy of the Head and Neck, edit.* 1824—*Hodgson's Treatise on the Diseases of Arteries and Veins, containing the Pathology and Treatment of Aneurisms and Wounded Arteries,* 8*vo.* 1815, *decidedly the most valuable work extant.*

CHAPTER III.

DISEASES OF THE VEINS.

Previous to the discovery of the circulation of the blood, the structure and functions of the venous system were very much studied; since that period the attention of surgeons has been directed almost exclusively to the arteries, and the veins have been neglected. Like the arteries, however, they are subject to important changes, or to disease in their coats, which frequently give rise to serious, and even fatal consequences.

A common disease of the veins is inflammation. This may arise from wounds, as in venesection, or from the application of the ligature. In either case the lining membrane of the vessel is the chief seat of the disease, and along this membrane the inflammation, sometimes, travels until it reaches the heart—producing great irritation and symptoms resembling those of typhous fever. In other instances an effusion of coagulable lymph takes place, and the sides of the vessel being thus glued together, frequently in different places, the extent of the inflammation is limited, or pus, if it should form, prevented from passing through the circulation, and the patient's life, probably, thereby saved. This obliteration of a vein from the effusion of lymph, is sometimes produced slowly by pressure from an adjoining aneurismal sac, or some other species of tumour. In all such cases the circulation is carried on

by the collateral veins, which anastomose so freely throughout the body with the main trunks, that little inconvenience is experienced from the obstruction, even although veins of the largest class be obliterated. Inflammation of the veins sometimes terminates in ulceration, and gives rise to hemorrhage. This, however, is a rare occurrence ; the formation of calcareous concretions in the venous coats is equally rare. Veins are occasionally ruptured from muscular exertion, from engorgement or overdistention of their coats by blood, produced by sudden immersion in a cold bath, or by other causes. But the most common venous affection, perhaps, is varicose enlargement, of which it will be proper to treat in a separate section.

Section I.

Varicose Veins.

The deep seated as well as the superficial veins, are frequently rendered varicose by undue muscular exertion, by interruption of the circulation from ligatures, by the pressure of tumours, by collections of hardened fæces in the intestines, by the enlargement of the gravid uterus, &c. If from any of these causes the disease is once induced, it continues gradually to increase and to extend from one vein to another, until numerous ramifications are affected. The veins of the upper extremities rarely become varicose, but those of the leg and thigh, especially the saphenæ and their branches, are very prone to the disease. In the commencement, numerous small circumscribed swellings may be observed. After a time, the venous trunks and branches appear enlarged throughout their whole extent, and run in a serpentine or tortuous direction. Sometimes they are knotted or doubled upon each other, and these gyrations are particularly conspicuous in the neighbourhood of the valves. In proportion as the veins enlarge, the support afforded by the valves to the column of blood is diminished, until it is entirely lost. Not only are the veins expanded greatly beyond their natural size, but their coats also, in many instances, are very much thickened. This, together with the coagulated blood which not unfrequently fills their cavities, renders them solid and incompressible. Under particular circum-

stances, these coagula are absorbed, and the diseased veins are converted into cords. In by far the greater number of cases, however, the vessels remain pervious, and the fluid blood still circulating through them sluggishly, keeps up incessant irritation, and gives rise to inflammation in the surrounding cellular membrane, that often terminates in extensive and very painful ulcerations.* Profuse hemorrhage, from sudden rupture or ulceration of a varicose vein, followed by extreme debility and even death, has repeatedly happened.

Treatment of Varicose Veins.

In addition to compression with the roller or laced stocking, which, in slight cases, are well calculated to effect a cure, the older surgeons frequently extirpated large portions of the trunks or branches of varicose veins, sometimes with success, but oftener with an unfavourable issue. On this account the operation has long been abandoned, and that of simply including in a ligature the largest varicose trunk substituted in its stead. This mode of practice, although familiar to Celsus and other ancient writers, was introduced to the notice of the profession many years ago by Sir Everard Home, and has since been executed repeatedly by different surgeons, generally without any serious consequences, but sometimes with a fatal result. Many surgeons of the present day, therefore, never resort to the operation, especially as there is no certainty of a radical

* See an account of the varicose ulcer, in vol. 1. p. 199.

cure. Sir Astley Cooper, a surgeon of great experience, pointedly condemns the practice, and states that he has known it to prove fatal in eight instances. "Another overwhelming objection to the operation," says he, "is, that when it does not prove fatal, its ultimate effects are useless. If I were asked which of the following operations I would rather have performed upon myself, viz. the saphena major vein or the femoral artery tied, I certainly should choose the latter."* In opposition to Sir Astley's statement, that the operation is never permanently useful, I may remark, that I have practised Sir Everard Home's plan of taking up the vena saphena above the knee, for the last sixteen or seventeen years; in numerous instances, without an unpleasant symptom, and generally with great relief to the patient and a speedy cure of the accompanying ulcer. It is an operation, however, that I have never undertaken lightly or upon every common occasion, being fully aware of the danger of inflammation extending along the inner surface of an injured vein to the heart. Of late years Mr. Brodie, in order to avoid the occasional ill effects of the ligature, has proposed, as a substitute, the simple division of the vein by the knife;† but this operation, also, it is stated,

* The Lectures of Sir Astley Cooper, by Tyrrel, vol. i. p. 205.

† "For this operation," says Mr. Brodie, "I have generally employed a narrow sharp-pointed bistoury slightly curved, with its cutting edge on the convex side. Having ascertained the precise situation of the vein, or cluster of veins, from which the distress of the patient appears principally to arise, I introduce the point of the bistoury through the skin on one side of the varix, and pass it on between the skin and the vein, with one of the flat surfaces turned forwards and the other backwards, until it reaches the opposite side. I then turn the cutting edge of the bistoury backwards, and in withdrawing the instrument the di-

has sometimes been followed by fatal consequences. Petit was in the habit of opening varicose veins with a lancet, and withdrawing the coagulated blood; after which, in many instances, he found that the vessels became obliterated, and the patient experienced no further inconvenience from the disease. Even drawing off occasionally small quantities of fluid blood by puncture, produces great relief. This mode of treatment, indeed, conjoined with the use of the roller, astringent washes, and an elevated position of the limb, will often effect a cure, and should always be tried before an operation is resorted to.

vision of the varix is effected. The patient experiences pain, which is occasionally severe, but subsides in the course of a short time. There is always hemorrhage, which would be often profuse if neglected, but which is readily stopped by a moderate pressure, made by means of a compress and bandage carefully applied."

Section II.

Cirsocele.

The veins of the spermatic cord, and those of the scrotum, often become varicose. To the former the term cirsocele has been applied—to the latter varicocele. The two diseases sometimes exist simultaneously. Cirsocele is chiefly met with amongst young, vigorous, unmarried men, those especially who have led very chaste and exemplary lives. In several instances I have known it connected with despondency or hypochondriasis. When examined, the whole of the cord appears to consist of a congeries or bundle of knotted and tortuous veins, which feel like a bunch of worms wrapped around and twisted upon each other. Generally the disease first shows itself at the bottom of the testicle or scrotum, and thence gradually travels up the cord, producing more or less weight, uneasiness or pain. When the patient is laid in the recumbent position, the tumour subsides, and the diseased veins feel soft and flaccid. The moment, however, he stands erect, especially if, at the same time, the upper part of the cord be compressed with the finger, the tumour re-appears. This will serve to distinguish cirsocele from hernia, hydrocele, and other complaints.

Treatment of Cirsocele.

It is seldom that the testicle, or cord, sustains any injury from varicose enlargement of its veins. Sometimes, however, it happens that the testicle, from long continuance of the disease, or from neglect, wastes away. To guard against this, and to relieve the unpleasant weight and uneasiness, of which most patients complain, there is nothing so effectual as a bag truss, so contrived as to suspend the testes and give them a firm and equable support.* Conjoined with this, cold astringent washes, applied by means of linen rags to the affected parts, will be found highly serviceable. Robust and plethoric patients will also derive benefit from general and local blood-letting, from purging, low diet, &c. Extirpation of the diseased veins has been practised by some modern surgeons in cases of cirsocele attended with severe pain and extraordinary enlargement of the cord and testicle. I have never met with a case requiring an operation of the kind, and have strong doubts, independently of its difficulty, of the propriety of the measure under any circumstances.

I might next give an account of *hemorrhoids*, but as the affection does not invariably depend upon a morbid condi-

* Several years ago I placed in the hands of Mr. Frederick Brown, an eminent druggist of this city, an article of this description of very superior construction, known in England under the name of hunting truss. From the pattern Mr. Brown has ever since kept a constant supply. Excellent trusses of the same description are also imported from France, by Mr. Durand, of Chesnut street.

tion of the *veins*, I shall defer the consideration of it until I have occasion to treat of the diseases of the *rectum*.

On diseases of the veins consult—*Hunter's Observations on the Inflammation of the Internal Coats of Veins, in Transactions for the Improvement of Medical and Chirurgical Knowledge, vol.* 1. *p.* 18—*Hodgson on the Diseases of Arteries and Veins, p.* 511—*Observations on Varix and Venous Inflammation, &c. by Richard Carmichael, in Transactions of the Association of Fellows and Licentiates of the King's and Queen's College of Physicians in Ireland, vol.* 2. *p.* 345—*Home's Practical Observations on the Treatment of Ulcers of the Legs, to which are added some Observations on Varicose Veins, &c. p.* 274—*On Wounds and Ligatures of Veins, by B. Travers, in Surgical Essays by A. Cooper, &c. part* 1. *p.* 227—*Brodie's Observations on the Treatment of Varicose Veins of the Legs, in Medico-Chirurgical Transactions, vol.* 7. *p.* 195—*Oldknow's case, in which the operation of tying the vena saphena, for the cure of an old ulcer of the leg, terminated fatally, in Edinburgh Medical and Surgical Journal, vol.* 5. *p.* 175—*C. Bell's Operative Surgery, vol.* 1. *p.* 89 *and* 94—*Delpech's Précis Elémentaire des Maladies Réputées Chirurgicales, tom.* 3. *p.* 251, *article Varices.*

CHAPTER IV.

INJURIES OF THE HEAD.

In a pathological, as well as practical point of view, there are no diseases more deserving of the surgeon's attention, than those usually comprehended under the name of injuries of the head. These embrace several affections very distinct from each other in character, and requiring the most opposite modes of treatment. On this account, it will be proper to consider them in separate sections. It must not be supposed, however, that these diseases are always so well marked and insulated in their symptoms, and altogether so independent of each other, as never to exist simultaneously. This is so far from being the case, that we often find them blended or intermixed in a manner so extraordinary, as to puzzle or confound the most intelligent practitioner. Indeed, as has been well remarked by the experienced Hennen, "the young surgeon, who, for the first time, witnesses a series of injuries of this description, will at every step have something to unlearn; he will find symptoms so complicated, contradictory, and insufficient to give any rational clue to their causes; diagnostics, of the truth of which he had read himself into a conviction, so totally unsupported by the results of practice; and the sympathies he was led to look for as infallible

accompaniments of certain states of disease, so often wanting altogether, that he will probably be inclined to relinquish the hope of ever arriving at a correct theory, or at least, he will enter the clinical ward with the pride of science considerably subdued."

Section I.

Fracture of the Skull.

Fractures of the skull differ widely from each other in appearance and extent; hence their division by writers into several varieties, such as fissure, counter-fissure, depressed fracture, double depressed or camerated fracture, stellated fracture, punctured fracture, &c. These distinctions are of some importance, since the mode of treatment must in many instances depend upon the particular variety of fracture that may happen to exist. By the term fissure, is understood a simple crack or division of one or more bones of the skull; by counter-fissure, a separation produced at a point opposite to that upon which the force was applied. A depressed fracture is that in which the bones are forced beneath their natural level. The fracture is said to be camerated when "the centre is depressed in a direct line, and the sides decline towards that centre, like the form which the two hands make when laid together edgeways."* A stellated fracture takes its name from the resemblance it bears to a star. Punctured fracture is the result of a pointed instrument driven through the bone. These varieties of fracture, are owing in part to the shape of the instrument by which they are produced, to the force with which it is impelled, and to the inequality of thickness and strength of the different bones composing the

* See J. Bell's Principles of Surgery, vol. 2. part. 2. p. 795.

skull. Were it not for this inequality, counter-fissure would very frequently take place; for the skull being formed upon the principle of a hollow sphere, any force applied to it must extend its influence throughout the circle, and produce fracture at a point opposite to that upon which the force was exerted. But this is prevented by the circumstance of some of the bones being thinner and weaker than others. If, for example, a man in falling backwards receives a violent blow upon the occiput, this bone, being unusually thick and strong, does not give way, but the percussion is propagated towards the temples, where the bones are weak, and here the fracture occurs. The same thing may arise from a blow upon the top of the head. In like manner a force applied to the frontal bone will often, instead of fracturing that bone, fracture the orbitar plate. My preceptor, Mr. Charles Bell, has satisfactorily illustrated these and several other interesting points relating to fractures of the skull in a most ingenious paper contained in the first volume of his "Surgical Observations." In the paper referred to, Mr. Bell not unaptly compares the skull to the roof of a house, in which the sphenoid bone serves as the *tie beam* to prevent the *rafters*, or parietal bones, from giving way. Again, the broad and expanded surface of the petrous part of the temporal bone is supposed to bear a resemblance to the *groining* of a wall in masonry, and as such to afford a foundation for the parietal bones to rest upon, while the mastoid, zygomatic, and petrous processes are likened to the arches built under a wall, to increase the security of the foundation.

Treatment of Fracture of the Skull.

Simple fissures or fractures of the cranium, unaccompanied by injuries of the brain or its membranes, seldom demand particular treatment. Indeed there is reason to believe that such accidents often escape the notice of the surgeon, and are cured without his assistance. But even when the fracture is known to exist, the patient's safety may be endangered by officiousness in tracing it, or attempting its elevation. The rule in all cases of the kind, should be to refrain from an operation so long as the contents of the skull remain unaffected, and of this the surgeon is to judge by the *symptoms*. It will always be proper, however, to remove sharp points or ragged edges of bone, by the cutting forceps, trephine or saw, to prevent them from irritating the dura mater, brain, or the soft parts exterior to the skull. In certain cases, also, the bone becomes carious some weeks after the fracture, and if suffered to remain, may destroy the patient by exciting inflammation upon the surface of the brain. The treatment necessary for fractures, conjoined with injury of the brain, will be pointed out under the head of *compression* of the brain.

Section II.

Concussion of the Brain.

It often happens, that a man receives a smart blow upon the head, which does not fracture the skull, or materially injure the brain, but disorders the intellectual functions, and produces vertigo, sickness of stomach, trembling of the limbs, dimness of vision, &c. This may be considered a case of slight concussion. In more severe injuries of the kind, the symptoms are different. The accident is immediately succeeded by insensibility, coldness of the skin, relaxation of the extremities, feebleness and irregularity of pulse, difficulty of breathing, and dilatation of the pupil. The breathing, however, though weak and labouring, is commonly free from stertor. After a time the sensibility is partially restored, so that the patient may be roused from the apparent sleep or lethargy in which he is usually found, and made to answer questions, especially those relating to the seat of his injury. Gradually the pulse rises, and the natural breathing is restored, the pupil contracts and the body recovers its warmth. There is now danger of inflammation of the brain, since the pulse, in proportion as the immediate symptoms wear away, continues to augment in volume and strength, and the blood is determined forcibly to the head. Independently of this, in most cases of severe concussion, there is reason to believe that blood is

poured out upon the brain or its membranes, in greater or less quantity, and afterwards becomes a source of irritation.

Treatment of Concussion of the Brain.

If called immediately after an accident, and symptoms of concussion are found to exist, the surgeon should be very careful not to adopt the practice, but too common among the ignorant and vulgar, of bleeding the patient instantaneously. But he must wait until the pulse rises, or until reaction is established, and this usually takes place in an hour or two; he will *then* bleed to diminish vascular action, and to prevent inflammation of the brain, which in severe cases of concussion is extremely apt to ensue. If blood-letting, however, is pernicious in the first stage of concussion, the administration of stimulants will generally prove equally so, for although the patient may seem to be benefited for the time by a mouthful of wine or brandy, yet the effect of such practice will be in the end to hurry on the cerebral excitement. A few tea spoonsful of cool water, immediately after the injury, will often be found singularly useful in reviving the patient, and cannot interfere with the after treatment. With regard to the continuance of blood-letting, much will depend upon the extent of the injury, and the age and constitution of the patient. Many instances are recorded of death from profuse evacuations of blood, designed to obviate inflammation of the brain. A medium must, therefore, be observed. In addition to blood-letting, low diet and purgatives should be re-

sorted to. Applications to the head, which ought previously to be shaved, will also be found highly serviceable, such as cloths dipped in cold water, &c.; and after full benefit has been derived from these, blisters may be used with decided advantage; keeping the head in an elevated position, also, during the whole treatment, will greatly contribute towards the prevention and removal of inflammatory action.

Section III.

Compression of the Brain.

Compression of the brain may arise from three different causes—from a depressed fracture, from effused or extravasated blood, and from suppuration within the brain or its membranes. It seldom happens, however, that a mere depression of the bone, unattended by other injury, will give rise to severe symptoms, or to such as characterize a compression of the brain. Indeed the records of surgery furnish numerous examples of perfect recoveries after the most extensive depressions, from which the patients sustained very little inconvenience, and for the relief of which no operations were performed. On the other hand, cases are now and then met with, where, from depression of both tables of the skull, or from extensive fracture of the inner table, the most urgent symptoms have followed, but have been speedily relieved upon elevating the bones to their natural level.

Compression arising from extravasation of blood is very common, and may accompany fracture of the bone or be independent of it. Sometimes the blood is poured out between the dura mater and the skull, in which case the membrane is actually shaken from the bone, and the blood issues from numerous small vessels. Sometimes the middle artery of the dura mater is torn by the rough edge of the fractured bone, or by the force which produced the

fracture, and then the hemorrhage is very sudden and profuse. At other times the vessels of the brain are torn, and the blood is spread over its surface, forced into its substance, or poured into the ventricles. In most cases of extravasation, there is commonly an interval between the injury and the appearance of the symptoms of compression, and this, when it does occur, may be considered as a sufficient characteristic of its nature; for immediately after the vessels are torn there is no compression, but as the blood accumulates and extends itself widely, the symptoms denoting that condition are gradually developed and finally confirmed.

Matter, like the coagulum formed by extravasated blood, may give rise to compression; it is always, however, the result of inflammation, and, on this account, does not immediately follow an injury of the skull. Often it proceeds from the irritation produced by fragments of the shattered internal table, or from sharp or ragged spicula wounding the dura mater or brain. A depressed fracture, too, although it may not have produced, at first, symptoms of compression, will sometimes eventually cause suppuration on the surface of the dura mater. Even when the skull has not been fractured, but severely bruised, suppuration may follow with caries of the bone. Extravasated blood, also, may give rise to suppuration between the bone and dura mater or within the brain.

If from either of the foregoing causes compression should arise, it will be denoted by the following symptoms. The pulse will be found slow and regular, the pupils of the eyes greatly dilated and insensible to the strongest light, the

breathing stertorous, slow and difficult, the limbs loose or yielding and sometimes paralytic, the insensibility complete, so much so that the patient cannot be roused by the most powerful stimuli. There is no sickness or vomiting. These symptoms will distinguish it from *concussion*, in which the pupils are either contracted or moderately dilated, the pulse weak and tremulous, the breathing without stertor, the insensibility partial, the affection of the stomach almost universal. It must be confessed, however, that we seldom meet, in these two states of disease, with the symptoms so insulated and distinct, as to enable us accurately to separate them; that, on the contrary, they are commonly combined and so intermixed as often to create great confusion and doubt in the mind of the surgeon.

Treatment of Compression of the Brain.

When called to a patient labouring under all the symptoms of compressed brain, the surgeon can scarcely do wrong in drawing blood from the arm, and in repeating the operation as often as the pulse may seem to require it. In addition to this treatment, purgatives should be administered; and by pursuing this plan, he will often have the satisfaction to find that the symptoms abate, or are so entirely removed as to render an operation unnecessary; should he be disappointed, however, in this expectation, and an operation be afterwards demanded, the patient, from the previous depletion, will have a better chance for recovery. If, notwithstanding this treatment, the comatose symptoms continue, and there is reason to believe that the brain is

oppressed by a coagulum, the trephine must be resorted to, whether the skull be fractured or not, and the coagulum removed. The same observation will apply to fracture with depression, always recollecting, however, that the *symptoms* call for the operation, and not the mere fracture; and that this, if the brain be uninjured, will often unite like any other fractured bone, even although the depression be left. On the other hand, it should be stated, that a depressed fracture, which at first did not interfere with the functions of the brain, will sometimes give rise to inflammation of the dura mater or brain, and subsequently to compression from the formation of matter; and that these consequences might have been prevented, perhaps, by a timely operation. But a great deal of judgment will be required to enable the surgeon to anticipate such consequences.

The *instruments* that may be required for an operation on the skull, are two or three trephines, the largest about an inch in diameter, the second three quarters, and the third half an inch; all of them provided with sharp teeth widely set, and with *centre pins; Hey's saw*, a *lenticular, raspatory, trepan forceps*, two *elevators*, a *brush* for cleaning the trephine and saw, a *tooth-pick* or *probe, tenacula, sponges, crooked needles, ligatures*, a *scalpel, &c.*

The object the surgeon has in view in applying the trephine, is either to make an opening for the removal of coagulated blood, or for the introduction of the elevator beneath a depressed bone. In the former case a large trephine should be employed, in the latter a small one. Very frequently, however, it happens, that there is a sufficient

Plate 3 V. 2.

Fig. 1.

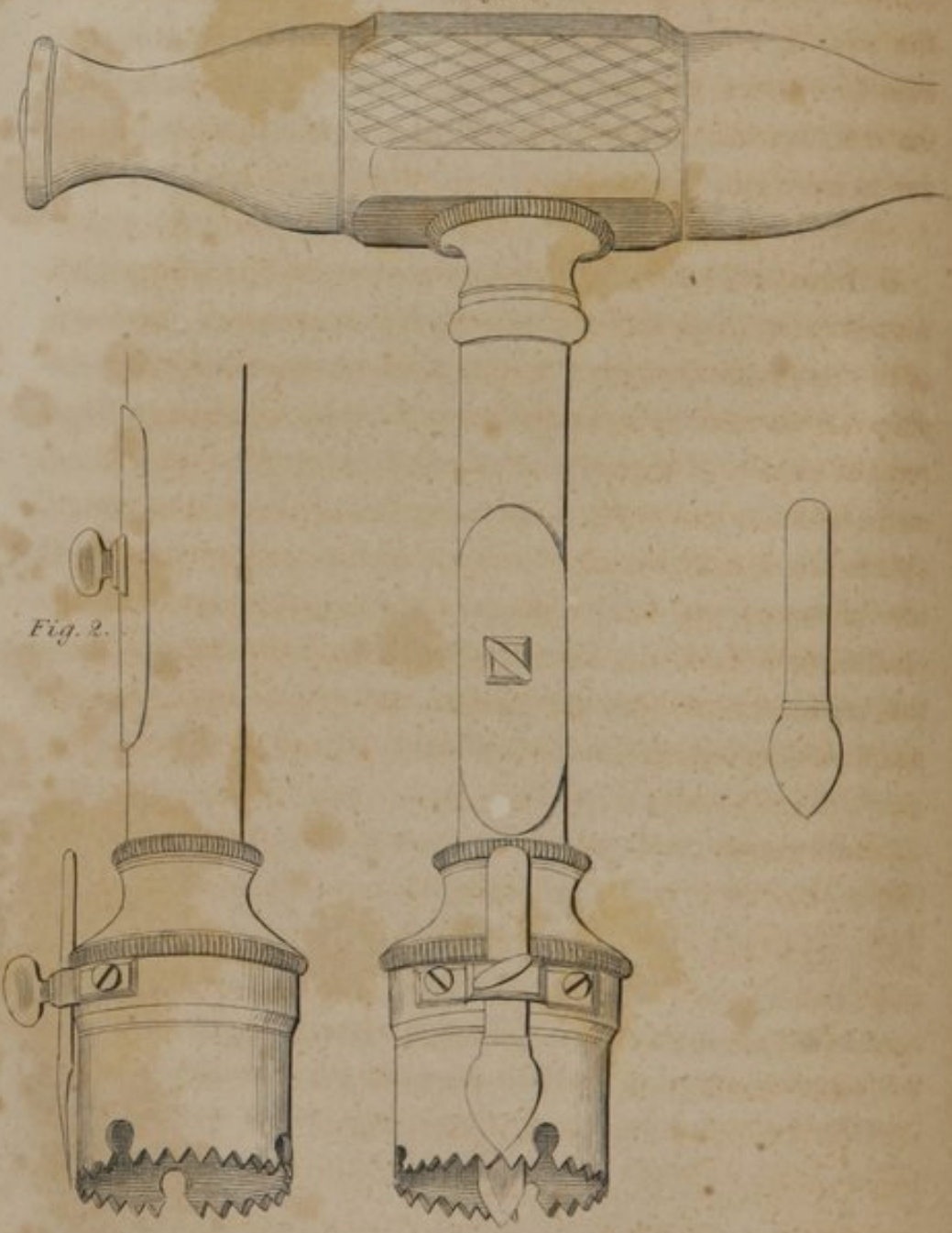


Fig. 2.

Drawn & Eng'd by J. Drayton.

space between the edges of the fragments of bone to insinuate the elevator, and with it restore the depressed portion to its natural level. Under such circumstances, the trephine need not always be employed. It is commonly recommended to plant the crown of the trephine partly upon the sound, and partly upon the depressed bone. Whenever the latter is sufficiently firm to bear the pressure of the instrument, I prefer resting it entirely upon it, in order to save the sound bone.

If there is a wound of the scalp along with the fracture, it may be enlarged, if necessary, or so changed in shape, as to enable the surgeon to get at the bone, and effect his purpose in the easiest way possible. If the integuments remain entire, I would recommend the *tripod* incision—made in such a manner as to leave the angles of the wound obtuse instead of acute. The flaps of the integuments being turned back, the *centre pin* of the trephine, without the preliminary measure formerly practised, of scraping away the pericranium,* is fixed upon the bone, and serves the purpose of guiding the saw, which, being worked steadily

* Having seen much mischief result from the common practice of rasping the pericranium, and from the teeth of the saw when applied in the way above directed, I have used for some time past, a trephine with a small moveable lancet attached to its outer surface, the extremity of which can be made to project about the sixteenth part of an inch beyond the teeth of the instrument. The object of this is to cut the pericranium smoothly instead of *tearing* it. As soon as this is accomplished the operator may retract the lancet and proceed to saw the bone. The advantages gained by this simple proceeding must appear too obvious to require illustration; and yet I am not aware that either the principle upon which the operation is founded, or the instrument itself, have ever before been suggested or applied. (See Plate v. fig. 1 and 2.)

backwards and forwards for a few minutes, forms a track or gutter for itself, in which it will afterwards run without the assistance of the pin. The pin being withdrawn, or made to retire within the axle of the trephine, the operator continues to divide the bone (occasionally removing the saw and brushing away the sawings, or dust, to prevent them from clogging the teeth) until he has reason to believe that he is nearly through. He should then examine carefully and very repeatedly with the probe or tooth-pick, lest he cut into the dura mater or brain, before he is aware. Frequently it occurs, that one part of the bone is divided, whilst another remains entire. The surgeon in this case should discontinue the saw, and attempt the removal of the circular piece of bone, by breaking up its attachment with the forceps. Any irregularity or projecting edge of bone that may remain may be smoothed off by the *lenticular.* If blood be extravasated between the dura mater and skull, and the perforation has been made in the proper place, the coagulum will be presented as soon as the circle of bone is removed, and evacuated through the hole by the pulsations of the brain. If the blood be effused between the brain and dura mater, this membrane will sometimes be forced into the opening, and the dark blood will appear beneath it. The surgeon should then cautiously open the membrane, and evacuate the blood; though the operation does not commonly succeed when this is necessary. Still it is the only chance the patient has. In many instances, the moment the brain is relieved from the pressure of a depressed bone, or from the load of extravasated blood, the symptoms of compression instantaneously disappear, and the patient recovers his reason. In other cases, the coma-

tose state continues, and no benefit is derived from the operation.

If any large arteries are divided during the operation, they may be taken up by the tenaculum or needle. In a very extensive fracture of the skull, which I attended many years ago with Dr. Gustavus Warfield, an eminent practitioner of Maryland, I had occasion to tie up the middle artery of the dura mater; this was easily accomplished by the needle. Sometimes this artery runs in a groove in the bone; in that case, it may be compressed by a plug of soft wood. After the common operation of the trephine, the edges of the wound should be drawn together by adhesive straps, and secured by a pledget and light dressing.

For extensive extravasations, one or more openings with the trephine may become necessary. As it cannot always be determined readily whether there is extravasation or not, Mr. Abernethy has suggested the ingenious expedient of cutting down upon the bone, and scraping the pericranium before perforating the skull. This operation is founded upon the fact of the free interchange of vessels between the dura mater, bone, and pericranium, or rather upon the circumstance of the latter membrane being in a great measure dependent for its supply of blood upon the dura mater. Hence it was inferred, that if by a shock communicated to the skull the dura mater was torn up from the inner surface of the skull, the vessels passing through the bone to the pericranium must also be torn, and consequently that that membrane if scraped would not bleed, and vice versa. Mr. Abernethy has found this to

hold true in practice, but his statements have not been confirmed *in toto* by other surgeons.

With the exception of the occipital bone, the trephine may be applied with equal effect, and comparatively with little danger, to any part of the skull. When the frontal sinus is fractured, and it is necessary to trephine its inner table, two trephines should be employed—a large one for the outer portion of bone, and a smaller one for the inner portion. This mode of performing the operation was first pointed out by Mr. Charles Bell. It is founded upon the unequal form of the sinus, in consequence of which a single trephine could not be made to work perpendicularly against its inner table. If a patient recovers after the application of the trephine, the external wound gradually heals up, and the opening in the bone is covered by a membrane, formed partly from the pericranium, and partly from the dura mater, which serves afterwards to protect the brain, but the bone is seldom if ever regenerated. If the patient dies after the operation, it is commonly from inflammation of the brain, or from suppuration within its substance. This will show the propriety of endeavouring to combat the inflammatory action, both before and after the operation. The trephine, when employed to evacuate matter from the brain, is seldom found to succeed.

Section IV.

Inflammation of the Brain.

If, from any of the causes pointed out in the preceding sections, inflammation of the brain should arise, it will be characterised by the following symptoms. The face becomes flushed, the eyes are red and impatient of light, the pupils are contracted, the skin hot, the pulse hard and quick, and the tongue dry. The pain in the head is intensely severe, the scalp is puffy and œdematous, retains the impression of the finger, has a peculiar glossy aspect, and the wound, if there be one, discharges a sanious matter. Soon after the appearance of these symptoms, the patient is seized with rigors or shiverings, which occur at irregular intervals, and are always indicative of great danger. During the early stages of the inflammation, the patient often continues sensible for days together, and answers questions very distinctly; when the disease is further advanced, however, he becomes irrational, moans or sighs heavily, tosses from one side of the bed to the other, mutters constantly, withdraws his hand from the surgeon, and seems unconscious of all that is passing around him. These symptoms are sometimes followed or accompanied by hemiplegia, and violent convulsions. If the patient survive until the suppurative stage is established, the matter will be found either between the dura mater and bone, between the pia mater and brain, in the substance of the brain itself, or in the longitudinal sinus.

Treatment of Inflammation of the Brain.

To counteract inflammation of the brain or its membranes, the most active antiphlogistic measures must be pursued. Blood-letting is more to be relied on than any other remedy; but the surgeon should not be satisfied with merely drawing blood from the arm; he should take it freely from the scalp by leeches, or open the temporal artery, or the jugular vein. Purgatives, also, will be found essentially necessary, and after full effect has been produced by these and by blood-letting, the scalp may be covered with a large blister, which should be repeated as often as the symptoms require it. If in spite of these remedies the inflammation terminate in suppuration, and give rise to the symptoms of compressed brain, the trephine should be resorted to, though it must be confessed that the patient's chance of recovery is very limited, when such a measure seems to be called for. In some instances, months or years elapse before inflammation or suppuration of the brain takes place from injuries of the head. A carious bone, in such cases, will commonly be found to be the cause of the mischief, but unfortunately the removal of it by the trephine, will seldom prevent the patient's death.

Section V.

Fungus Cerebri, or Encephalocele.

After extensive fractures, and the removal of large pieces of the skull, or after the operation of the trephine, a tumour, having all the appearances of a vascular organized growth, sometimes sprouts from the brain, fills up the openings in the bone, and projects beyond the scalp, and often acquires considerable magnitude. Commonly this morbid enlargement is first seen making its way through a laceration in the dura mater; but in other instances the dura mater ulcerates, from being forced repeatedly by the pulsations of the brain against the sharp edges of the bone, and the tumour appears immediately beneath, and afterwards increases with wonderful rapidity. Mr. Abernethy is inclined to believe that "this disease frequently consists of a tumour formed by coagulated blood, and that an organized fungus could hardly be produced in so short a time as that in which these tumours are usually formed." Mr. Charles Bell, on the contrary, maintains that the tumour is vascular, and formed of the substance of the brain itself; that it bleeds when torn or cut, which would not be the case if formed of a mere coagulum; that it is affected like spongy granulation by caustic, and collapses after death: all which, in my opinion, furnish decided evidence of its vascular nature. Indeed Mr. Bell's views have been amply confirmed by the observations and dissections of subsequent writers. In particular, Mr. Stanley having had occasion

to cut off a tumour of this description, found, upon dissection, "the exterior of the tumour to consist merely of a layer of coagulated blood, and the rest of the mass of brain, possessing a natural appearance, the distinction between the cortical and medullary matter being readily seen with the convolutions and pia mater dipping down between them."

Tumours, very different in structure from the foregoing, sometimes sprout from the external surface of the dura mater. They are apt to follow blows and other injuries of the head, in which the bone has been bruised but not fractured. The patient, in such cases, usually complains of deep-seated severe headach, which may continue for weeks or months together. At last a swelling is observed beneath the scalp, communicating a pulsatory motion to the finger, and rapidly enlarging, without the integuments taking on ulceration—though this sometimes happens in the advanced stages of the disease. If the integuments are divided, and the tumour examined, it will be found to consist of a vascular growth from the surface of the dura mater; a further examination will also show that the bone has been absorbed by the pressure of the tumour.

Treatment of Fungus Cerebri.

The termination of this discase is almost always unfavourable, especially when it is followed by symptoms of compression of the brain. Spontaneous cures sometimes, though rarely, take place—from the fungus being strangulated by the rapid increase of the surrounding granulations, or by pressure from the edges of the bone. From what I have seen of the disease, I am disposed to believe that light

dressings, conjoined with occasional moderate pressure upon the tumour, will prove of more service than any other remedies. Caustics and excision have been highly extolled by some writers, and as pointedly condemned by others.

When a fungus protrudes from the external surface of the *dura mater*, and increases to such an extent as immediately to endanger the patient's life, its removal by the knife should be attempted. The operation, however, seldom succeeds.

Consult—*Potts's Chirurgical Works, by Earle, vol.* 1—*Abernethy's Surgical Works, vol.* 2—*Desault's Surgical Works, by Smith, vol.* 1—*John Bell's Principles of Surgery, vol.* 2. *part* 2—*Hennen's Principles of Military Surgery, p.* 277—*Thomson's Report of Observations made in the Military Hospitals in Belgium, p.* 49—*C. Bell's Operative Surgery, vol.* 1. *p.* 403—*C. Bell's Surgical Observations, p.* 461—*Dorsey's Surgery, vol.* 1. *p.* 291—*Richerand's Nosographie Chirurgicale, tom.* 2. *p.* 230—*Lassus' Pathologie Chirurgicale, tom.* 2. *p.* 252—*Callisen's Systema Chirurgiæ Hodiernæ, tom.* 1. *p.* 728, *et sequent.*—*Stanley's Cases of Hernia Cerebri, with Observations, in Medico-Chirurgical Transactions, vol.* 8. *part* 1. *p.* 12—*Sir Astley Cooper's Lectures on the Principles and Practice of Surgery, with Additional Notes and Cases, by Frederick Tyrrell, Esq. vol.* 1. *p.* 252.

CHAPTER V.

DISEASES OF THE EAR.

From the complex structure and diminutive form of the auditory organs, the older surgeons always despaired of arriving at any certain knowledge of the nature and treatment of their diseases. Hence all the information we possess on the subject, may be considered, comparatively, of modern origin. Still, we are much in the dark, and may perhaps for ever continue so, respecting many affections, especially those of the internal ear. For these very reasons, however, the student, instead of neglecting, as is too common, the anatomy of the ear, under the impression that he can never acquire an accurate knowledge of it, should strive to make himself minutely acquainted with its most intricate structure, as the only means of understanding its diseases, which after all are not in reality so complicated and obscure, as is commonly imagined. Much assistance, also, may be obtained from a simple and accurate classification of these diseases—such as I shall endeavour to present in the ensuing sections.

Section I.

Diseases of the External Ear, and Meatus Auditorius.

The external ear may be separated from the head by a sabre cut, or by a cannon ball, or it may be bitten off. It is sometimes frost bitten, and sloughs away; at other times, it is destroyed by ulceration. Formerly, it was supposed that such accidents or diseases would necessarily be followed by loss of hearing; but experience proves the reverse; indeed, cases are recorded of patients born without external ears, who nevertheless enjoyed to a certain extent the sense of hearing. Of the individual parts of the ear, the lobe is the most subject to disease. In several instances, I have known sarcomatous tumours to spring from it—in shape resembling the vegetable called prickly pear —which have sometimes attained a large size. In all these cases, the disease was met with in negroes, and seemed to originate from brass earings worn by the patients. Encysted or steatomatous tumours of the lobe are very common. They generally occupy the centre, and seldom increase beyond the size of a pea.

The *meatus auditorius* is liable to accidents and to diseases. Extraneous bodies, such as peas, stones, glass beads, pieces of slate pencil, cherry stones, bits of wood or metal, are frequently put into the ear by children; and by lodging at the bottom of the meatus, or upon the mem-

brana tympani, excite irritation or suppuration. Sometimes insects find their way into this passage, and produce great alarm to the patient, as well as pain. Worms, also, may be generated within the meatus, in consequence of the eggs from which they are produced, having been deposited by flies during the patient's sleep. At other times worms creep into the ear, as in the following instance. Several years ago, a poor woman, the wife of a skin dresser, brought her child to me, stating that a few days before, the child had been playing with its companions on a pile of sheep's wool that lay in the yard; and that in a few minutes after, he complained of uneasiness in the ear, which was soon followed by violent ear-ache, and subsequently by suppuration. To relieve the pain and check the discharge, the mother poured sweet oil into the ear, and in a few moments to her great surprise and horror, observed a worm make its appearance near the surface, but upon attempting to seize it, it immediately retired beyond her sight and reach. Scarcely giving credit to the woman's statement, I repeated the experiment with the oil, and in a few seconds the worm appeared, its approach being preceded by several bubbles of air passing through the oil. I tried instantly to secure it with a pair of slender forceps, but with great dexterity it eluded the grasp, and made its escape. Several times the attempt was repeated, and at last with success. When placed on the table, the animal was found three-quarters of an inch long, about as thick as a common piece of twine, black about the head, and white on the rest of its body. It was extremely active, and appeared very tenacious of life. The woman immediately recognised it as a species of worm very commonly met with amongst new shorn wool, and had no doubt that it

had found its way into the boy's ear at the time he was playing on the pile. Cases in some respects similar to this, are recorded by Acrell, Valsalva, Morgagni, and others.

The *cerumen*, or wax of the ear, often accumulates in undue quantity, and forms an inspissated mass, which may interrupt or destroy the hearing.

Suppuration of the lining membrane of the meatus auditorius is a very common affection, especially amongst infants and young children, in whom it arises from cold, want of cleanliness, &c. When the discharge is profuse and long continued, it becomes, particularly during warm weather, very offensive; and if not checked, may eventually destroy the membrana tympani and small bones of the ear.

Polypi of the meatus are occasionally met with. They spring from the bottom of the passage, or from the sides of the membrane. In either case they generally increase until they fill up the whole cavity, and project beyond the orifice, so as to render the patient partially or entirely deaf.

An *herpetic eruption* is another complaint to which this passage is subject. It is rather frequent than otherwise, and occurs chiefly in scrofulous patients. The discharge from the sore is extremely offensive, and sometimes so profuse, thick and viscid, as to block up the passage. Occasionally the eruption extends beyond the meatus, and affects the external ear.

Children are sometimes, though very rarely, born with the meatus auditorius imperfect. This may proceed from a thin membrane covering the orifice of the passage, or seated some distance within it, or from the whole tube being filled up by a tumour or by a coalescence of its sides.

Treatment of the Diseases of the External Ear, &c.

For sarcomatous tumours of the lobe of the ear, there is no other remedy than excision, and this commonly succeeds. Encysted, or steatomatous tumours, if they attain a sufficient size to produce deformity, or to become troublesome, may be dissected out in the same manner that they are removed from other parts of the body.

Extraneous bodies introduced into the meatus auditorius, if attended to before they excite inflammation and swelling, may generally be removed by a pair of very slender forceps. Beads, cherry stones, and shot, however, are always difficult to seize, on account of their round form and smooth surface. Upon one occasion, after having ineffectually tried to extract a pea from the ear of a child by the forceps, I succeeded in splitting it with a couching needle, and then removed the pieces without difficulty, by throwing in a stream of water from a syringe. A bent probe will sometimes answer a better purpose in the removal of an extraneous body than any other instrument. Insects that find their way into the meatus, or are generated in the passage, are easily gotten rid of by pouring olive or any other mild oil into the ear. The oil obstructs the

pores of their respiratory apparatus and obliges them to come to the surface. They may also be destroyed by the smoke or infusion of tobacco, or by other stimulating articles. *Hardened wax* is easily removed by the repeated use of the syringe and ear-pick. Warm water, or soap and water, are the best solvents for this wax.

Suppuration of the lining membrane of the meatus auditorius may be relieved or removed, in most instances, by antiphlogistic remedies, and by moderately astringent injections, provided the disease is attended to in its commencement. The passage should be protected during cold weather by a dossil of wool introduced into its orifice.

In scrophulous children it is not uncommon to meet with offensive discharges from the ear, which have continued for years. In all such cases I have derived great benefit, and sometimes effected perfect cures, by fumigating the passages with æthiops mineral. A small portion of the powder may be strewed on a heated iron and held close to the ear, or the fumes may be conveyed more accurately to the part by collecting them in a tin vessel resembling an ear trumpet. The operation should be repeated two or three times a day.

Polypi of the ear, if not too deeply situated, may be extracted by slender forceps; but the operation is a delicate one, and requires considerable skill. The ligature, recommended by some surgeons, cannot be employed with advantage. The application of lunar caustic is sometimes rendered necessary to destroy the remnants of the disease.

For the removal of *herpetic* eruptions, mercurial preparations are the most serviceable, especially the internal use of calomel, and a weak solution of corrosive sublimate, as an injection.

The *imperforate* meatus auditorius has sometimes been restored by dividing the membrane which blocks up the passage, and afterwards wearing a tent to keep it from closing. When the sides of the tube are firmly united, and all remains of the original meatus obliterated, an operation will seldom prove successful.

Section II.

Diseases of the Tympanum and Eustachian Tube.

Otalgia or ear-ache, a very common, and sometimes most severe affection, is generally the result of acute inflammation of the membrane lining the cavity of the tympanum. The pain is excessive, and extends, in many instances, from the ear to other parts of the head, accompanied by fever and delirium. If these symptoms continue for any length of time, suppuration is almost sure to ensue, and matter collects not only in the cavity of the tympanum, but in the mastoid cells and eustachian tube. This matter is generally ichorous and sometimes sanious. When copiously secreted, it destroys by pressure the membrana tympani, and is discharged at the meatus externus, not unfrequently along with one or more of the small bones that occupy the tympanum. From this cause, and from obliteration of the eustachian tube by inflammation, permanent deafness is extremely apt to follow. Caries, too, of the tympanum and mastoid cells, complicated with fungus, is a frequent consequence of this distressing disease.

The *eustachian tube* is frequently closed, independently of any affection of the tympanum, from the sloughing or ulceration which sometimes follows cynanche maligna, scarlet fever, cynanche tonsillaris, syphilis, the immoderate use of mercury, &c. In all such cases, partial deafness ensues, owing to the air within the tympanum being con-

fined, or absorbed, or to the cavity being filled by mucus. The membrana tympani, in either event, is incapable of the requisite degree of vibration, and the patient's hearing is thereby rendered very indistinct, or entirely destroyed. It is not always easy to discriminate between this variety of deafness and that proceeding from other causes. Much information may be gained, however, from accurate inquiries into the history of the complaint, and by directing the patient to close the nostrils and mouth, and blow forcibly with his breath, which, if the eustachian tube be closed, will not enter the cavity of the tympanum and communicate an impulse to its membrane or drum, as generally happens when the guttural extremity of the tube is pervious. Moreover, patients deaf from closure of the eustachian tube, are seldom disturbed by those unpleasant sounds in the ear which so commonly accompany nervous deafness.

Treatment of Diseases of the Tympanum, &c.

A most absurd and highly pernicious practice is frequently pursued in the treatment of inflammation of the membrane lining the tympanum—that of pouring stimulating or acrid fluids into the meatus externus, with a view of relieving the intense pain accompanying the disease. Instead of this, general and topical blood-letting, purging, blistering, &c. in the commencement of the disease, are the proper remedies. If by these means suppuration be not prevented, and the matter is rapidly accumulating, the surgeon, without delay, should make a small opening with a sharp pointed probe or couching needle in the membrana

tympani, and evacuate the matter; otherwise, the whole of this membrane may be destroyed by ulceration, the ossicula discharged, and the hearing irrecoverably lost. After the inflammation has subsided, astringent injections may be employed to correct and suppress the discharge. If fungous or polypous excrescences sprout from the tympanum and fill up the meatus, they should be removed by the forceps and lunar caustic.

For the relief of deafness arising from obliteration of the eustachian tube, an ingenious expedient was suggested, long ago, by Chesselden, and afterwards practised by Sir Astley Cooper—the perforation of the membrana tympani. This operation, as was correctly imagined, served the purpose of admitting the external air to the tympanum, and thereby, for a time, restored the patient's hearing. It was soon found, however, in most instances, that the benefit was temporary—owing to the inflammation excited by the puncture, producing an induration of the membrane, and a consequent loss of vibratory power. The opening in the membrana tympani, in other cases, moreover, was found to close speedily after the operation. For these and some other reasons, the operation is now seldom practised. Should it ever become necessary to resort to it, a small sharp pointed probe will answer all the purposes of the regular and more complicated instruments—care being taken to select such cases of deafness only, as are dependent upon closure of the tube, and in performing the operation to avoid perforating that part of the membrane to which the handle of the malleus is attached.

Some of the English and French surgeons have contrived instruments for cleansing the eustachian tube, when clogged with mucus or extraneous bodies. The difficulty, however, of introducing the pipe of a syringe or probe into the guttural extremity of this passage, has deterred most persons from attempting the operation.

Section III.

Diseases of the Internal Ear.

That variety of deafness, usually called *nervous*, is exceedingly common, and arises, for the most part, from some organic defect, or change in the structure of the auditory nerve. The membrane, also, upon which the nerve is expanded, and the fluid which it contains, may undergo such alterations as render them unfit to perform their proper functions, and from these causes there is reason to believe that nervous deafness frequently proceeds. So far as inferences can be drawn, from the appearances presented upon dissection, the following circumstances may be enumerated as likely to interfere materially with the sense of hearing. 1st. An unusual hardness of the auditory nerve; 2dly, a diminution of the nerve; 3dly, a thickening of the membrane of the labyrinth; 4thly, the formation of a steatomatous or caseous substance within the cavity of the vestibule; 5thly, calcareous matter in the vestibule; 6thly, malformation of the vestibule, semicircular canals, and cochlea. If from these, or other causes, nervous deafness should arise, it will be indicated, in most instances, by tinnitus aurium, or ringing in the ears, by unpleasant and peculiar sounds, resembling the dashing of waves, the murmuring of bees, the roaring of a cataract or water-fall, the hissing of a tea-pot, the rustling of leaves, the singing of a conch or shell, the vibration of the stethescope, and many other strange, and, to the patient, unaccountable noises. These symptoms

are most urgent during the winter, at night, and in cloudy weather, and whenever the patient has taken cold. Most patients, indeed, troubled with nervous deafness, are peculiarly susceptible of cold; from this, and from other causes, there is a diminution of the ceruminous secretion, and, consequently, a peculiar dryness or huskiness of the meatus auditorius. Despondency is a frequent concomitant of nervous deafness. Children, totally deaf, at birth, from some permanent organic defect of the internal ear, necessarily remain dumb.

Treatment of Diseases of the Internal Ear.

For confirmed nervous deafness, unfortunately, there is no remedy, though much may be done towards arresting the progress of the disease whilst in the commencement. The chief indication, generally, is to reduce the patient by blood-letting, purging, and low diet; after which a blister behind the ear, or a succession of blisters, will often prove highly beneficial. In addition to this treatment, the patient should be directed to guard, carefully, against cold or exposure, by protecting the feet, wearing in other respects suitable clothing, avoiding a current of air, &c. The free use of common salt applied to the skin, or rubbed among the hair of the head, will be found to contribute very much to this end, and is frequently prescribed by Dr. Physick in cases of nervous deafness accompanied by great susceptibility of cold. Nervous deafness from syphilis is by no means uncommon, and may generally be removed radically by a course of mercury.

See *The Anatomy of the Human Ear, illustrated by a Series of Engravings, of the natural size; with a Treatise on the Diseases of that Organ, the Causes of Deafness, and their proper Treatment, by the late John Cunningham Saunders,* 8vo. 1817—*A Treatise on the Physiology and Diseases of the Ear; containing a Comparative View of its Structure and Functions, and of its various Diseases, &c. by John Harrison Curtis,* 8vo. 1817—*An Essay on the Human Ear, its Anatomical Structure and incidental Complaints, &c. by W. Wright,* 8vo. 1817—*Observations on the Effects which take place from the destruction of the Membrana Tympani of the Ear, by Astley Cooper,* 4to. 1800—*Farther Observations on the Effects which take place from the destruction of the Membrana Tympani, with an Account of an Operation for the removal of a particular species of Deafness, by Astley Cooper,* 4to. 1801—*Richerand's Nosographie Chirurgicale, ou Nouveaux Elémens de Pathologie, tom.* 2. *p.* 135—*Dictionnaire des Sciences Medicales, tom.* 38. *p.* 24. *article Oreille*—*Rosenthal, Essai d'une Pathologie de l'Organe de l'Ouie, in Journ. Complement. du Dict. des Sciences Med. tom.* 6—*Memoire sur la Théorie des Maladies de l'Oreille, et sur les moyens que la Chirurgie peut employer pour leur curation, par M. Leschevin; in Memoires sur les Sujets proposés pour le Prix de L'Académie Royale de Chirurgie, tom.* 9. *p.* 111. *Edit. duodec.*

CHAPTER VI.

DISEASES OF THE EYE.

The eye, from its delicate and complex structure, and the number and diversity of its diseases, was formerly much neglected, especially in Europe, by the regular members of the profession, and attended to almost exclusively by ignorant and itinerant oculists. Within the last twenty years, however, the value of this important branch of surgery has been duly estimated, in proof of which it need only be mentioned that Ware, Saunders, Gibson, Adams, Wardrop, Travers, Veitch, in Britain, and Scarpa, Beer, Schmidt, and others on the continent, have contributed largely by their writings and operations to elevate this department to a most respectable rank. Many of these gentlemen, indeed, forsaking the general practice of their profession, have devoted their whole attention to ophthalmic surgery, and with a result truly honourable to themselves, and glorious to their country.

The most common affection, perhaps, of the eye, is ophthalmia. Of this therefore it will be proper first to treat. Ophthalmia is employed by most modern writers as a generic phrase—denoting ocular inflammation. For the sake of precision and accurate discrimination, other terms have been invented, some of them simple and expressive enough, others formidable in the extreme, or alto-

gether monstrous.* To elucidate the varieties of the disease, I shall not follow the exact arrangement of any individual author, but endeavour to simplify as much as possible, and oppose every distinction which is not perfectly clear and obvious.

* Nothing short of affectation or pedantry will enable us to tolerate, in many instances, the phraseology of Beer and Schmidt—such as opthalmo blennorrhœa, blepharo-opthalmo-blennorrhœa, dacryoadenitis, blepharophalmitis idiopathica, anchyloblepharon, symblepharon, and a hundred more, either of which surpasses in complexity the old anatomical mouthful baseochondroceratoglossus, &c.

Section I.

Conjunctival Ophthalmia.

Conjunctival inflammation, to denote which some writers employ the word *ophthalmitis*, is the most common form of ophthalmia, and is characterised by the following symptoms—a sense of uneasiness, or itching, an impatience of light, diffused redness of the conjunctiva, pain, heat, and swelling of the globe of the eye, an epiphora or increased secretion of tears, a pungent pain proceeding, apparently, from the lodgment of a particle of sand or some other extraneous body, but in reality from one or more bundles of enlarged vessels. To these symptoms are superadded, if the inflammation continues to advance, deep seated, pulsatile, and violent pain in the eye ball, which extends to the forehead, accompanied by fever and other general indisposition. Very often, moreover, the conjunctiva becomes thickened, and projects in a fungous form beyond the margin of the cornea. At other times blood is extravasated between the conjunctiva and sclerotic coat. In the still further advanced stages of the disease, suppuration is liable to ensue, followed by destruction of the cornea, evacuation of the humours, and abolition of sight. It is seldom, however, that a simple conjunctival ophthalmia terminates so unfavourably; on the contrary, the symptoms gradually decline, and the eye is restored to its natural state, though sometimes the disease assumes a chronic form, and is then very difficult to manage.

The *causes* of conjunctival ophthalmia are, for the most part, exposure to extremes of cold and heat, sleeping in the open air without cover, too intense and vivid a light to the eye, whether direct or reflected, blows, wounds, irritation from the lodgement of extraneous bodies upon the globe or between the eyelids, disorder of the digestive organs, &c.

Catarrhal ophthalmia is a variety of conjunctival inflammation exceedingly common on the continent of Europe, and sometimes met with in this country. It is frequently epidemic, and occasionally accompanies influenza. It is marked, in the early stage, by a peculiar dryness of the eye and eyelids, and by a pungent pain near the caruncula lacrymalis. In a few days these symptoms diminish, and are followed by a copious flow of tears and a mucous discharge, which is generally so acrid as to excoriate the eyelids and adjacent parts of the cheek. The patient is scarcely ever free from fever. In severe cases of the disease, the whole conjunctiva is covered with small pustules, containing purulent matter or a yellowish serous fluid.

Purulent ophthalmy differs from the catarrhal in many respects. It is a very formidable and destructive disease, and sometimes destroys one or both eyes in the course of a few hours. Adults as well as children, are liable to it, but especially the latter. It usually commences four or five days after birth, by a slight redness and tumefaction of the conjunctiva lining the eyelids. This is speedily followed by the secretion of a thin adhesive matter which glues the lids together. In a few hours the discharge becomes very copious, thicker in consistence, acquires a yellowish or

greenish cast, and is so acrid as to excoriate the cheeks. From the lids the inflammation extends to the conjunctiva covering the ball of the eye, and the whole membrane is converted into a thick fungous mass; which, when the eyes are opened, projects beyond the lids, and obscures the cornea. If the disease should continue to spread, the cornea is next involved, and either ulcerates or sloughs, the humours are discharged and the eye lost. A great deal of constitutional irritation attends the early stage of the disease, but this subsides in three or four days, and the ophthalmia then assumes a chronic form.

To assign any satisfactory explanation of the origin of purulent ophthalmia is very difficult. Some writers suppose it to be closely allied to the gonorrheal ophthalmia, others that it proceeds from leucorrhea; the matter of which, in both instances, is applied, it is imagined, to the eyes of the child during its passage through the vagina. Mr. Saunders is inclined to believe that the inflammation is of the erysipelatous kind.

Gonorrheal ophthalmia, another variety of conjunctival inflammation, bears a striking similitude to purulent ophthalmy, that form of it especially which is so prevalent in Egypt and other eastern countries, and from which the British and French troops, a few years back, suffered so severely. The symptoms, however, are in every respect more vehement, and such as to terminate almost invariably in the loss of one or both eyes. That it follows, in many instances, the direct application of the gonorrheal virus, I have the strongest proofs, having had, at different times, patients under my care in whom the disease was produced

by the practice, so common among the vulgar, of washing inflamed eyes with urine. There is reason to believe, also, that the disease is sometimes induced by sympathy or a metastasis in consequence of suppressed gonorrhea.

Scrofulous ophthalmy, a disease very common amongst scrofulous children, may be distinguished from other affections of the conjunctiva by a peculiar morbid irritability of the eye, or intolerance of light, unaccompanied with pain, which obliges the patient to keep the lids constantly in a half closed state, and confine himself altogether to a dark room. In addition to this, numerous distinct vessels may be seen running towards the cornea, some of which pass to the centre of that tunic, and terminate in a small pustule or ulcerated spot. This disease may continue for months together, without much alteration, and is very apt to be followed by corneal specks.

Treatment of Conjunctival Ophthalmia.

In the early stage or acute form of simple inflammation of the conjunctiva, the disease may be removed, in a short time, by general and local blood-letting, mild purgatives, nauseating doses of antimony, low diet, blisters behind the ears, or on the back of the neck, lotions of tepid water, a solution of opium, or of the acetate of lead. If in spite of this treatment the inflammation should not terminate, but runs into the chronic stage, cold astringent washes and stimulating ointments may then become necessary, such as the

vinous tincture of opium, the citrine ointment, the ointment of the red oxide of mercury, &c.

For *catarrhal* ophthalmia the best remedies are moderate depletion, at first, and afterwards highly stimulating collyria and ointments.

Purulent ophthalmia, in the commencement, should be treated upon common antiphlogistic principles, and by moderately astringent washes, introduced into the eye by means of a syringe. The best lotion for this purpose is the undiluted liquor of the acetate of lead. In advanced stages of the disease, an infusion of two drams of the leaves of tobacco in eight ounces of water was found highly serviceable by Mr. Vetch in restraining the discharge, relieving pain and removing watchfulness. The aqua camphorata of Bates' Dispensatory has been praised as extremely efficacious in the chronic form of purulent ophthalmy. I have often tried it, however, without benefit, and sometimes with manifest aggravation of the symptoms.

Gonorrheal ophthalmia, unfortunately, admits of no relief; at least in several instances of the kind which have fallen under my care, and in others which have occurred in the practice of Dr. Physick, no benefit whatever has resulted from any mode of treatment that could be devised. Mr. Vetch, however, with great confidence states that the disease may be certainly cured by those remedies adapted to the treatment of Egyptian ophthalmia.

Scrofulous ophthalmy seldom requires antiphlogistic measures; on the contrary, a tonic plan of treatment will

generally be indicated. In the commencement of the disease, however, it may be necessary to purge the patient, regulate strictly his diet, order warm clothing, moderate exercise in the open air, &c. To alleviate the intolerance of light, which is so much complained of by all patients in this disease, a blister at the back of the neck, kept open by savin cerate, will be found the best remedy. Sometimes the internal use of mercury will be required. The best collyria are those composed of weak solutions of the argentum nitratum, of sulphate of zinc, alum, &c.

Section II.

Sclerotic Ophthalmia.

An inflammation of the sclerotic coat described by many writers under the name of *rheumatic* ophthalmia, is often met with. That it is closely allied to rheumatism is exceedingly probable, both from the circumstance of its being a frequent concomitant of that disease, and from the nature of the texture which it occupies. The pain in the commencement of the disease, is generally seated in the temple, and extends thence to the eyebrow, cheek and eye of the affected side. It is constantly present, but commonly most severe during the evening and late at night. The eyeball itself, when examined, does not present the common appearances of conjunctival inflammation. There is no purulent discharge, nor does the patient complain of intolerance of light. The vessels, moreover, instead of following a tortuous course, run in parallel lines upon the sclerotic coat, and terminate at the margin of the cornea. These vessels are small and very numerous, and from being distributed over the whole albuginea, give it an uniform red colour; the redness, however, is not of the bright scarlet or vermilion hue, but of a dingy, brickdust tinge. More or less fever, and derangement of the digestive organs, generally accompany the disease; and in bad cases the inflammation may run so high as to involve the cornea and destroy the eye.

Treatment of Sclerotic Ophthalmia.

The chief indications in the treatment of this disease, are to restore, by means of emetics and purgatives, the functions of the stomach and biliary organs, or, if the inflammation has been induced by exposure, to excite the skin by antimonials. Afterwards bark may, perhaps, be employed with advantage. The best local applications are a blister behind the ears, and the free use of the vinous tincture of opium as a collyrium.

Section III.

Iritic Ophthalmia.

The term *iritis* was employed by Mr. Saunders to denote a variety of ophthalmic inflammation which previous to his time had been very little attended to. From the peculiarity and distinctness of the symptoms, there can be no question as to the propriety of considering the disease purely an inflammation of the iris, and totally independent of every other species of ophthalmia. These symptoms are severe lancinating pain extending from the eye-brow to the orbit; and shooting thence through the globe of the eye towards the optic nerve, extreme impatience of light, and an extraordinary morbid sensibility of the eye. Unlike most other varieties of ophthalmia, iritis is unaccompanied by redness of the conjunctiva, but the sclerotic coat is covered with numerous red vessels, which are particularly conspicuous on that portion of it connected with the margin of the cornea. On the iris also, at least on its anterior surface, red vessels may be distinctly seen; but the most remarkable change that this membrane undergoes, is the loss of its brilliancy, and a change from its natural colour to that of a reddish or greenish hue. At the same time the pupil becomes contracted and irregular, and its edge is turned backwards towards the crystalline lens. Instead of terminating in suppuration, the inflammation generally stops at the adhesive stage, and lymph is deposited upon the outer surface of the iris in one or more spots, and is

sometimes secreted so copiously as to fill the anterior chamber. From this cause, incurable obliteration of the pupil often ensues.

The causes of iritic ophthalmia are various. Sometimes the disease is induced by exposure of the eye to intense or vivid lights; sometimes it proceeds from wounds of the iris made by the cornea knife or couching needle; at other times it appears to arise from some constitutional affection, such as gout. In the greater number of instances, however, it is the result of syphilis or of the abuse of mercury.

Treatment of Iritic Ophthalmia.

The antiphlogistic system carried to its full extent, will barely prove sufficient, in many instances, to arrest the progress of this severe disease. Hence the propriety of resorting to it as speedily as possible after the inflammation has set in. To guard against obliteration of the pupil, by breaking up the bands of coagulable lymph which extend across it, the extracts of belladonna or stramonium will be found immensely serviceable. They should be applied to the outer surface of the eyelids, or over the eyebrows two or three times a day, and kept on for half an hour at a time. Care should be taken, however, not to employ them during the height of the inflammation. For the removal of *syphilitic* iritis, the moderate use of mercury, followed up by sarsaparilla, will generally prove an efficient remedy.

Section IV.

Psorophthalmia.

Some of the German writers understand by psorophthalmia, a variety of inflammation of the eyelids, induced by psora or itch. In the usual acceptation of the term, however, nothing more is implied than simple inflammation or ulceration of the lids, whether induced by small pox, measles, scrofula, erysipelas, styes, or any other cause.

Children, particularly those of scrofulous constitution, are very subject to this disease; adults, however, are not exempt from it. The inflammation first appears on the edges of the lids, and extends thence along the conjunctiva towards the globe of the eye. The pain is sometimes very severe, and the redness considerable, but the most distressing symptom is the intolerable itching, to relieve which the patient is obliged constantly to rub the affected part; and in this way only aggravates the disease. Sometimes the inflammation runs so high as to terminate in suppuration. This is followed by troublesome ulceration of the tarsi, and frequently by great deformity. The meibomian glands are always more or less affected in this complaint, and pour out an adhesive fluid that glues the lids together during sleep. To open these in the morning, some force is usually employed, and this keeps up constant irritation, and frequently renders the disease chronic, causing the formation of small crusts or scabs along the tarsi and the cilia to drop

out. In bad and long standing cases of the disease, the puncta lacrymalia are sometimes permanently obliterated, and an incurable epiphora is produced.

Treatment of Psorophthalmia.

In the early stage of this disease, purgative medicines and a moderate diet will contribute very much towards a speedy cure. Weak solutions of the acetate of lead, of the sulphate of zinc, or sulphate of copper, will also be found useful as collyria. To prevent the lids from adhering, a very important indication in the treatment, a little fresh cream or butter should be placed between them every night before the patient retires to rest. After the inflammation has in a measure subsided, and is verging towards the chronic stage, the unguentum hydrargyri nitrati, applied to the edges of the lids two or three times a day, will prove singularly useful in relieving the itching, and in healing the ulceration. With the same view, an infusion or decoction of the pith of the sassafras is sometimes used, and in many instances with decided advantage. Not unfrequently the disease resists for a long time every remedy, and indeed continues for years together. Under these circumstances, blisters behind the ears and neck, and a course of mercury, may prove useful.

Section V.

Pterygium.

The pterygium, or eye wing, is a thin membranous expansion seated upon the conjunctiva. It commonly occupies the inner angle of the eye, in the shape of a triangle, the apex of which looks towards the cornea. The disease is very common, but in most instances productive of so little inconvenience, that many persons are subject to it for years together, without being aware of its presence. In the early stages, it resembles a globule of fat, and appears to possess little vascularity; a slight cold, however, or an inflammation of the conjunctiva, renders its vessels very distinct. Although the disease may remain stationary or nearly so for many years, it is always liable to increase, and in this case may extend over the surface of the cornea. But it is somewhat remarkable that it seldom, if ever, passes beyond the semidiameter of the cornea. Sometimes a pterygium originates at each angle of the eye, and approaching the cornea in opposite directions, covers the whole of its surface. The disease is then called a pannus. There are two varieties of pterygium—the membranous and fleshy.

Treatment of Pterygium.

So long as this membranous excrescence continues small, and does not encroach upon the cornea, it will seldom be necessary to resort to an operation for its removal. When, however, it has attained considerable bulk, and is a frequent source of irritation, it should be dissected off either by a small scalpel or curved scissors. The scissors will generally be found the most convenient. To perform the operation advantageously, an assistant should stand behind the patient and support his head firmly upon his breast, and with one or two fingers elevate the upper eyelid, whilst another assistant depresses the lower lid, and keeps it fixed. The surgeon then taking a pair of small forceps should elevate the pterygium from the conjunctiva, and by a few strokes of the scissors separate the whole of it from the globe. A smart and sometimes violent inflammation follows the operation, and this must be subdued by the usual remedies.

Section VI.

Encanthis.

The encanthis, an enlargement of the lacrymal caruncle and semilunar fold, is a very uncommon, but sometimes most malignant disease. It proceeds in some instances from obstinate and protracted ophthalmia; at other times the gland assumes a cancerous action, and terminates like most diseases of this description—unfavourably. In every disease of the kind, whether benign or inveterate, the caruncula lacrymalis presents a granulated and livid aspect. In proportion, however, as the tumour increases, its surface becomes less rugged, and is covered with varicose vessels. From the caruncle the disease extends sometimes to the cornea, and along the inner surface of each eyelid. When the tumour attains a large size, the puncta lacrymalia are commonly compressed or obliterated, and a troublesome epiphora ensues.

Treatment of Encanthis.

Excision of the caruncula and of the valvula semilunaris is the only remedy for this disease; but the operation frequently fails, either from the whole of the tumour not being taken away, or from the malignant character of the com-

plaint. In performing the operation, the surgeon will find it most convenient to secure and control the tumour, by introducing a small hook into its substance, and then dissecting it out with a narrow scalpel. Care must be taken to avoid the puncta lacrymalia. If the tumour has taken on the cancerous action, is very large, and has involved the surrounding parts, it may become necessary to extirpate the globe of the eye.

Section VII.

Opacity of the Cornea.

There are three varieties of corneal speck, noticed by most writers under the names of nebula, albugo, and leucoma. By nebula is commonly understood a "superficial opacity of the cornea preceded and accompanied by chronic ophthalmia, through which the iris and pupil are seen, and which does not therefore entirely take away from the patient the power of seeing, but only causes the surrounding objects to be seen as if covered with a veil or cloud."* The whole cornea is sometimes covered by a nebula; in other instances, several distinct specks appear in spots upon its surface, each of which is generally supplied with one or more vessels from the conjunctiva, or other coats of the eye. These vessels, indeed, serve to nourish or keep up the disease.

The *albugo* differs in several respects from the common nebula. It is more deeply seated, and occupies the lamellæ or substance of the cornea; it is also of a white or pearl colour, is frequently unaccompanied by ophthalmia or by red vessels, and is always the result of an abundant effusion of lymph.

Leucoma is a dense callous speck of the cornea of a pure white or chalk colour, and polished aspect. It is usually

* Scarpa.

the result of a cicatrix from a wound or ulcer. Sometimes it follows small pox or measles.

Treatment of Opacity of the Cornea.

A simple *nebula* or cloudiness of the cornea, may often be dispersed by slightly astringent collyria, such as are calculated to subdue the ophthalmia that usually accompanies the disease. But, in many instances, a division of the vessels supplying the speck is rendered necessary. If the trunks are large, they should be elevated by forceps, and a piece taken out of each by the curved scissors.

The treatment of an *albugo* of long standing will always be found very difficult, and nothing short of highly stimulating applications will effect a cure. One of the best for this purpose is the unguentum hydrargyri nitrati, applied by means of a camel hair pencil to the surface of the speck once or twice a day. In several obstinate cases of the disease which have resisted all the usual remedies, I have known a speedy absorption of the speck accomplished by the repeated ablution of the eye and eyelids with diluted vinegar. The practice originated, I believe, with Dr. John K. Mitchell of this city. In addition to the local treatment, the internal use of calomel and other preparations of mercury should be resorted to. The *leucoma* is seldom, if ever, removed.

Section VIII.

Ulcer of the Cornea.

The cornea, as well as the fine lamina of conjunctiva covering its surface, is liable to assume the ulcerative action. In either case, a very troublesome and perhaps destructive disease may be induced. This ulcer is commonly the result of the different varieties of ophthalmia, or it may proceed from the introduction of acrid or caustic substances into the eye. Sometimes the whole cornea is covered by the ulceration; at other times, a small dimple-like cavity, not larger than the head of a pin, occupies some particular part of the cornea, and instead of spreading towards its margin, penetrates the layers until it lays open the anterior chamber of the eye. An ash-coloured slough, resembling wet pasteboard, generally covers the surface of the corneal ulcer. The edges of the ulcer, also, are high and serrated.

Treatment of Ulcer of the Cornea.

To relieve the excessive pain that usually attends this disease, and to promote healthy granulation, there is no application so effectual as the argentum nitratum. The sore should be lightly touched with the caustic, until an eschar forms on its surface, and when this drops off, which it

generally does in twelve or eighteen hours, the application should be renewed—taking care to wash away, with milk and water, any superfluous caustic that may happen to lodge about the eye or eyelids. When the ulcer assumes a healthy aspect, the caustic may be discontinued, and mild collyria or ointments substituted.

Section IX.

Staphyloma.

In the sense affixed to it by most modern writers, the term staphyloma implies a thickening and opacity of the layers of the cornea, together with a greater or less projection of the anterior surface of that tunic. Children, in whom the cornea is proportionally thicker than in adults, are most subject to the disease. One eye or both may be affected at the same time or in succession. Small pox, purulent ophthalmia, wounds of the eye by the couching needle or extracting knife, blows, and other injuries, are among the most frequent causes of staphyloma. In the advanced stages of the disease, the tumour of the cornea is sometimes partially absorbed, and both the anterior and posterior chambers of the eye appear to be filled with a serous fluid.

Treatment of Staphyloma.

There is no remedy, unfortunately, for this disease; at least the transparency of the cornea cannot be restored, and the patient, therefore, must for ever remain blind. But the surgeon, generally, has it in his power to alleviate the severe pain and inflammation (caused by dust and other extraneous bodies lodging upon the portion of the cornea

projecting beyond the eyelids) by an operation. The object of this is to evacuate the humours, and permit the eye to collapse. To accomplish this purpose most effectually, and prevent a return of the disease, a section of the most prominent part of the cornea, by the knife used for extracting the cataract, should be made. The humours having escaped, the flap of the cornea may be removed with a curved scissors. A circular opening will thus be left large enough for the contents of the eyeball gradually to drain away, whereas if the surgeon were merely to puncture the cornea with a needle, as formerly practised, the opening would soon close, and the disease return.

Section X.

Hypopion.

In consequence of violent deep seated ophthalmia, it sometimes happens, that purulent matter is formed within the posterior or anterior chamber of the aqueous humour—constituting the disease known under the name of hypopion. Besides extreme redness of the conjunctiva, a yellowish crescent-shaped spot may always be observed at the bottom of the anterior chamber, which gradually increases in size until the whole of the cavity is filled. During the height of the inflammation, the pain, intolerance of light, &c. are intensely severe, and the matter copious ; but as these symptoms decline, the pus is proportionably absorbed, and sometimes disappears in a few days without material injury to the eye. In other instances, it remains for weeks together, after the inflammation has entirely subsided, in the anterior chamber, mixed with the aqueous humour which it renders turbid. It is seldom, however, that the disease terminates so favourably. On the contrary, in bad cases of the kind, ulceration and sloughing of the cornea are apt to ensue, followed by discharge of the humours and destruction of the whole eye.

Treatment of Hypopion.

The proper mode of managing this disease is not to puncture the cornea and evacuate the matter, as some advise, but to subdue the accompanying inflammation, after which it will be found, commonly, that the matter is slowly absorbed, and will in time entirely disappear. When, however, the collection of pus is so large and the inflammation so violent as to leave no hope of saving the eye, it may become expedient to open the cornea and discharge the matter in order to relieve the patient from unnecessary pain and irritation.

Section XI.

Hydrophthalmia.

Dropsy of the eye, a disease rarely met with, may originate either in the anterior or posterior chamber of the eye. It is, for the most part, dependent upon some constitutional affection, and is frequently connected with general dropsy. The most striking symptom of the disease is a gradual enlargement of the globe of the eye without much pain or injury to vision. When the globe, however, begins to protrude from the socket, and the coats of the eye are rendered tense by the accumulation of serum within their cavities, a considerable degree of pain is experienced, which extends in some instances to the head. At the same time the vision becomes impaired, the aqueous humour acquires a turbid appearance, and the iris appears more deeply seated than usual, and trembles upon the slightest motion of the patient's head. Finally, if not evacuated by an operation, the humours accumulate in such quantity as to excite violent irritation and suppuration, and the eye is irrecoverably lost.

Treatment of Hydrophthalmia.

When hydrophthalmia depends upon general dropsy, and is attended to in the commencement of the disease,

some benefit may be derived, perhaps, from internal remedies—such as digitalis, squill, volatile tincture of guiacum, calomel, cicuta, &c. But after vision has been materially injured, or destroyed, and the eye projects beyond the lids, the operation of paracentesis is the only mode of treatment calculated to afford relief. This must be considered, however, as merely palliative. It may be performed with a common lancet or couching needle, and the operation occasionally repeated, or whenever the accumulation of water is such as to require its evacuation.

Section XII.

Obliterated Pupil.

From common ophthalmia or from iritic inflammation, whether induced by operations for cataract or by other causes, closure or obliteration of the pupil frequently takes place. The iris, under such circumstances, becomes wrinkled or puckered, and the pupil is either entirely effaced or contracted to a very small compass. If complicated with cataract, the opake lens or its capsule may generally be seen behind the pupil of a whitish or bluish aspect; but if the lens and capsule remain transparent, the pupil, although contracted, still retains its natural black colour; and vision, perhaps, to a certain extent, is still preserved.

Treatment of Obliterated Pupil.

This disease can be relieved, or cured, only by an operation. Since the time of Chesselden, who was the first to resort to such an expedient, various methods have been practised. Chesselden's operation, in his own hands, proved eminently successful; with others it often failed, and at last was abandoned altogether. Recently, however, it has been revived by Sir William Adams, and as modified by him is better calculated, I conceive, for most

cases of closed pupil, than any other operation. "The patient being seated as in the operation for cataract, and the eye rendered steady by a gentle pressure with the concave speculum, placed under the upper eyelid, the artificial pupil knife should be introduced through the coats of the eye about a line behind the iris, with its cutting edge turned backwards instead of downwards. The point is next brought forward through the iris somewhat more than a line from its temporal ciliary attachment, and cautiously carried through the anterior chamber until it has nearly reached the inner edge of that membrane, when it should be almost withdrawn out of the eye, making a gentle pressure with the curved part of the cutting edge of the instrument against the iris in the line of its transverse diameter. If in the first attempt the division of the fibres of the iris is not sufficiently extensive, the point of the knife is to be again carried forward, and similarly withdrawn, until the incision is of a proper length, when the radiated fibres will immediately contract, and an opening of a large size will be formed. After the operation is thus completed, the eye should be covered over with a plaister of simple ointment, spread on lint, and the patient put to bed with his head raised high."* If the obliterated pupil should be combined with an opake lens or capsule, the surgeon should make it a point, at the time he divides the iris, to cut up or lacerate these textures, and thrust them forward through the pupil which they will assist in keeping open.

Wenzel, Gibson of Manchester, and many other oculists prefer, in cases of closed pupil, a section of the *cornea* and the removal of a portion of the iris with scissors. Under

* Adams' Practical Observations, &c. p. 137.

particular circumstances, I should select this operation in preference to that of Chesselden.

Several years ago, Dr. Physick invented a small instrument, resembling a saddler's punch, for cutting out a piece of the iris; but he has never, as he informs me, made use of it. It will, sometimes, become necessary to make an artificial pupil (even although the natural one remain of its usual size) on account of corneal opacity.

Beer, Schmidt, Reissinger, Maunoir, Flagani, Assalini, Scarpa, have all particular modes of operating for obliterated pupil; they possess no advantages, it appears to me, over those in common use.

Section XIII.

Procidentia Iridis.

A PROLAPSUS or projection of the iris through an ulcer or wound of the cornea is by no means unfrequent. The pain attending the disease is extremely severe, and the intolerance of light so excessive that the patient cannot bear the exposure of the eye for a moment. The pupil, in this disease, always assumes an unnatural shape; its particular form, however, will depend very much upon the situation of the opening in the cornea. Generally it is of an oval figure. Sometimes there are two or three projections of the iris, each of which passes through a distinct opening of the cornea. After the protrusion has continued for some time, an adhesion is apt to ensue between the cornea and iris, and the part of the iris that projects beyond the cornea becomes dry and hard, and sometimes sloughs away.

Treatment of Procidentia Iridis.

When this disease follows a wound of the cornea, the iris may always be replaced at the time the edges of the wound are adjusted; but when it proceeds from an ulcerated opening, the surgeon will find it impossible to retain the iris in its natural situation so long as the ulcer exists. The

great object, therefore, in the treatment should be to heal the ulcer, and this will be most speedily accomplished by repeated touches of the argentum nitratum. The caustic will serve the additional purpose of subduing the morbid sensibility of the iris and of removing the superfluous portion of it projecting beyond the cornea.

Section XIV.

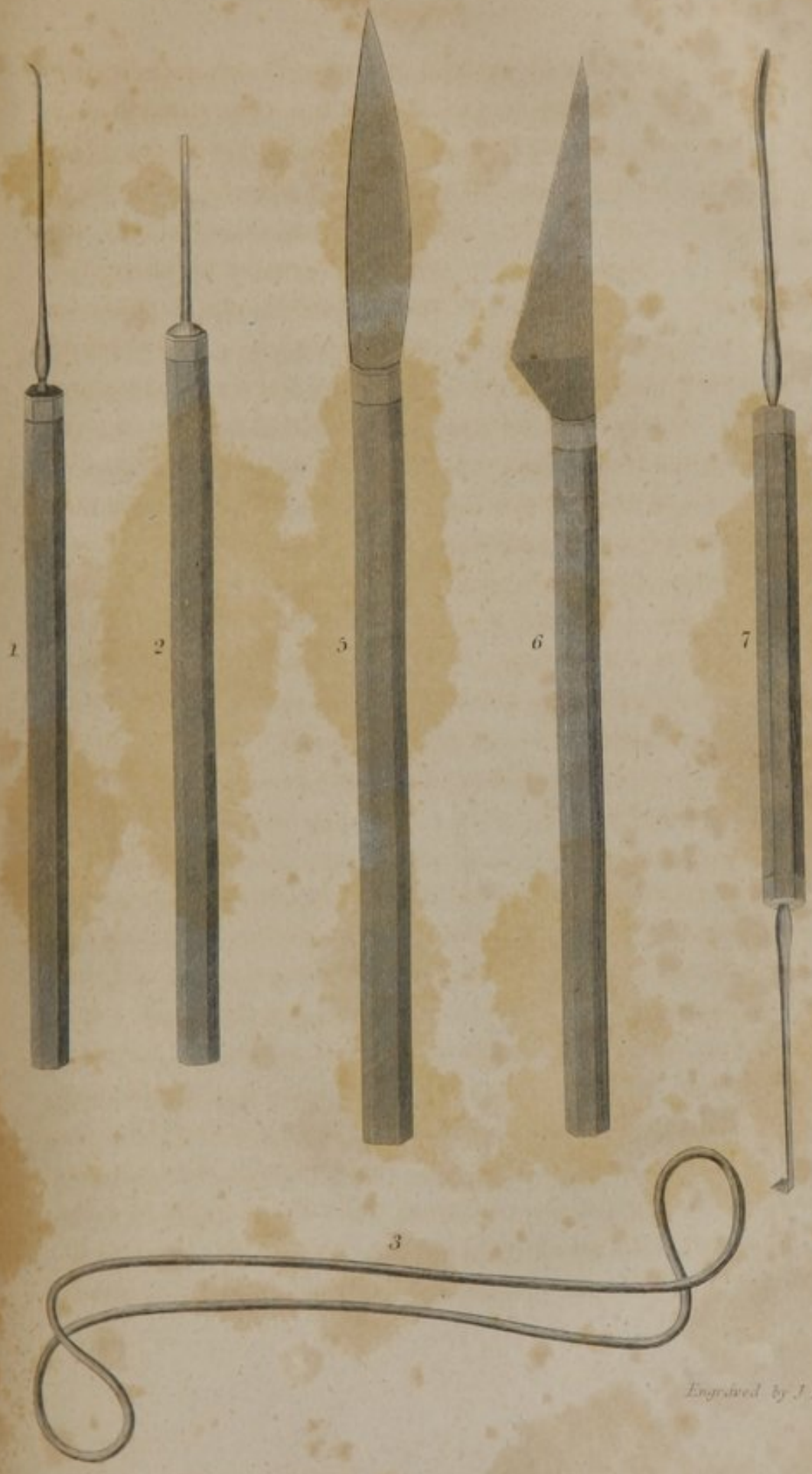
Cataract.

The ancients entertained very erroneous notions respecting the nature and seat of cataract. They supposed it to be formed by an adventitious membrane in the posterior chamber of the aqueous humour. Dissection, and operations on the living subject, afterwards proved that the disease was confined to the crystalline lens or its capsule, which becoming opake prevented the rays of light from passing to the retina.

Cataracts differ from each other as much in consistence as colour. Sometimes the lens is rendered perfectly fluid, and resembles milk, and on this account has been called the *milky* cataract. Sometimes it is found of the consistence of jelly or cheese, and hence the terms *gelatinous* and *caseous* cataracts. Not unfrequently the lens is perfectly *hard*, or ossified, so much so, that the sharpest instrument will make no impression upon it. When the anterior or posterior capsule is rendered opake, and the lens remains transparent, or is absorbed, the disease is called *capsular* cataract. When a cataract exists at birth, the appellation *congenital* is applied to it. Most cataracts are of a bluish or pearl colour, some are gray or green, others white as snow. In a few rare instances the lens has been found of a brownish tint or perfectly black.

The formation of cataract has never been satisfactorily explained. By some the disease has been attributed to inflammation of the lens and its capsule, by others to hereditary transmission. That it may proceed from blows upon the eye and from wounds of that organ is very certain. In all cases of the kind there is reason to believe that the anterior capsule of the lens is either ruptured or cut, so that the lens itself is brought into immediate contact with the aqueous humour, which possesses the well known property of dissolving its texture as well as that of its capsule. It is remarkable, however, that an injury or destruction of one eye, as I have several times witnessed, will frequently give rise, at a subsequent period, to a cataract in the other. Old persons are most subject to cataract, though the disease may occur at any period of life; indeed new-born infants are not exempt from it, and it has sometimes happened that all the children of a numerous family have been born with cataracts in both eyes. Persons whose eyes are much exposed to vivid and reflected lights are said to be peculiarly liable to cataract.

The existence of cataract may be determined generally, by the following symptoms. In the commencement, the patient is often sensible of a diminution of sight long before any opacity can be observed behind the pupil. Objects, moreover, especially white ones, appear to him as if enveloped in mist or smoke, and when the eye is suddenly exposed to a strong light, vision is nearly destroyed. In a dull light, on the contrary, vision is more distinct, because the pupil being expanded, the rays of light, besides their increased quantity, pass through the thin margin of the lens. When the lens is completely opake, its colour



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will commonly indicate the nature of the disease. The black cataract, however, is very liable to be mistaken for amaurosis. Cataracts are said to have been formed very suddenly, or in the course of a night, without any obvious cause; but I am inclined to believe this to be erroneous, and that the disease has existed, at least in one eye, for some time, without the patient being aware of its presence, and that the discovery of it has been purely accidental.

Treatment of Cataract.

Although repeated attempts have been made, both by internal remedies and by local applications, to remove cataract, there is no well-attested instance, I believe, on record, of a cure having been effected except by an operation. There are two or three different operations now in use, each of which it will be proper to describe.

Couching or *depression* of the cataract, an operation practised, there is reason to believe, long before the time of Celsus, is usually performed by the modern surgeon either with a curved or straight needle. The former is preferred by Scarpa—the latter by Hey. (See plate VI. fig. 1 and 2.) The patient being seated on a low stool, with an assistant behind to support his shoulders and head, the operator, sitting or standing before him, passes the speculum of *Pellier* (plate VI. fig. 3) beneath the upper eyelid, and directs the assistant to hold it steadily, whilst with one or two of the fingers of his own hand he depresses the lower lid. He then takes the needle, (and if Scarpa's be used,

which I prefer to any other,) holds it in his fingers like a pen, and laying the handle of the instrument nearly parallel with the patient's temple, directs its point backwards and its convex surface forwards, and penetrates the coats of the eye, at its external angle, about two lines posterior to the iris. The needle is next pushed towards the superior margin of the crystalline lens, and thence in the direction of the pupil until its point is distinctly seen. It only remains to lacerate freely, but cautiously, with the point of the needle, the anterior capsule of the lens, which being done, the lens itself should be pressed downwards and backwards by the needle and lodged in the vitreous humour. Instead of withdrawing the needle immediately after from the eye, as is too often done, it should be suffered to remain a few seconds, lest the lens reascend, in which case the surgeon should again depress it, and then carefully remove his instrument and close the eyelids.

Extraction of the cataract is performed by a *knife* instead of a needle, and the opening made in the cornea in place of the sclerotic coat. There are two knives in general use—the one invented by Wenzel and improved by Ware, straight and blunt on the back, convex on the edge, five eighths of an inch in width, and in other respects shaped like a wedge, or gradually tapering from the handle to the point—the other invented by Beer, and differing from that of Wenzel chiefly in having a *triangular* shape. (See plate VI. fig. 5 and 6.) With either, the operation may be equally well performed.

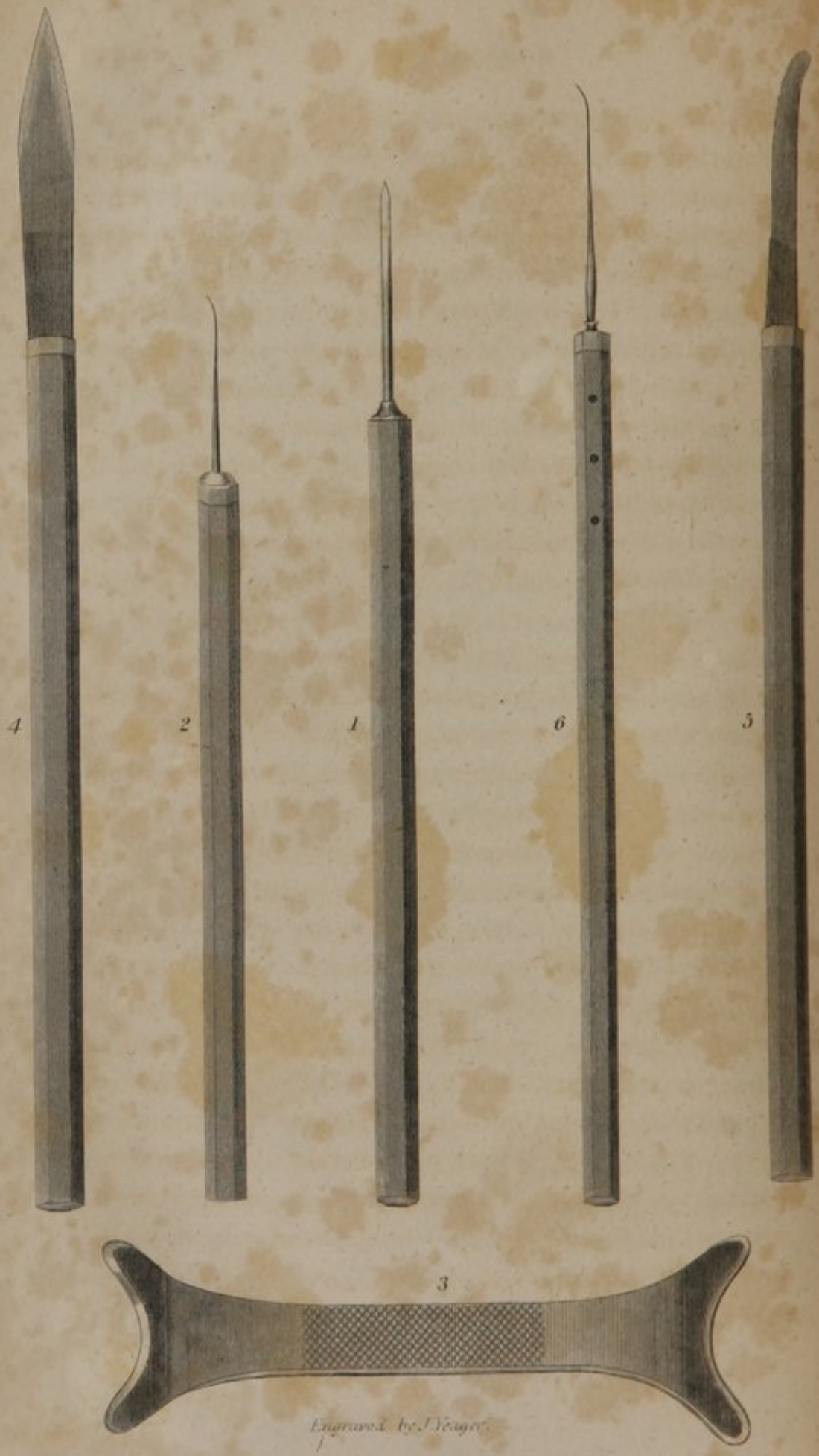
The necessary arrangements being made, the patient is placed on a low chair or stool, and his head committed to

an intelligent assistant (one accustomed to the office and in the habit of performing the operation), who with his fingers, instead of a speculum, elevates the superior eyelid, and supports it against the superciliary arch. The surgeon himself taking charge of the lower lid, which he depresses with one or more fingers, and waiting until the patient rolls the eye towards the inner canthus and holds it steady, enters the knife above the semidiameter of the cornea and about a quarter of a line anterior to its junction with the sclerotica, with its edge downwards, passes it slowly and steadily along through the anterior chamber until its point emerges at the inner edge of the cornea. This completes what has been called the *punctuation* of the cornea, and to finish the *section* it is still necessary to push on the blade of the instrument until it cuts itself out. As soon as this is accomplished, the aqueous humour is discharged, the knife is withdrawn, and the lids are closed for a few moments. The next step of the operation, and the most important one, is to separate the lids, gently raise the flap of the cornea with the curette, (plate VI. fig. 7) pass a gold or silver wire through the pupil, and cautiously lacerate the anterior capsule of the lens precisely in its centre. If this part of the operation be well managed, and care taken to avoid any thing like pressure upon the globe of the eye, the lens, after its capsule is broken, will gradually approach the surface and be discharged through the opening made in the cornea, without bringing with it any portion of the vitreous humour. As soon as the lens is removed, the flap of the cornea should be adjusted, the lids closed, and a bandage applied lightly over both eyes. It sometimes happens, owing, principally, to the cornea knife being dull and ill-constructed, that the aqueous humour flows before the sec-

tion of the cornea is completed, and that the iris falls under the edge of the knife, and is liable to be wounded. To guard against this, Baron Wenzel suggested an expedient which has proved extremely important—friction of the cornea with the end of the finger during the passage of the knife. If this plan be adopted, the iris will immediately retire from the edge of the knife, and so remain as long as the friction is continued.

The *absorbent practice*, as it is denominated by Sir William Adams, may be said, perhaps, to have originated with Mr. Pott; at least that eminent surgeon was fully aware of the solvent power of the aqueous humour, and frequently took advantage of the circumstance, by pushing fragments of the lens which happened to be detached during the operation of couching into the anterior chamber. Gleize also, as well as Scarpa, Hey, and others, followed the same practice. But it is chiefly owing to Saunders, Conradi, and Adams, that this mode of removing the cataract has been brought to its present degree of perfection.

There are two operations in use, each founded upon the absorbent principle—the *anterior* and *posterior*. The first, or the operation of Conradi, as it is usually called, is chiefly adapted to the soft or fluid cataract, and may be performed in the following way. The pupil being dilated by the application of the extract of belladonna or stramonium to the eyebrow an hour or two before the operation, the patient is seated, and the eye secured as in the operation of couching or extraction. With a straight spear-pointed needle, an inch in length, rounded in the shank, and tapering from the shoulder towards the point, (Plate VII. fig. 1) the surgeon penetrates the cornea, at its lower and outer



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part, about a line anterior to its union with the sclerotic coat, carries the needle along the plane of the iris and through the pupil as far as the centre of the crystalline lens, the capsule of which is first lightly scratched over its whole surface, then freely torn, after which the lens itself may be broken up and some of its fragments brought by the needle into the anterior chamber. It is highly important, in performing this operation, to guard against wounding the iris; the surgeon, therefore, should not attempt to accomplish too much at a single operation, but calculate, in most instances, upon a second or third being necessary. In general, several weeks elapse before the remains of the capsule and lens entirely disappear.

The *posterior* operation is distinguished from the anterior by the circumstance of the opening being made in the sclerotic coat instead of the cornea. Mr. Saunders was in the habit of performing this as well as the anterior operation; but for many valuable improvements in the mode of executing it, and for the invention of ingenious instruments adapted to the purpose, we are particularly indebted to Sir William Adams, whose success as an oculist, perhaps, exceeds that of any other individual now living. The needle (Plate VII. fig. 2) chiefly employed by this distinguished surgeon for "solid cataract in children and adults," is spear-pointed, eight-tenths of an inch long, the thirtieth part of an inch wide, and slightly convex throughout the blade. The eye being fixed by a *concave speculum* (Plate VII. fig. 3), the needle is passed through the sclerotic coat about a line behind the iris, perpendicular to its edges, until it reaches the anterior chamber and the nasal margin of the pupil. Its edge is then turned backwards, and at a

single stroke made to divide the capsule and its lens. After this, repeated cuts are made in different directions, so as to divide the cataract into numerous pieces, most of which should be pushed afterwards by the flat surface of the needle into the anterior chamber, for solution.

Formerly, Sir William Adams, in cases of *very hard and solid* cataract, was in the habit of introducing a knife similar to that recommended by him for artificial pupil, but smaller, and slicing off pieces of the lens; finding, however, the operation very difficult and sometimes impossible, and having known, in several instances, violent inflammation and even destruction of the eye to follow the lodgement of an entire lens, or of large portions of it in the anterior chamber, he has latterly performed the ordinary operation with his spear-pointed needle, with which he pushes the whole of the lens into the anterior chamber, and thence immediately afterwards extracts it through the cornea by making a section of that tunic with a knife of peculiar shape (Plate VII. fig. 4), enlarging the incision, should he find it necessary, with a blunt-pointed curved knife (Plate VII. fig. 5).

Besides *couching*, *extraction*, and the *absorbent practice*, other operations have been proposed for the removal of cataract. For the most part, however, they are entitled to so little attention, as to render a description of them unnecessary. But a question naturally arises respecting the merits of the operations in common use, and how far one should be preferred to another; though there is little probability of such a question being ever satisfactorily determined, for, on both sides, it has been customary to extol

the merits of one, and exaggerate the inconveniences of the other. Perhaps it may be fairly stated in relation to the operation of extraction, that under favourable circumstances —where the subject is young, healthy, the eye prominent, the vitreous humour sound, &c.—this operation, when dexterously performed, possesses advantages over every other, inasmuch as the cataract is at once removed, and a speedy cure follows. But on the other hand, it must be recollected that the operation is always extremely difficult, and that if it once fail it cannot be repeated. As respects the operation of *couching*, it appears to me that the chief objection to it arises from the difficulty of keeping the lens below the axis of vision; in addition to this, from its lodgement, in many instances, upon the retina, great pain and incurable amaurosis have not unfrequently ensued. Under all circumstances, therefore, I am inclined to prefer the "*absorbent practice*," principally because the operations are easily executed, give little pain, and if necessary may be repeated again and again without injury to the eye, and are the most likely to prove successful.

It should be remembered that previous to the performance of any operation for cataract, the patient must be prepared by diet, purging, &c.; that the stramonium or belladonna be invariably used; that means be taken to subdue inflammation after the operation, and that the eye be not prematurely exposed to too strong a light. As a general rule, too, no operation should be undertaken so long as the patient enjoys the perfect sight of one eye.

Section XV.

Congenital Cataract.

This disease is more common than is generally imagined; indeed, many examples are recorded of all the children of a numerous family being born with cataracts in each eye. In the District of Columbia, there is a family of six children, all of whom are blind from congenital cataract. Sometimes only one eye is affected.

There is a peculiarity attending this disease which is seldom observed in common cataract—an extraordinary mobility or incessant rolling motion of the eye; that increases with the age of the patient, and is seldom, if an operation be long delayed, entirely gotten rid of. It is somewhat remarkable, also, that unlike ordinary cataract, the lens of the congenital variety, in most instances, is gradually absorbed, and the two capsules approach each other and are at last identified, forming a tough elastic membrane. This fact was first particularly noticed by Saunders.

Treatment of Congenital Cataract.

Formerly, surgeons entertained the opinion that congenital cataract did not admit of relief until the patient at-

tained the age of eight or ten years. Gibson of Manchester, and Saunders of London, were among the first to correct this erroneous doctrine. Independently of the importance of an early operation, as respects education of the child, it is equally necessary to correct the mobility of the eye, and to guard against decay of the retina, which, for want of its natural exercise, is apt to fade and die.

For the removal of congenital cataract, I prefer, with the exception of the mode of securing the patient, the *anterior* operation as performed by Saunders, and described in the preceding section. Instead of four or five assistants to hold the child, some of whom must necessarily be in the way of the operator, I am inclined to recommend from experience the plan of Mr. Gibson of Manchester, which is simply to inclose the body, arms, and legs of the patient in a bag open at each end, and furnished with tapes or strings to secure the limbs. Thus situated, the child may be laid on a large pillow placed on a table, and firmly held by one or two assistants. The operation may be performed, if necessary, on infants a month or six weeks old.

Before concluding the subject of cataract, it may be proper to state, that the anterior capsule of the lens sometimes adheres to the iris, and occasions an immobility of the pupil. Under these circumstances, I should still prefer the *posterior* operation, and the use of the curve-pointed needle of Sir William Adams, (Plate VII. fig. 6) taking especial care to be as gentle as possible in separating the adhesion, lest the iris be so injured as afterwards to cause obliterated pupil. It now and then happens that after operations for

cataract (and operations, too, that have succeeded for a time,) *secondary* cataract is produced. This arises from capsular opacity. The *posterior* operation will, for this variety of the disease, also be found the most suitable.

Section XVI.

Amaurosis.

Amaurosis, gutta serena, or an insensible state of the retina, a disease of frequent occurrence, and always extremely difficult to cure, may be distinguished, generally, from other affections of the eye by the following symptoms. The pupil is of a greenish black colour, greatly expanded beyond its natural size, irregular in shape, and its edges undulating. When exposed to the strongest light, no perceptible contraction can be observed. Sometimes, however, instead of being dilated, it is unnaturally contracted. In other instances, the iris retains its sensibility so far as to be obedient to the stimulus of light, and contracts and dilates as usual, and yet the retina is completely insensible. In addition to these symptoms, the general aspect of the eye is peculiar, its natural lustre and intelligence are diminished or lost, and in bad cases of the disease the patient is unable to direct his eyes steadily at any object, but turns them towards it obliquely. Most patients in the incipiency of the disease, are exceedingly annoyed by fantastic figures, called by most writers muscæ volitantes, which are constantly flitting before their eyes, especially when white and shining objects are looked at. Severe pain about the superciliary ridge and orbit is a frequent concomitant of the disease.

The *causes* of amaurosis are either local or constitutional. Among the former may be enumerated blows upon the head, wounds of the supra-orbitary nerve, exposure of the eye to vivid lights, long continued fatigue of the eye from examination of minute objects, the use of powerfully magnifying glasses, confinement in dark cells or dungeons, pressure upon the optic nerve from tumours, hydrocephalus, &c. The constitutional causes are derangement of the digestive organs, violent mental emotions, suppression of accustomed or periodical discharges, immoderate venery, manstupration, excessive indulgence in opium and other narcotics, frequent attacks of syphilis, repeated mercurial courses, and a great variety of similar sources of excitement.

There is a singular variety of amaurosis, called hemeralopia, nyctalopia, or night blindness, in which patients see objects with perfect distinctness during the day, but lose their sight as soon as it becomes dark, remain blind throughout the night, and upon the approach of morning again recover their vision, which continues perfect until the return of evening. This disease sometimes arises without any evident cause; generally, however, it is endemic, and prevails to a greater extent in the East and West Indies than in other countries. Sometimes it appears to be hereditary; at least there are instances of whole families for several generations being subject to it. In Maryland there are now two distinct families in which the disease has existed from time immemorial. Persons having black eyes are said to be more subject to the complaint than others. When examined the eyes do not commonly exhibit any visible defect, except that the pupil is unusually large, and less moveable than natural.

Treatment of Amaurosis.

This must depend in a great measure upon the cause of the disease. When it arises from any organic defect, and from most of the local causes above enumerated, there will be very little probability of affording permanent relief. If it proceed from gastric derangement, or from passions of the mind, emetics and purgatives will prove the most useful remedies, and after full benefit has been derived from these, tonics may be resorted to.

For *hemeralopia*, repeated purgatives and a succession of blisters to the temples, are highly recommended by Mr. Bamfield,* the most experienced writer on the subject.

* Medico-Chirurg. Transactions, vol. 5.

Section XVII.

Hordeolum.

The hordeolum, or stye, is a red, inflamed, and painful tumour involving one or more of the meibomian glands. It is similar in many respects to the common furuncle or boil, met with in other parts of the body, and is usually seated upon the lower eyelid near its inner angle. The disease is very common, and arises, for the most part, from some disordered action of the stomach. Like the furuncle it seldom terminates in suppuration.

Treatment of Hordeolum.

Purgative medicines and attention to diet will often, without the aid of local applications, remove hordeolum. When the tumour, however, continues stationary for some time, and is painful, an attempt should be made, by warm emollient applications, to excite suppuration in the cellular membrane surrounding it. By these means we sometimes succeed in detaching the core or slough that occupies the centre of the tumour, after which the opening left will soon heal. When the inflammation has subsided and the tumour become indolent, the application of lunar caustic or of nitric acid will frequently effect a cure.

Section XVIII.

Encysted Tumours of the Eyelids.

Steatomatous and melicerous tumours, from the size of a pea to that of a large bean, are frequently met with beneath the conjunctiva, or imbedded in the substance of the eyelid. They are, generally, soft, devoid of pain, and roll under the finger. The upper eyelid is the most common seat of the disease. When the tumour attains a very large size, it is liable to interfere with vision, or it may produce eversion and other diseases of the eyelids.

Treatment of Encysted Tumours of the Eyelids.

Extirpation is the only remedy, and this, when the tumour has acquired a moderate size, is easily accomplished, especially when it is seated on the inside of the lid immediately beneath the conjunctiva. The surgeon everts the lid with his finger, secures the tumour by a fine hook, then makes an incision with a diminutive scalpel over its surface parallel with the eyelid. As soon as the external covering is fairly divided, the tumour is easily loosened from its bed, and by a few strokes of the knife or scissors

entirely removed. When it is deeply seated within the substance of the orbicular muscle, or lies exterior to it, the operator will find it most convenient to extract the tumour by cutting through the lid on its outer side—taking care to separate the muscular fibres longitudinally.

Section XIX.

Entropeon.

By the term entropeon is understood an inversion of the tarsus or of its cilia. *Trichiasis* is also used to denote the same disease. The upper eyelid is commonly the seat of entropeon, which, in proportion to its duration and the extent of the inversion, is productive of more or less irritation by encroaching upon the ball of the eye. In general, the entropeon proceeds from protracted ophthalmia, or psorophthalmia, and from other causes capable of producing a morbid inclination of the tarsus, or a wrong direction of the cilia.

Treatment of Entropeon.

An evulsion of the eyelashes by a pair of fine forceps or tweezers, when the entropeon depends upon their unnatural position, is the only remedy calculated to remove the complaint, and this does not succeed always. For inversion of the tarsus itself, several different operations have been practised. In simple cases, especially where the disease appears to be owing to inordinate relaxation of the skin of the eyelid, the removal of an oval portion of this superfluous skin by the forceps and curved scissors will generally effect a cure, provided the surgeon take care to

cut as closely as possible to the tarsus, and afterwards draw the edges of the wound together by a fine suture. The cicatrix that ensues will afterwards prevent the tarsus from falling inwards upon the globe of the eye. But this operation does not commonly answer for cases of long standing. Mr. Crampton, an ingenious Irish surgeon, has proposed to dissect off the thickened conjunctiva, which he conceives to be the most common cause of entropeon. On the other hand, Mr. Saunders and Dr. Dorsey advise the entire or partial removal of the tarsus. I have, however, tried these different operations, and have found them painful and difficult, and not always successful. I am inclined to think more favourably of an operation lately proposed by Dr. Jæger of Vienna, though I have had no opportunity of testing its merits. This surgeon, instead of removing the whole tarsus, merely dissects off its anterior edge, and along with it the cilia, thereby removing a considerable source of irritation, at the same time preserving that portion of the cartilage which serves to guide the tears towards the puncta lacrymalia.

Section XX.

Ectropeon.

The ectropeon is the reverse of the entropeon—the eyelid being turned outwards instead of inwards. Sometimes both the upper and lower eyelids are simultaneously affected, but in most instances the lower lid is the seat of the disease. Like the entropeon, it may proceed from repeated and long continued attacks of ophthalmia, and in such cases the conjunctiva lining the lid is generally thickened or in a fungous state. Occasionally, the ectropeon arises from burns or wounds in the neighbourhood of the eyelids, the cicatrices of which, by contracting and distorting the tarsus, evert the lid and expose its inner surface. In all cases of the kind, the deformity arising from the red and exposed surface of the conjunctiva is considerable, and the irritation to the globe of the eye such as not unfrequently to produce opacity or ulceration of the cornea.

Treatment of Ectropeon.

Excision of the fungous conjunctiva, and the application of various caustics, have been advised by most writers. The only operation, however, likely to afford permanent relief, is that practised by Sir William Adams. It is performed in the following way. A portion of the lid, in the

shape of the letter V, is removed from the outer angle of the eye by a pair of straight sharp scissors. The thickened conjunctiva is next carefully dissected off, when there will be no obstacle left in most cases to the replacement of the lid. To retain it in its situation, and to promote adhesion, a fine interrupted suture should be passed through the edges of the wound, and supported by a compress. The size of the portion to be removed must depend upon the extent of the eversion, &c. It needs hardly be mentioned that the base of the triangular incision should look towards the edge of the tarsus. When the ectropeon depends upon a cicatrix from loss of substance near the lid or from a burn, it may become necessary to make an incision parallel with the lid through the contracted integuments, and afterwards interpose lint to prevent their re-union. But the operation seldom succeeds perfectly.

Section XXI.

Fistula Lacrymalis.

Epiphora or stillicidium lacrymarum, and fistula lacrymalis, have been used by some writers indiscriminately to denote the same disease; by others they have been looked upon as essentially distinct; they may, however, I conceive, be ranked with propriety as varieties or stages of the same complaint; but it by no means follows that every epiphora must necessarily terminate in fistula lacrymalis, although fistula lacrymalis may be said to be preceded invariably by epiphora.

Epiphora may arise from several different causes—from an undue secretion of tears—from closure of the puncta lacrymalia or obliteration of the canaliculi lacrymales—from inflammation of the lacrymal sac, and from stricture of the nasal duct. These in their turn may be the result of other agents, especially of the different varieties of ophthalmia, &c.

When the puncta lacrymalia are closed, the tears constantly flow over the lids, and spreading upon the cornea produce a morbid refraction of light, which obliges the patient constantly to wipe them away. On the contrary, when the nasal duct is obstructed, the tears accumulate in the sac, and form a tumour immediately below the tendon of the orbicular muscle; and upon pressing this tumour, the

tears regurgitate through the puncta mixed with flocculent matter. So long as the disease continues in this state, the terms epiphora, and stillicidium lacrymarum, are strictly applicable to it. Should the sac, however, inflame and ulcerate, and an opening be established between it and the integuments, then a fistula lacrymalis is produced. In such cases, the inflammation generally extends to the globe of the eye, and in some instances to the side of the face and head. If neglected, the disease may continue for months or years, or indeed during the patient's life, sometimes better, sometimes worse, and in the end may be followed by caries of the unguis, and injury of the æthmoid and spongy bones.

Treatment of Fistula Lacrymalis.

A simple epiphora, dependant upon obstruction of the nasal duct, or, as sometimes happens, upon a morbid secretion from the meibomian glands, may be generally removed by the repeated introduction of Anel's probes into the puncta and duct, and by the application of the unguentum hydrargyri nitrati, and other astringent ointments and washes to the lids and edges of the tarsus. After the obstruction has been overcome by the probes, the passages should be syringed out two or three times a day, taking care to introduce the curved pipe of the syringe into the lower punctum, and at the same time with the point of a finger to stop the upper punctum, and thereby prevent the regurgitation of the fluid. Tepid water, at first, and afterwards a weak solution of the sulphate of zinc or acetate of

lead, will be found the most suitable wash. When the epiphora depends upon obliteration of the puncta or canaliculi lacrymales, the disease may be considered incurable.

Fistula lacrymalis can be removed only by overcoming the obstruction in the nasal duct, or by establishing a new route for the tears through a perforation of the unguis. The first mode should, if practicable, be always resorted to. The surgeon introducing into the fistulous orifice a common pocket case probe, carries it, at first, horizontally, until it is fairly introduced into the cavity of the lacrymal sac; the handle of the instrument is then raised, and made to rest nearly in a perpendicular direction against the superciliary ridge, while the point is directed downwards in the course of the duct, and pressed firmly but steadily against the stricture. As soon as this is overcome, the probe passes easily into the nose, and a few drops of blood and matter issue from the nostril of the affected side. The probe is then withdrawn, and a silver style, (an instrument resembling in shape and size the probe, but only an inch and a quarter in length, and having a head obliquely placed upon its top) introduced in its place. This is permitted to remain in the passage, and serves the purpose of conducting the tears by a sort of capillary attraction into the nostril. In the mean time, the fistulous orifice gradually contracts around the neck of the instrument, the head of which afterwards prevents it from falling into the nose. Occasionally the style should be withdrawn, and the passage syringed out. Some patients find it necessary to wear the style several months, others are cured by it in a few weeks. Where the fistulous orifice is so small that the

probe will not enter, it should be enlarged by a spear-pointed lancet. Sometimes it is necessary to make an opening into the sac, where the fistula is not properly situated, or does not exist. Under these circumstances, the surgeon should always take as his guide the small tendon of the orbicularis, and immediately beneath this make his incision.

If, as sometimes happens, the nasal duct be permanently closed by stricture, or by an exostosis from the surrounding bony canal, it will become necessary to perforate the os unguis. This can be most conveniently done by the perforator of Cruikshank, (an instrument resembling in some respects the shoemaker's punch) which is carried through both sides of the lacrymal sac, and made to bear upon the inferior part of the unguis. To prevent the instrument from passing too far inwards, a narrow piece of horn should be carried up the nostril, and upon this the perforator will rest and perform its office with great facility. After the opening has been made through the sac and bone, a silver or leaden style, somewhat shorter than that used for the natural duct, should be introduced and worn as long as may be found necessary. When the operation is properly performed, the opening will always be made between the superior and inferior spongy bones.

There are other operations practised for the cure of fistula lacrymalis, but they seldom prove so effectual as those I have described.

On diseases of the eye consult—*Scarpa's Practical Observations on the Principal Diseases of the Eyes, translated from the Italian, with notes, by James Briggs, 2d edit.—Ware's Chirurgical Observations relative to the Eye, in 2 vols. 8vo.—Wardrop's Essays on the Morbid Anatomy of the Human Eye, in 2 vols. 8vo. Edinburgh,* 1808 *and* 1818—*Vetch's Practical Treatise on the Diseases of the Eye,* 1820—*Travers' Synopsis of the Diseases of the Eye, and their Treatment,* 1820—*A Treatise on some Practical Points relating to the Diseases of the Eye, by the late John Cunningham Saunders,* 8vo. 1811—*Practical Observations on Ectropeon, or Eversion of the Eyelids, with the Description of a new Operation for the Cure of that Disease; on the Modes of Forming an Artificial Pupil, and on Cataract, by William Adams,* 8vo. 1812—*An Essay on the Entropeon, by Philip Crampton, M. D. London,* 1806—*Wenzel's Treatise on Cataract, by Ware,* 1791—*Pott's Remarks on Cataract, in third vol. of his Chirurgical Works—Hey's Practical Observations in Surgery—A Practical Enquiry into the Causes of the frequent Failure of the Operations of Depression, and of the Extraction of the Cataract as usually performed, with the Description of a Series of New and Improved Operations, &c. by Sir William Adams,* 8vo. 1817—*Practical Observations on the Formation of an Artificial Pupil, and Remarks on the Extraction of Soft Cataracts, by Benjamin Gibson,* 8vo. 1811—*A Treatise on the Diseases of the Eye, including the Doctrines and Practice of the most eminent modern Surgeons, and particularly those of Professor Beer, by George Frick, M. D.* 8vo. 1823.

CHAPTER VII.

DISEASES OF THE NOSE AND ANTRUM.

The mucous membrane which lines the cavity of each nostril, not only covers the spongy bones, but extends to the antrum maxillare, to the frontal, æthmoidal and sphenoidal sinuses, and even to the mouth and throat. Hence a similarity of disease is found to pervade each of these parts, the foundation of which may be said to be laid, generally, by inflammation produced by cold, specific diseases, and other causes. The most common diseases of these cavities, are polypous tumours, collections of purulent matter, and ulcerations.

Section I.

Polypus of the Nose.

A POLYPUS may spring from any portion of the schneiderian membrane; it originates, however, most frequently either from the superior or inferior spongy bone. In shape it is usually pyriform—being narrow at its root and expanded below; though this will depend very much upon the natural form of the cavity it occupies. Sometimes the base of the tumour is exceedingly broad. Not unfrequently a polypus originates high in the nose, and instead of falling forwards or towards the anterior nares, takes a backward direction, hangs behind the palate, and sometimes reaches the pharynx. One or both nostrils may be the seat of this disease. When both are filled, the patient breathes with difficulty, and with a peculiar rattling noise. In damp weather, the tumours often project beyond the nose, and contract and disappear as soon as the weather becomes dry. The consistence of polypus is not less variable than its form. Firm, fleshy, and very solid, in some instances, it is in others extremely soft, and so tender as to tear upon the slightest touch. The most common variety, so far as my experience goes, is that which bears, in consistence, shape, colour and size, a striking similitude to the common oyster. Most polypi are extremely vascular, and if rudely handled bleed profusely. No age or sex are exempt from the disease, which sometimes assumes a malignant form, at other times destroys the patient by exciting, from pressure, caries

of the spongy and æthmoid bones, inflammation of the brain, &c.

Treatment of Polypus of the Nose.

Several operations, very opposite in character, have been practised for the removal of nasal polypus. I prefer in most cases the use of the forceps. These when properly made should be stouter than the common dressing forceps, with their extremities slightly curved, serrated, and a considerable slit or hole in each blade about half an inch from its point. The patient being seated before a strong light on a low chair, with his head moderately thrown back and firmly supported by an assistant, the surgeon carefully introduces the instrument with its blades expanded, as far as the root of the tumour, takes firm hold of it, and by two or three turns of the instrument, instead of pulling in a straight line, twists it away. A copious gush of blood generally follows, especially if the tumour be partially removed. Clearing this away, the forceps are again and again introduced until the whole nostril be free, the strongest proof of which will be the freedom with which the patient can breathe or force air through the nostril. In performing this operation, great care must be taken not to use unnecessary violence, because it has sometimes happened that the æthmoid bone has been broken up, and other mischief produced sufficient to lead to fatal consequences. This operation is chiefly adapted to polypi with narrow necks, and confined to the cavity of the nostril.

The operation of *excision* has been recommended by J. Bell, Whately and others, for the removal of polypi of large size and broad base. There are very few cases, it appears to me, requiring such a measure. Independently of the difficulty of the operation, the hemorrhage is always very profuse, and besides the uncertainty of removing the whole of the disease, the surgeon will run considerable risk of injuring the sound parts in the neighbourhood of the tumour. Mr. Whately employs a sheathed knife, somewhat similar to Dr. Physick's bistoury for fistula in ano.

The *ligature*, although recommended by some writers for every variety of polypus, can seldom be employed advantageously except where the tumour arises by a narrow neck and hangs beyond the posterior nares. In such cases, a silver or iron wire, or a piece of a catgut, eighteen inches long, should be doubled so as to form a loop, and introduced into the nostril until it appears below the palate, when it should be caught by a pair of narrow forceps, and drawn towards the mouth, and the loop at the same time expanded by the fingers of the surgeon. As soon as this is accomplished, the operator, still holding the loop with one or two fingers, draws the projecting ends of the wire with the other hand from the nostril, and thus by one simultaneous movement, carries the loop over the base of the polypus, and thence to its neck. The ends of the wire are next passed through the double cannula of Levret, and after being drawn so firmly as to constrict the neck of the polypus, are twisted upon the wings of the instrument and secured. In proportion as the wire becomes loose from the shrinking of the tumour, its ends must be tightened every few hours until the polypus drops off, which it does

sometimes so suddenly as nearly to suffocate the patient. If the surgeon should experience any difficulty, as he often does, in introducing the wire and noosing the polypus in the manner directed, he may resort with advantage to the cannula of Bellocque.*

Whatever method may be practised for the removal of polypus, there are two points which must always be particularly attended to—the suppression of hemorrhage, and the removal of any fragments of the tumour so situated as to elude the instruments directed against them. The first may be accomplished, generally, by cold astringent solutions thrown up the nostrils by a syringe, or if these do not succeed, by passing a catgut, to which two or three dossils of lint are secured, through the nostril and mouth. The pressure thus created, hardly ever fails to stop the flow of blood. To guard against the return of the disease, from portions of the tumour being left behind, the argentum nitratum, repeatedly applied, will be found the most effectual remedy.

* See a description of this instrument in page 91, Plate II. fig. 1 and 2.

See *Pott's Chirurgical Works, by Earle, vol. 3. p.* 165—*J. Bell's Principles of Surgery, vol.* 3. *p.* 89—*Whateley's Cases of two Extraordinary Polypi removed from the Nose, the one by Excision with a new Instrument, the other by Improved Forceps,* 8vo. 1805—*Callisen's Systema Chirurgiæ Hodiernæ, vol.* 2. *p.* 207—*Lassus Pathologie Chirurgicale, tom.* 1. *p.* 528—*Deschamps' Traité des Maladies des Fosses Nasales, &c.*—*C. Bell's Operative Surgery, vol.* 1. *p.* 208.

Section II.

Ozæna.

A troublesome ulceration of the lining membrane of the nostrils, attended with fetid discharge, and sometimes followed by destruction of the cartilage and by caries of the bones of the nose, is denominated by most modern writers ozæna. The origin of the disease is very obscure, though there is reason to believe that, in most instances, it is connected with the primary or secondary forms of syphilis. In other instances, marks of the purely scrofulous character are apparent. One of the most troublesome attendants of the disease is the accumulation of inspissated mucus, or of incrustations in the cavities of the nose. These are sometimes so considerable in quantity, as to block up entirely the passages. After the ulceration is fairly established, it not only takes possession of the cartilaginous septum, the æthmoid and spongy bones, and the other bones of the nose, but extends to the cheek. If the patient should recover after such ravages, he must for ever remain horribly deformed.

Treatment of Ozæna.

The remedies best adapted to the cure of ozæna are bark, iron, the mineral acids, muriate of lime, sarsaparilla, and antimony. When there is any suspicion of the dis-

ease having originated from syphilis, mercury alone, or conjoined with other preparations, should be employed. During the height of the inflammation, solutions of opium and of the acetate of lead, may be injected into the nostrils, or applied to the ulcerated surface on lint. Some of the mild animal oils introduced into the cavities of the nose, will also prove serviceable, by softening the incrustations and lessening pain. After the inflammation has abated, more stimulating materials may be employed, such as solutions of lunar caustic, sulphate of copper, the ointment of the red oxide of mercury, citrine ointment, &c.

On the subject of Ozæna, consult Pearson's Principles of Surgery, p. 279.

Section III.

Polypus of the Antrum.

Fungus or polypus of the antrum maxillare, is less frequently met with than abscess of that cavity—a disease already treated of in another place.* It is, however, one of the most formidable affections in surgery, and unless speedily arrested, generally proves fatal. The tumour sprouts from the lining membrane of the antrum, from what cause it is always exceedingly difficult to determine, and grows with more or less rapidity, until it fills the whole of the cavity. By this time, considerable pain is experienced in the cheek and eye of the affected side, and soon after a perceptible enlargement of the face may be observed. These symptoms are, in the course of time, followed by distortion of the nose, projection of the eye, enlargement of the gums corresponding to the antrum, profuse discharges of sanious fetid matter, and finally by protrusion of the bones of the face and alveolar processes, and as a necessary result, by hideous deformity. In consistence, the tumour is generally firm and fleshy, sometimes soft, and in a few rare instances, osteosarcomatous or bony.

* See Vol. I. p. 167.

Treatment of Polypus of the Antrum.

If, instead of temporizing, as is too common, until the disease is so advanced as to leave no reasonable hope of effecting a cure, the surgeon were always to follow the practice of the enlightened and fearless Desault, and operate at an early period, most patients, perhaps, would recover. As soon, therefore, as the nature of the tumour is ascertained, the surgeon should not only determine to remove it, but resolve to set no limits to the sacrifices it may be necessary to make. With this view he must provide himself with several curved and angular scalpels, of unusual strength and thickness, two or three cauterizing irons, a key for pulling teeth, chisels, gouges, a mallet, &c. Every arrangement being made, the surgeon first separates, with a common scalpel the cheek from the maxillary bone, by opening the patient's mouth as widely as possible, and cutting through the internal membrane. His next object should be to remove the molares teeth and their alveolar processes corresponding with the floor of the antrum. This may be done by the tooth key, or by two or three strokes of a chisel and mallet. Having in this way exposed the cavity of the antrum and the surface of the tumour, the curved and angular knives must then be employed until every remnant of the disease is rooted out. The hemorrhage that follows the operation is sometimes extremely profuse, but may be instantly arrested, and with little pain to the patient, by one or two applications of the cautery. I have, however, performed several operations of the kind without ever being under the necessity of doing more towards stopping the flow of blood than plugging the

antrum with lint or tow. If the operation prove successful, the antrum is filled in a few weeks with healthy granulations; but if the disease return, this is soon rendered evident by the reappearance and rapid growth of the fungus. To repress this, repeated applications of caustic, or the cautery, will be found necessary, or perhaps a second operation may be demanded. Sometimes the teeth and alveolar processes appear sound. In such cases, an incision should be made through the cheek from its outer surface, the anterior walls of the antrum perforated by a trephine, and the tumour removed through the opening.

I say nothing of the modern proposal of curing polypus of the antrum by tying the *carotid*, because I have reason to believe that all attempts of the kind hitherto made, (in which the ligature of this vessel was entirely depended upon,) have proved abortive.* I should conceive it equally unnecessary, and not less reprehensible, first to tie the carotid, and afterwards to extirpate the tumour, inasmuch as the patient's danger must be increased tenfold, and without any adequate compensation.

* Dr. Davidge, Professor of Anatomy in Baltimore, took up the carotid artery, two or three years ago, in a case of polypus of the antrum —leaving the tumour untouched. Six weeks after the operation the patient died of locked jaw. Professor Davidge, in his account of the case, mentions, "that the parts concerned in the *operation* were examined after death, and every thing found in the best possible condition." From this and other passages, however, we are led to infer that the *tumour* had not disappeared.

Consult *Desault's Works, by Smith, vol.* 1. *p.* 141—*Desault's Parisian Chirurgical Journal, vol.* 1. *and* 2—*Traité des Maladies Chirurgicales,*

et des Operations qui leur Conviennent par MM. Chopart, et Desault, tom. 1. *p.* 195—*J. L. Deschamps' Traité des Maladies des Fosses Nasales et de leur Sinus—Suite d'Observations sur les Maladies des Sinus Maxillaire, par M. Bordenave, in Memoires de l'Academie Royale de Chirurgie, tom.* 13. *edit. duodecimo, p.* 367—*Abernethy's Account of a Singular Disease in the Upper Maxillary Sinus, in Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol.* 2. *p.* 309—*Gibson on Bony Tumours, in the Philadelphia Journal of the Medical and Physical Sciences, vol.* 3. *p.* 100—*C. Bell's Surgical Observations, vol.* 1. *p.* 413.

CHAPTER VIII.

DISEASES OF THE MOUTH.

Under this head may be included several diseases, some of which have already been treated of in the preceding volume. The principal affections of the mouth, and of the parts in its immediate vicinity, are hare lip, cancer of the lip,* cancer of the tongue,† ranula, malformation of the frænum linguæ, enlargement of the tonsils, elongation of the uvula, epulis or scirrhus of the gums, and caries of the teeth. To give even a general account of the diseases of the teeth, and of the various operations practised upon them, would alone occupy a volume. The present state of surgical science, however, and the subdivision of professional labour, would seem to obviate altogether the necessity of treating of these affections in a work of this description.

* See Vol. I. p. 221. † Vol. I. p. 224.

Section I.

Labium Leporinum, or Hare Lip.

This is a congenital deformity, and takes its name from a supposed resemblance to the lip of a hare or rabbit. There are two varieties of the disease—the single and double. The former is the most common, and is a simple fissure or slit, extending from the edge throughout the substance of the lip to a greater or less extent; the latter is comparatively rare, and differs from the single variety chiefly in having a wider opening, and an intermediate hanging portion. Both varieties are often complicated with a cleft or opening in the bones of the palate. The upper lip is in nine cases out of ten the seat of the disease, and the borders of the fissure are invariably rounded, and covered with the red and delicate membrane peculiar to the edges of the natural lips. Hare lip, independently of its deformity to the infant, proves a serious inconvenience by interfering with its powers of suction, and to the adult by interrupting speech, and preventing the articulation of labial sounds. Sometimes one or more of the incisor teeth project from the upper part of the hare lip nearly in an horizontal direction, and add very much to the deformity.

Treatment of Hare Lip.

The only effectual remedy for hare lip is an operation, and the sooner this is performed the better. If the fissure in the lip is single, it will be sufficient to remove each of its rounded edges in the following way. The infant being firmly held in the arms of a nurse, or laid on a pillow with its head elevated and securely fixed by an assistant, the surgeon having previously separated the internal membrane of the mouth and its frænum, introduces between the lip and gums a narrow flat piece of wood five or six inches long. This being held by another assistant, the operator himself stretches the lip upon the board, and commencing near the nostril, makes an incision downwards, and at a single cut removes in a straight line the edge of the lip. The opposite edge is next detached in a similar manner, when the chasm left will resemble the letter V inverted. It only remains to draw the edges of the wound together, and retain them by the twisted suture, taking care to commence by passing a pin first through the hanging edge or lower portion of the lip, instead of the upper. Two or three pins will generally be sufficient. They should be passed horizontally, at regular intervals, and rather nearer the internal than the external surface of the lip. The close contact of the edges of the wound, and the pressure necessarily occasioned by the tightening of the ligatures, are sufficient to arrest the hemorrhage. Each pin should be surrounded by a separate ligature passed about it in the form of the figure 8.* In four or five days,

* See Vol. I. p. 74 and 222.

the adhesion is usually complete, and the pins may be withdrawn, to prevent them from exciting ulceration.

When the operation for double hare lip is performed, it should be conducted upon the principles just laid down. But four instead of two incisions should be made—one on each side of the intermediate projection, which may then be dovetailed, as it were, with the outer edges of the lip by one or two pins passed entirely across. The cleft in the bony palate, should it exist, generally closes up, sua sponte, provided the operation be not too long delayed.

See *Sabatier de la Médecine Operatoire, tom.* 3. *p.* 273, 8*vo.* 1810—*Lassus Pathologie Chirurgicale, tom.* 3. *p.* 451—*Richerand's Nosographie Chirurgicale, tom.* 2. *p.* 255—*Dictionnaire des Sciences Medicales, tom.* 3. *p.* 55, *article Bec de Lievre—Desault's Works, by Smith, vol.* 1. *p.* 148—*B. Bell's Surgery, vol.* 4. *p.* 447—*C. Bell's Operative Surgery, vol.* 2. *p.* 38—*Kirby's Cases in Surgery, p.* 61.

Section II.

Ranula.

An obstruction of one or more of the ducts of the sublingual gland gives rise to the formation of a semipellucid soft tumour, denominated by the older surgeons ranula—from an imaginary resemblance to the belly of a frog. This tumour is generally filled with saliva, or with a viscid fluid resembling the white of an egg. Sometimes it attains so large a size as to interfere with speech and deglutition, and even to displace the teeth. It arises either from adhesion, or natural imperfection of the duct, or from the lodgement of a calculous concretion within its passage. Children and infants are more subject to the complaint than adults.

Treatment of Ranula.

A simple evacuation of the fluid with a lancet answers no purpose, inasmuch as the opening closes again in a few hours. To effect a permanent cure the cyst must be laid open freely, or a portion of it removed with scissors. The application of caustic may afterwards become necessary.

See *Lassus' Pathologie Chirurgicale, tom.* 1. *p.* 402—*C. Bell's Operative Surgery, vol.* 2. *p.* 24—*Callisen's Systema Chirurgiæ Hodiernæ, vol.* 2. *p.* 108.

Section III.

Malformation of the Frænum Linguæ.

It sometimes happens, though not so frequently as imagined, that children are born with the frænum of the tongue so short, as to prevent them from sucking. To ascertain whether this be really the case, the surgeon should endeavour to raise the point of the tongue with a spatula. If he should fail in this attempt, and the tongue appears upon examining it on the side to be unnaturally confined, little doubt can remain of the frænum being defective.

Treatment of Malformation of the Frænum Linguæ.

Although the division of the frænum linguæ is usually looked upon as a trifling operation, it is one that should not be lightly performed, and upon every common occasion. Petit relates two instances, in which death followed from the frænum being so much loosened, as to permit the tongue to fall backwards into the pharynx, and suffocate the patient. Other cases are recorded of fatal hemorrhage from wounds of the ranine arteries and veins. To guard against accidents of this description, the operator should use a pair of probe-pointed scissors, and take care to direct

their points downwards, and divide no more of the frænum than is absolutely necessary.

See *Petit's Traité des Maladies Chirurgicales, tom.* 3. *p.* 260—*Burns' Surgical Anatomy of the Head and Neck, p.* 264, *edit.* 2—*C. Bell's Operative Surgery, vol.* 2. *p.* 28.

Section IV.

Enlarged Tonsils.

Enlargement of the tonsils is very common among scrofulous children, and arises from exposure or repeated attacks of catarrh and sore throat. Sometimes, however, the disease is slowly induced without being preceded by pain, swelling, or any of the characteristics of acute inflammation. If suffered to remain for any length of time, the tumours occasionally attain so large a size as to interfere materially with respiration and deglutition. Persons troubled with this disease, have a peculiar hoarse, husky, or croaking voice, and when labouring under cold, wheeze excessively.

Treatment of Enlarged Tonsils.

The *knife* and *ligature* have been frequently employed in the removal of enlarged tonsils. To the latter the preference should invariably be given, inasmuch as there is no risk of hemorrhage—a consequence very apt to follow the use of the knife even when employed with the utmost caution. Formerly the ligature was suffered to remain upon the enlarged gland for several days, or indeed until the tumour sloughed away, and from this practice great irritation about the fauces, tongue, and mouth, ensued. To

obviate these inconveniences, Dr. Physick first suggested the following mode of practice, which experience has proved to be extremely advantageous. The operator takes a double cannula about four inches long, and passes through it, doubled, a piece of soft, flexible iron wire, one-twenty-fourth part of an inch in diameter, secures one end of the wire to an arm of the cannula, and permits the other end to project about five or six inches beyond the opposite barrel of the instrument. The cannula being thus armed, the loop of wire is spread out to a sufficient extent to pass over the tumour, and is bent a little to one side that it may with the greater facility approach its base. An assistant holds down the patient's tongue with the handle of a large spoon, while the operator conveys the wire over the base of the tumour, and taking hold of its projecting end draws it loosely in order to ascertain whether it is properly fixed. Finding this to be the case, and that the uvula is not included, the end of the wire is then seized with a pair of flat pliers, drawn as firmly as possible, and secured by wrapping it around the remaining arm of the cannula. The wire, thus applied, should be permitted to remain on the tonsil *twenty-four hours*, and then disengaged in the following way. The cannula being firmly held with one hand, the other is employed in loosening the end of the wire from the arm of the instrument; having accomplished which, the surgeon straightens the wire with the pliers, and pushes it backwards until it is removed from the tonsil. In a few days the tumour drops off entire, or in fragments, and the ulcer left heals without difficulty.

See *Desault's Works, by Smith, vol.* 1. *p.* 193—*Sharp's Treatise on the Operations of Surgery, p.* 199. *edit.* 9—*Chevalier's New Mode of Tying Diseased Tonsils, in vol.* 3. *p.* 79, *of Medico-Chirurgical Transactions—Dorsey's Surgery, vol.* 1. *p.* 422—*The Double Cannula and a Wire recommended in the Operation of Extirpating Schirrous Tonsils, and Hemorrhoidal Tumours, by Philip Syng Physick, M. D. in vol.* 1. *p.* 17, *of the Philadelphia Journal of the Medical and Physical Sciences.*

Section V.

Elongation of the Uvula.

The uvula, from colds and other causes, is frequently enlarged or elongated. If it continues so for any length of time, troublesome irritation about the epiglottis, nausea, vomiting, and even hæmoptysis, and pthisis pulmonalis may be induced.

Treatment of Elongation of the Uvula.

To obviate some of these consequences, an operation has been practised from time immemorial—the excision or amputation of the uvula. This may be conveniently performed by a hook and scissors, or still better by the particular scissors described and engraved by Mr. Samuel Cooper, in his "First Lines of the Practice of Surgery."* These are so contrived, as, by means of a transverse projection from one of the blades, to support the uvula, and keep it from falling backwards at the moment the operator attempts to divide it. Even with this instrument, however, the operator is extremely apt to fail, or else divide a part only of the uvula, which is immediately drawn up-

* Vol. I. p. 526, edit 4.

wards, and lodged behind the velum in such a way as to render it difficult afterwards to remove it.

Mr. Benjamin Bell states that he has known very profuse hemorrhage to follow amputation of the uvula. I have often performed the operation, but never met with an accident of the kind.

The real importance of amputation of the uvula has only been estimated of late years, and it remained for Dr. Physick to point out the cases to which it was peculiarly adapted. He had met with several instances of troublesome cough, followed by emaciation of the whole body, sometimes by hemorrhage from the lungs, and eventually pthisis pulmonalis, which were produced apparently by elongation of the uvula. This determined him to try the effect of an operation in the early stages of the disease, and the result was favourable in the extreme—the cough and other urgent symptoms disappearing almost immediately, and the patients recovering perfectly in a very short time. From experience I can speak confidently of the value of the remedy, and have reason to believe that it seldom fails unless too long delayed.

Section VI.

Epulis, or Tubercle of the Gums.

This disease, like polypus of the antrum, sometimes assumes a malignant form, and, involving the teeth and adjoining parts, is soon beyond the reach of surgery. This will show the propriety of attending, in the commencement, to every small tumour about the gums, however harmless may be its appearance. Any one, indeed, who will peruse the melancholy but instructive cases detailed by Messrs. John and Charles Bell, the only writers who appear to have taken a deep interest in the subject, will need no further proof of the importance of the disease.

Epulis generally sprouts from the sockets of the incisor teeth of the upper or lower jaw. The teeth themselves are frequently sound and perfectly white, and in many instances long before the tumour is perceptible, are loosened and carried above the range of the adjoining teeth. In other cases, a small seed-like excrescence is seated upon the gum between the teeth. This remains stationary for months together, or it grows so slowly, and is attended with so little inconvenience, as scarcely to attract the patient's attention. At last it loses its hard and solid feel and gristly appearance, becomes soft and rugged on the surface, bleeds upon the slightest touch, and throws out a prolific fungus. After this, no bounds are set to the increase of the tumour, the teeth are successively displaced, the lympha-

tic glands and other soft parts in the neighbourhood contaminated, the mouth filled with a mass of disease so large as to embarrass the breathing and swallowing, the texture of the bones of the face or lower jaw broken up, and the patient eventually destroyed by hemorrhage, suffocation, or irritation.

Treatment of Epulis.

Extirpation of this tumour, in its very incipiency, is the only remedy likely to effect a permanent cure. In performing this operation, the surgeon will find it necessary to provide himself with forceps and other instruments for pulling teeth, one or two short and very strong scalpels, two or three fine watch-spring saws, tenacula, sponges, a vial of the muriated tincture of iron, lint, &c. If there is strong evidence of the tumour having originated deep among the sockets of the teeth or in the cells of the bone, the teeth surrounded by the tumour, however perfect they may appear to be, must be sacrificed, and not only the teeth, but their alveolar processes also. The cut in this case should be made with one of the fine saws perpendicularly through the bone on each side of the tumour. By these means it will be so loosened as to be easily detached with a pair of strong forceps. The hemorrhage that follows is commonly very profuse, but may be speedily arrested by dipping a piece of lint in the muriated tincture of iron, and thrusting it to the bottom of the wound, (placing above the lint a bit of cork or some elastic substance to support the lint,) closing the patient's jaws, and securing them by a bandage. In

twenty-four or thirty-six hours the lint may be removed, and if necessary the application of the muriated tincture renewed at each succeeding dressing; or the lunar or vegetable caustics may, with the same view, be applied. By adopting this plan, (the one suggested and practised by Mr. C. Bell,) I have in several operations of the kind succeeded perfectly. In other instances, where I have merely removed the tumour with the knife and caustic, it has invariably returned.

See *John Bell's Principles of Surgery, vol.* 3. *p.* 178—*Charles Bell's Surgical Observations, being a quarterly Report of Cases in Surgery, vol.* 1. *p.* 413—*Gibson on Bony Tumours, in the Philadelphia Journal of the Medical and Physical Sciences, vol.* 2. *p.* 145.

CHAPTER IX.

DISEASES OF THE NECK.

The importance of the diseases of the neck can be fairly estimated only by those who possess an accurate knowledge of the structure and functions of its numerous and complicated organs. The student should use, therefore, in prosecuting his anatomical investigations of these parts, more than ordinary diligence. Besides the great blood vessels and nerves of the neck, the pharynx, œsophagus, larynx, trachea, thyroid gland, are subject to accidents and diseases of the most pressing and grievous nature. Wounds of these different parts have already been considered;* but it still remains to treat of several other affections. These are the lodgement of foreign bodies in the pharynx and œsophagus, stricture of the œsophagus, foreign bodies in the larynx and trachea, ulceration of the glottis, bronchocele, wry-neck, &c.

* See Vol. I. p. 138.

Section I.

Extraneous bodies in the Œsophagus.

It frequently happens that persons, from hurry or voraciousness, in attempting to swallow a large piece of beef, tripe, gristle, cheese, bread, and other similar substances, are choked, and in danger of suffocation. In other instances, fish bones, chicken bones, pins, needles, pieces of coin, stick in the pharynx or œsophagus, and excite irritation in proportion to their size, shape, &c. There is reason to believe, in most cases of the kind, that the difficulty of breathing which ensues, arises from the spasmodic action of the muscles of the glottis by which this chink is preternaturally constricted. Death may follow from this cause, or from the foreign body distending the œsophagus to such a degree, as to press upon the trachea and interrupt the passage of air, or the patient may die at some subsequent period from inflammation or gangrene, induced by the continued pressure of the extraneous body, or by injudicious and violent attempts to remove it.

Removal of Extraneous Bodies from the Œsophagus.

When a large substance is swallowed, it generally sticks in the pharynx or between the cornua of the os hyoides and thyroid cartilage, and often may be seen or reached

with the finger. In like manner, fish bones and other small and irritating bodies when similarly situated, may be removed by a pair of forceps, or by tickling the fauces with a feather, or by holding a solution of tartar emetic in the mouth. These last, by exciting vomiting, have the effect of expelling the foreign body. There are, however, several regular instruments well adapted to the removal of articles lodged in the throat, but the surgeon, if suddenly called to a patient apparently choking, and in imminent danger of his life, should waste little time in searching for these instruments. On the contrary, he should seize upon any thing that happens to be in his way, calculated to dislodge the morsel—such as a horse whip, the handle of a spoon, a rattan, &c. As a general rule, digestible articles, provided they are free from asperities, should be forced into the stomach by the *probang*—a whalebone rod, having a round piece of sponge fixed upon one end, and a blunt hook upon the other. This instrument (its sponge being previously softened a little) may be easily introduced by thrusting it against the back part of the pharynx. The sponge imbibing freely the moisture of the passage fills it up entirely, and carries the body before it, unless very firmly fixed.

Copper coins, and all sharp or ragged bodies, should, if possible, be extracted by the gula forceps, probang hook, or by a hook made of a piece of bell wire, upon the spur of the occasion. Sometimes a rod of whalebone, with numerous loops of thread attached to one end of it, answers an excellent purpose, by entangling fish bones and other sharp bodies. After extraneous substances have been pushed into the stomach, the patient should take for se-

veral days successively, purgatives and mucilaginous draughts, to promote their passage through the intestines. Needles and pins that have been swallowed, not unfrequently perform extensive journeys throughout the body, and at last are discharged through the skin.

The operations called *pharyngotomy* and *œsophagotomy* should seldom if ever, I conceive, be performed; but in order to sustain the patient's breathing, during the attempts to remove a large body from the pharynx or œsophagus, it may possibly become expedient to resort to bronchotomy or tracheotomy, as will be explained hereafter.

Section II.

Stricture of the Œsophagus.

The œsophagus, like the urethra, is sometimes the seat of stricture, either of the spasmodic or permanent kind. Nervous and hysterical patients are most subject to the former disease, and the latter may occur in patients of every variety of constitution. Occasionally, the two affections are combined. Permanent stricture is met with in two or three different situations. Its most common seat, however, is immediately behind the cricoid cartilage, or in the commencement of the œsophagus. The contraction is generally found to consist of a fold of the internal membrane of the tube. In advanced cases of the disease, the whole cavity of the œsophagus is often entirely closed, and to a considerable extent, arising, probably, from the effusion of lymph, or from the glands of the passage assuming a schirrous or cancerous action. The symptoms of permanent stricture of the œsophagus, are difficulty of swallowing in proportion to the duration of the disease, pain in the stomach, nausea, troublesome eructations, pain in the fauces, and extending thence along the base of the skull. In addition to these symptoms, the patient often finds it impossible to pass either solids or fluids in the smallest quantity, and as a necessary result, emaciation ensues. Some patients, however, can readily swallow fluids, especially when sipped in small quantity; others find it easier to swallow solids.

A disease very opposite in character to stricture of the œsophagus, is sometimes met with—paralysis of the œsophagus. This occurs, for the most part, in old people, and frequently as a concomitant of palsy in other parts of the body. The power of the muscular fibres of the œsophagus being impaired or lost, the patient can take neither solids nor fluids, and unless speedily relieved, must die of inanition.

Treatment of Stricture of the Œsophagus.

Bougies, either alone or armed with lunar caustic, may be considered the only remedies for this disease. To ascertain the situation and extent of the stricture, a soft wax bougie is employed. This may be readily introduced, by directing the patient to draw back his tongue and imitate the action of swallowing. If the stricture is ascertained, from the resistance and the impression made on the end of the bougie, to be a permanent one, the caustic bougie may be immediately carried down, and kept in contact with the stricture three or four minutes. In two or three days, the operation may be repeated, and kept up occasionally until the stricture is destroyed, or until a common bougie will readily pass.

For the relief of *spasmodic* stricture of the œsophagus, I have often employed the unarmed bougie, and with the happiest effect. In such cases, also, the internal use of valerian, camphor, opium, æther, will be found highly serviceable.

Paralysis of the œsophagus may be sometimes removed by electricity. To nourish the patient during the cure, the gum elastic œsophagus tube is essential. The surgeon should take care that fluids conveyed through it are not too hot, otherwise the stomach may be scalded. From this cause, several patients have lost their lives. When the œsophagus, from stricture or any other cause, is so completely closed, that a bougie or gum elastic tube will not pass, the patient must be nourished by glysters.

Section III.

Extraneous Bodies in the Larynx and Trachea.

During the act of deglutition, articles of food, instead of passing into the œsophagus, are sometimes suddenly diverted from their course, and thrown into the glottis. An instantaneous, violent, convulsive cough, and laborious respiration, are the immediate consequences. If the extraneous body should be detained in the glottis, death speedily follows from suffocation; but in many instances, the body passes entirely through the chink of the glottis into the trachea, or else it is forced by the cough into the laryngeal pouches. In either case, the patient is saved for the time, or eventually may recover. The lodgement, indeed, of a morsel in the sacculus laryngeus, is comparatively harmless, and the irritation occasioned by its presence soon subsides. I have known extraneous articles to remain in these cavities for years, without inconvenience, and indeed without the patient being sensible of their presence. When, however, the substance descends into the trachea, incessant irritation is kept up, and although the patient, even under these circumstances, may survive for weeks, months, or years, yet in the end, unless relieved by an operation, he is sure to die—from effusion into the cells of the lungs, from pthisis pulmonalis, &c.

Removal of Extraneous Bodies from the Larynx and Trachea.

It is very seldom that the surgeon succeeds in extracting by instruments an extraneous body lodged even in the *vicinity* of the larynx; of course, the removal of it from the larynx or trachea, by such means, is out of the question. But to obviate instantaneous suffocation, or to remove the foreign body, an operation may be required.

Laryngotomy and *tracheotomy*, (so denominated according as the larynx or trachea may be the seat of the operation,) are both occasionally required. The former, however, is best adapted to the removal of extraneous bodies, and is performed in the following manner. The patient being laid on a table, with his head supported by a pillow, and thrown moderately backwards, the surgeon feels for the membranous space situated between the thyroid and cricoid cartilages, makes a perdendicular incision about an inch in length through the integuments, platysma-myoides, and between the sterno-thyroidei and sterno-hyoidei muscles. Any vessels that may have been divided, are next carefully secured, and the bleeding having entirely ceased, it only remains to push the knife through the crico-thyroid membrane, when the extraneous substance will be either immediately thrown out or presented at the wound. Sometimes it is too large to pass through the membranous space. In that case, the incision should be prolonged upwards, by separating from each other the two lateral parts of the thyroid cartilage. As soon as the foreign body is removed,

and the patient's breathing restored, the wound may be drawn together by adhesive straps, and permitted to heal.

Tracheotomy is now seldom resorted to, both on account of the difficulty of the operation, and the danger of wounding important blood vessels. Should it ever become necessary, however, it may be done in the following way. The surgeon makes an incision, from below the cricoid cartilage, and extends it through the skin and platysma-myoides, nearly as far as the sternum. The sterno-hyoidei and sterno-thyroidei muscles are next carefully pushed aside by the fingers, until the surface of the trachea is cleared, and when all hemorrhage has ceased, two or three of the rings of the trachea may be divided by a perpendicular cut.

These operations may be required for other purposes than the removal of extraneous bodies, and in that case the surgeon will generally find it necessary to keep the orifice of the wound open for some time afterwards. This should not be done, I conceive, by a cannula, which, independently of its liability to become clogged with the mucus of the passage, excites always a great deal of irritation. Upon two or three occasions in which I have found it necessary to open the membranous space in order to sustain the patient's breathing, I have dissected away the corners of the crico-thyroid membrane, and instead of introducing a cannula into the larynx, have merely prevented the integuments and muscles surrounding the opening from closing, by passing a piece of tape around the patient's neck, having attached to each of its extremities a piece of silver wire doubled, and bent in the form of a hook, and calculated by

pulling these parts in opposite directions, to keep them asunder—at the same time covering with a bit of gauze the opening in the larynx, to prevent the admission of dust and other extraneous matters. Laryngotomy and tracheotomy will sometimes be necessary, on account of substances lodged in the œsophagus, for cynanche trachealis or croup, for enlargement of the tongue or of the tonsils, for ulceration of the glottis, for suspended animation in persons apparently drowned, &c. In cases of croup, the operation seldom succeeds, owing to effusion having generally taken place in the lungs before the expedient has been resorted to. Some surgeons, and particularly Desault, in place of opening the larynx or trachea, on account of obstructions in the œsophagus, introduce a gum elastic tube into the windpipe, from the nose, or mouth, with a view of sustaining respiration until the obstructions are removed. The practice, putting the difficulty of the operation aside, in my estimation, is injudicious and censurable.

Section IV.

Ulceration of the Glottis.

From syphilis, abuse of mercury, and from other causes, the glottis is sometimes ulcerated, the epiglottis destroyed, the bony portion of the thyroid cartilage rendered carious, and covered with abscesses. This disease originates in the glandular structure of the larynx and trachea, and increases gradually, if not arrested, until it destroys the patient. The symptoms are a troublesome, hacking cough, with purulent and bloody expectoration, great difficulty of breathing, a peculiar, husky, wheezing, whistling, almost inaudible voice. After labouring under the disease for a few months the patient dies from suffocation, from effusion upon the lungs, or from irritation. Sometimes the disease appears to be hereditary; at least, I have upon several occasions known different members of the same family attacked in succession by it. Some years ago, I attended with Dr. Shaw, of this city, a female, who laboured under the disease, and finally died from it. Her sister, a stout healthy young woman, was attacked a few months afterwards in a similar manner, and also died.

Treatment of Ulceration of the Glottis.

When there is reason to suspect that ulceration of the glottis or epiglottis depends upon a syphilitic taint, mer-

cury, sarsaparilla, the nitro-muriatic bath, and other remedies of similar character should be employed. As a local application, there is nothing so serviceable as a solution of the argentum nitratum in the proportion of forty grains to an ounce of water. The practice originated, I believe, with Mr. Charles Bell; his mode of applying the caustic is to attach a pad of lint to a piece of wire, dip it in the solution, and, taking care to depress the tongue with a finger, place the lint in contact with the ulcerated surface. As a measure of necessity, Mr. Bell once performed the operation of laryngotomy, for ulceration of the glottis, with instantaneous relief to the patient, who continued to breathe freely through the opening for six weeks, but at last died in consequence of closure of the aperture by fungous granulations, the growth of which it was found impossible to repress.

Section V.

Bronchocele, or Goitre.

An enlargement of one or both lobes of the thyroid gland, constitutes the disease generally known under the name of goitre. It is a disease of very frequent occurrence, and indeed, in many parts of Europe is endemical and hereditary. The inhabitants of the Alps are, perhaps, more subject to the complaint than any other people. In the mountainous parts of Spain and Germany, the disease is frequently met with. It prevails to a considerable extent in many of the districts of France, and is by no means rare in England, especially in the counties of Derbyshire, Surrey, and Norfolk. In many of the Spanish settlements of America, the disease is exceedingly common, as well as in different parts of Canada and the United States.

Goitre, in the commencement, usually occupies one lobe of the thyroid gland; as the tumour increases, however, the other lobe becomes involved. For a long time the swelling may continue stationary, and indeed never attain a very considerable bulk. But in other instances, its magnitude is enormous. When examined, and even roughly handled, no pain is experienced unless the tumour has taken on inflammation. In that case the pain is exquisitely severe. Goitre is liable to be confounded with other tumours about the neck, but a surgeon who is at all careful, will seldom be mistaken in his diagnosis. If, in

directing the patient to imitate the action of swallowing, the tumour should follow the motions of the trachea and larynx, and at the same time occupies the natural situation of the thyroid gland, there can be very little doubt of its nature. When the swelling becomes enormously large, the patient experiences great difficulty of breathing, but I believe, there are few cases, if any, on record, of suffocation from this cause.

The structure of a goiterous tumour varies exceedingly. Sometimes its texture is compact, at other times soft and spongy. Sometimes the whole tumour is filled with cells containing a viscous gelatinous fluid. Occasionally, particles of bone are found in its substance, and writers even mention that pieces of shell, bunches of hair, and particles of tuft stone, have been met with.

The *causes* of goitre have never been satisfactorily explained. By many, the disease has been supposed to arise from the drinking of snow water, from scrofula, from meagre and unwholesome diet, from intermittent fevers, &c. These, however, and many others that might be enumerated, are mere hypotheses, and as such undeserving of consideration.

Treatment of Bronchocele.

The remedies proposed for the removal of this disease, are countless—the strongest proof of their inefficacy. It will be sufficient to enumerate the principal—burnt sponge,

mercury, pumice stone, muriate of barytes, sulphuret of potash, egg shells, muriate of lime, digitalis, muriate of iron, belladonna, electricity, pressure, friction, issues, setons, blisters, caustics, excision, and ligature of the thyroideal arteries.

In my own practice, I have found nothing so beneficial as the internal use of cicuta, administered cautiously at first, and afterwards in large doses. The seton, employed so frequently by the older surgeons, and recommended recently by Quadri of Naples, I tried repeatedly some months ago, in the case of a German boy from Lancaster, whose neck was covered with a lobulated goitre of enormous dimensions—without any other benefit than the copious discharge of a thin greenish fluid, which diminished the tumour for a time, and relieved the patient of the uneasiness occasioned by its pressure on the windpipe. With regard to the excision of bronchocele, it need only be mentioned that the operation has failed in almost every instance in which it has been executed—the patients having perished from hemorrhage or irritation. Mr. Thomas Blizzard, of London, was the first to tie the thyroideal arteries, with a view of causing the absorption of a goiterous tumour. The operation partially succeeded, but the patient died of another disease. In several instances within the last few years, the experiment has been repeated, and sometimes with success. It is the operation I should feel disposed to recommend, in case the tumour attain such a magnitude as to endanger the patient's life by suffocation.

Within the last ten years, a remedy for goitre has been introduced into practice, by Dr. Coindet of Geneva, which

has excited, in a great degree, the attention of the profession in almost every European country, and in America. I allude to the preparation termed *iodine.* The reports of Coindet in favour of this medicine were soon fully confirmed by many other continental surgeons; and its reputation rose speedily to the highest pitch; strange as it may seem, however, its decline has been almost as rapid as its rise, being now considered in the estimation of many practitioners nearly inert, and by others pronounced a most virulent poison. But from all the statements made on the subject, we have I think fairly a right to infer, that it is a medicine of great power, calculated in most cases to produce a very strong impression on goiterous and other tumours, as many well attested cases decidedly show; and that on the other hand it is followed occasionally by tremendous symptoms, and even death. Again, it is equally certain, that upon other patients not the slightest impression has been made by its use, either upon the tumour or upon the constitution of the individuals who have taken it, sometimes for months together and in the largest doses. My own experience in its use is very limited, but judging from this and from the reports made to me concerning it by my colleagues in the Alms-House Infirmary, I should feel inclined to doubt its efficacy. Still it is possible we may have been deceived, either by the bad quality of the medicine, or by other circumstances. Lastly, it may be stated, that Dr. Coindet himself, has abandoned the *internal* use of the remedy, and merely employs it in the form of inunction, from which he states that he has derived very beneficial results.

Section VI.

Torticollis, or Wry Neck.

From exposure to cold, from rheumatism, twists of the neck, or strains of the platysma-myoides, and sterno-mastoid muscles, from the cicatrices of burns, &c. the head is sometimes drawn to one side, or towards the shoulder or sternum, in such a way as to produce great deformity. Occasionally, the disease arises from paralysis; in other instances, it proceeds from some defect or malformation of the vertebræ of the neck. The clavicular is oftener affected than the sternal portion of the sterno-mastoid muscle; each, however, is liable to be converted into a substance resembling gristle. The whole of the muscle also is shortened, has an indurated, stringy feel, and is painful to the touch. Great pain is frequently experienced upon attempting forcibly to restore the head to its natural position.

Treatment of Wry Neck.

When the disease depends upon paralysis of the muscles, or upon malformation of the vertebræ, it may be looked upon, generally, as incurable; but when it arises from morbid contraction of the fibres of the platysma-myoides, or sterno-mastoid muscles, an operation will, in many instances, effect a cure. It should be done in the fol-

lowing manner. The patient is seated on a chair, and his head supported by an assistant standing behind him. An incision is then made two or three inches long, in the course of the muscular fibres, through the integuments, and the contracted portion having been fairly exposed, the handle of a knife, (or a small curved spatula,) is carried behind it, in order to protect the vessels beneath. By one or more cuts of a bistoury, the muscle is next separated, and when this is effectually done, the head may immediately,* in most cases, be restored to its natural situation. Very frequently it happens, that several strings of muscular fibres, in different places, require to be cut across. In such cases the surgeon must persevere until he has loosened the whole. After the operation, the head should be supported in its proper place by bandages or a stock of leather, and the edges of the wound, for some time, kept separated by lint. Sometimes, especially in females, it may be deemed expedient, in order to obviate deformity arising from the cicatrix, to pinch up the contracted portion of the muscle, along with the skin covering it, and divide it with a narrow and sharp pointed bistoury. Dupuytren has related a case in which he succeeded perfectly by adopting this plan. Professor Jorg of Leipsic, has attempted the cure of wry neck by machinery, and sometimes, it is said, with success.

* I performed an operation, two or three years ago, upon a young girl, sixteen years of age, whose head had been drawn for several months towards the right shoulder from a contraction of the clavicular portion of the sterno-mastoid muscle. As soon as the muscle was cut across, the head was instantly restored to its natural position, and has so remained ever since.

On Diseases and accidents of the Œsophagus and Trachea, consult —*Pelletan's Clinique Chirurgicale, tom.* 1—*Desault's Works, by Smith, vol.* 1—*C. Bell's Operative Surgery, vol.* 2—*C. Bell's Surgical Observations, vol.* 1—*Lawrence on some Affections of the Larynx, &c. in Medico-Chirurgical Transactions, vol.* 6—*Chevalier's Case of Croup, vol.* 6. *of Medico-Chirurgical Transactions—Monro's Morbid Anatomy of the Gullet and Stomach—Burns' Observations on the Surgical Anatomy of the Head and Neck—Hopkins' Case of a Shot in the Trachea, in Potter's Medical Lycæum.* In this case the shot was removed from the trachea of a young lady by her mother, who, without apprizing the patient of her intention, suddenly seized her while lying over the edge of a bed, and forced her head and shoulders towards the floor. The shot, being carried by this movement towards the glottis, was instantly discharged.

On Bronchocele consult—*A Memoir concerning the Disease of Goitre, &c. by Benjamin Smith Barton—Reeve on Cretinism in Edinburgh Medical and Surgical Journal, vol.* 5—*Foderè Traitè du Goitre et du Cretinisme—Dictionnaire des Sciences Medicales, vol.* 3—*Gooch's Chirurgical Works, vol.* 2—*Baillie's Series of Engravings to illustrate Morbid Anatomy —Alibert's Nosologie Naturelle—Gibson on Bronchocele, in vol.* 1 *of the Philadelphia Journal of the Medical and Physical Sciences—An essay on the effects of Iodine on the Human Constitution, with Practical Observations on its use in the cure of Bronchocele, Scrofula, and the Tuberculous Diseases of the Chest and Abdomen. By W. Guirdner, M. D.* 8*vo. London,* 1824—*Medical Researches on the effects of Iodine, in Bronchocele, Paralysis, Chorea, Scrofula, Fistula Lacrymalis, Deafness, Dysphagia, White Swelling, and Distortions of the Spine. By Alexander Manson, M. D.*

On Wry Neck, consult—*C. Bell's Operative Surgery, vol.* 2—*Gooch's Chirurgical Works, vol.* 2—*Sharp's Treatise on the Operations of Surgery—B. Bell's System of Surgery, vol.* 5—*Boyer's Traitè des Maladies Chirurgicales, tom.* 7—*Kirby's Cases with Observations on Wry Neck, &c.—Cooper's First Lines of the Practice of Surgery, vol.* 1. *p.* 558; *in which will be found an Engraving and Description of Jorg's apparatus.*

CHAPTER X.

DISEASES OF THE THORAX.

Gunshot and other wounds of the chest, emphysema, collections of purulent matter, and of blood, mammary abscess, carcinoma of the breast, fractures of the ribs and sternum, aneurism of the aorta, caries of the spine, having been already treated of in other places, it only remains to notice hydrothorax, and to describe the operation necessary for its removal, after the physician has exhausted his skill in the trial of medicines.

Section I.

Hydrothorax, or Dropsy of the Chest.

This disease is either idiopathic or symptomatic. The former is very rare, the latter frequent. Idiopathic hydrothorax generally occupies one side of the chest only, and is frequently unaccompanied by dropsy in other parts of the body. The pleura itself is seldom much diseased, and merely contains a serous fluid. The lung of the affected side is collapsed, and the patient complains of great difficulty of breathing.

Symptomatic hydrothorax is exceedingly common, and is characterized by the following symptoms. The patient finds it difficult, if not impossible, to lay in the horizontal position, or on the unaffected side. His respiration is hurried and laborious, pulse irregular, thirst incessant, urine diminished and high coloured. In addition to these symptoms, a troublesome cough and palpitation of the heart usually attend the disease. One of the most certain symptoms, however, is a sensation resembling the movement of water within the chest. This particular sensation may often be discovered by the surgeon himself, while the patient is in the erect position, by forcibly striking the chest, and still better by the use of the stethoscope. A collection of water in the pericardium may give rise to all the symptoms of common hydrothorax. Sometimes both sacs of the pleura are filled with fluid. In other instances, the cavities are

occupied by hydatids. The most common causes of symptomatic hydrothorax, are intemperance, gout, asthma, anasarca, pleurisy.

Paracentesis Thoracis.

This operation is seldom resorted to until the case is hopeless—a sufficient explanation of the unfavourable termination that generally awaits it. When performed early, however, and under favourable circumstances, it is calculated to afford great relief, even if it should fail to remove the disease. The situation most favourable for the evacuation of the fluid, is between the sixth and seventh ribs, counting from above downwards. Having placed the patient nearly in an upright position, with his back supported by pillows or by an assistant, and the head and shoulders directed backwards, the surgeon makes an incision three inches long, with a small scalpel or bistoury, through the integuments, cautiously penetrates the layers of the intercostal muscles (keeping close to the upper edge of the seventh rib to avoid the intercostal artery) and makes an opening through the pleura large enough to admit a full sized cannula or gum elastic catheter, which should be introduced as soon as the water begins to flow. Care must be taken, however, not to push the cannula too far, lest its extremity irritate the lungs, and excite coughing. This happened to me during the winter of 1824, in the Alms-House Infirmary, in a case of hydrothorax under care of Dr. Jackson, and brought on immediately a most severe cough that distressed the patient exceedingly. If a very large quan-

tity of fluid has collected, it will be improper to remove the whole of it at a single operation—lest the patient suddenly die from the pressure being taken off from the heart and lungs. When both sides of the chest are occupied by the fluid, an operation will be required on each side; but they should never be performed simultaneously, inasmuch as the lungs generally collapse as soon as the chest is opened, in which case the patient must necessarily die. After the fluid has been evacuated the lips of the wound should be closed by sticking plaster, and made to unite. Should the water accumulate again, as it often does, the operation may be repeated.

See *B. Bell's System of Surgery, vol. 5. p.* 188—*Laennec on the Diseases of the Chest—S. Cooper's First Lines of the Practice of Surgery, vol.* 1. *p.* 584—*Archer's Case of Paracentesis, in vol.* 1 *of Transactions of the King's and Queen's Colleges of Physicians in Ireland—Jackson's Case of Effusion into the Chest, in which Paracentesis was performed, in the Philadelphia Journal of the Medical and Physical Sciences, vol.* 1. *New Series, p.* 119.

CHAPTER XI.

DISEASES OF THE ABDOMEN.

With few exceptions, the surgical diseases of the abdomen are as numerous, diversified and important, as those of any other part of the body. Many of them too, are extremely intricate, and will require all the student's industry and skill to unravel them. In the ensuing sections, I propose to consider dropsy of the belly, poisons in the stomach, and the principal varieties of hernia. Abscess of the liver, aneurism of the abdominal aorta, lumbar abscess, and wounds of the abdomen, have been already treated of in their proper places.

Section I.

Ascites, or Dropsy of the Abdomen.

In the commencement, this disease is marked by difficulty of breathing, cough, dryness of the skin, constipation of the bowels, diminished secretion of urine, loss of appetite, prostration of strength. These symptoms are soon succeeded by general fulness of the abdomen, and by a sense of fluctuation easily perceived by laying one hand on the belly, and striking it with the other.

Ascites, for the most part, is the consequence of organic disease of the viscera of the abdomen, particularly schirrus of the liver, pancreas, or spleen. Sometimes it arises from an accumulation of water in the cavities of the pleura or pericardium, at other times it follows an enlargement of the mesenteric glands. In general the fluid is contained in the sac of the peritoneum, and sometimes accumulates in prodigious quantity.

Paracentesis Abdominis.

By the internal use of volatile tincture of guaiacum, squill, gamboge, calomel, digitalis, elaterium, and other similar medicines, I have frequently succeeded in removing, entirely, dropsy of the belly. The disease, however, often

terminates fatally for want of a timely operation. There are two situations in which this may be performed—midway between the spine of the ilium and umbilicus, or in the linea alba. The former has of late years been mostly abandoned, owing to the thickness of the muscular parietes, and to the epigastric artery, from irregular distribution, having sometimes been wounded. A trocar, either rounded or flat, is the instrument commonly used in this operation; or a common lancet may be employed, as advised by Dr. Physick. Preparatory to the operation, the abdomen should be surrounded by a piece of flannel, broad enough to cover its whole surface, and sufficiently long to go twice round, the ends of which are split in three or four places. The middle of the bandage is placed over the front of the abdomen, and the ends are crossed upon each other, and left hanging on each side. Having marked the spot in the linea alba best adapted to the operation—about two or three inches below the umbilicus—the surgeon makes a slit in the flannel, corresponding to the part, and through this penetrates with the trocar or lancet, the integuments, tendons, and peritoneum. The instrument being withdrawn, the water instantaneously follows the puncture, and in proportion as it flows, assistants placed on each side of the patient tighten the flannel by pulling at its ends. This serves the purpose of keeping up the general support of the abdomen, and prevents the patient from fainting. If a very large quantity of fluid has accumulated, it may, perhaps, be imprudent to draw it all off at once, lest the patient be too much exhausted. On the contrary, the better plan will be to close the orifice from time to time, until the whole is evacuated; after which, the opening may be permitted to heal. Should the surgeon prefer a common lancet for the

operation, he must be prepared with a flat cannula, corresponding to the size of the instrument, and introduce it into the opening immediately after the lancet is withdrawn. Sometimes the flow of water is suddenly interrupted by the intrusion of a particle of fat within the cannula. When this happens, the obstacle should be removed by a probe. The operation of paracentesis abdominis, is one which in general requires frequent repetition. Incredible quantities of fluid have been drawn from some patients at once, or at separate operations. Many patients sink under the disease in a few weeks or months; others live for as many years, and experience temporary relief from operations. A few recover perfectly.

It sometimes happens that pregnancy so closely resembles abdominal dropsy as to be mistaken for it, and cases are related in which the uterus has actually been tapped. The following remarks on this subject by Sir Astley Cooper are well calculated to put the young surgeon on his guard. Speaking of encysted dropsy, he says, "I will here mention two circumstances, in one of which my character was exposed to considerable risk; of the other, I was informed by a medical man who was invited to witness the operation. In the first case I was desired to see a lady who I was told laboured under dropsy. When I entered the room I saw a tall delicate female, with an immense abdominal swelling, giving a distinct sense of fluctuation. I requested the physician accoucheur whom I met to examine if the lady was not with child; he said he thought it was unnecessary, as the fluctuation was very distinct, but that he would do so and let me know the result in a few days. I heard no more of her for a week, and then I learned

that she had been put to bed on the morning following my visit. I would not have performed the operation of paracentesis for the universe. The circumstances which were told me of the other case were as follow: a surgeon in a country town called upon another surgeon, and said, 'I am going to tap a woman to-morrow; perhaps your young gentlemen would like to be present.' As it was an operation they had never witnessed, they most readily accepted the invitation; they were shown into a room in which the patient was already prepared to undergo the operation; she was sitting at one end with her abdomen bare. The surgeon then, taking his trocar and cannula, went to some distance, and walking up to the patient with the trocar presented, he charged, as it were with a bayonet, and plunged it into the abdomen; then withdrawing the trocar with an air of triumph, it was with no small chagrin he found not a drop of water escape; but, however, still undismayed, he withdrew the cannula, and again renewing his attack, he a second time introduced the trocar into the abdomen, but was equally as unfortunate as before, in finding that no water followed. Waiting a few moments, he withdrew the cannula, and turning round to the gentlemen, he said, 'you may do her up,' by which he meant they might apply the bandages; and he added, 'this, gentlemen, is an operation which you probably never saw before, and which most likely you may never see again. This is what we call the operation of dry tapping.'"*

* Sir A. Cooper's Lectures on Surgery, by Tyrrell, Vol. II. p. 378.

See *C. Bell's Operative Surgery, vol.* 1. *p.* 318—*Dorsey's Surgery, vol.* 2. *p.* 364.

Section II.

Poisons in the Stomach.

Accidentally, or by design, poisons are often taken into the stomach, and according to their particular quality and quantity, produce, in greater or less time, violent symptoms or death. Poisons from the mineral, vegetable, and animal kingdoms, are all capable of these effects. With few exceptions, however, mineral poisons are more active and deleterious than either vegetable or animal. The principal mineral poisons are arsenic, corrosive sublimate and some other preparations of mercury, acids, and alkalies, lead, tartrite of antimony, and lunar caustic. These when taken into the stomach, operate by exciting violent inflammation, or by producing excessive vomiting, palsy, or convulsions. Arsenic and corrosive sublimate give rise nearly to the same symptoms; these are swelling of the tongue, extreme thirst, a burning sensation throughout the gullet, violent spasmodic pain in the stomach and intestines, incessant vomiting and purging, and the evacuation of viscid mucus mixed with blood. If relief be not speedily afforded, cold sweats, faintings, twitchings of the limbs succeed and destroy the patient in a few hours. When examined after death, the stomach and œsophagus exhibit marks of violent inflammation, and are sometimes perforated with numerous holes.

Among the *vegetable* poisons most deleterious, may be

enumerated opium, cicuta, aconitum, hyoscyamus, digitalis, belladonna, hellebore, savin, laurus cerasus, and many varieties of fungus or mushroom. These when introduced into the stomach in large quantity, occasion palpitation of the heart, stertorous breathing, vertigo, dimness of sight, torpor, distention of the stomach, convulsions and death. In addition to these symptoms, opium and laudanum, in large doses, have the peculiar power of inducing profound sleep, which generally terminates in apoplexy, paralysis, or death.

The *animal* poisons capable of producing violent symptoms, or fatal consequences, by being taken into the stomach, are comparatively few in number. The principal are prussic acid, cantharides, and certain varieties of fish.* Prussic acid is a most subtile poison, and, sometimes, even in very small quantity, produces instantaneous death. Cantharides is more protracted in its operation, but is capable of inducing tremendous symptoms, and not unfrequently proves fatal. Some poisonous fish, when eaten, destroy life in a few hours.

Treatment of Poisons in the Stomach.

When the nature of the poison taken into the stomach can be ascertained, it may be possible sometimes, by anti-

* Poisonous fish are by no means uncommon in some parts of the West Indies. Those reputed the most deleterious are the yellow bill'd sprat, dolphin, the rock fish, barracuda, smooth bottle fish, the king fish, the gray snapper, the white land crab, and the conger eel.

dotes, to obviate its deleterious effects. A large quantity of albumen, or white of eggs, for example, is looked upon as the proper corrective for corrosive sublimate; lime water, charcoal, or carbonate of magnesia for arsenic; muriate of soda for lunar caustic; calcined magnesia for the mineral acids; acetic acid for the alkalies. It must be understood, however, that in general neither these nor any other articles of similar description are calculated to produce very beneficial effects, and that our reliance must be placed mainly upon speedy and copious vomiting, and upon the removal of the poison by means of the gum elastic tube and syringe. The last is a remedy of modern origin, and one of immense importance. By whom the idea was first suggested, is not positively known.* Renault, however, in his work on poisons,† expressly recommends an apparatus (somewhat similar to the one now in use) for removing arsenic from the stomach. Dr. Monro, afterwards, in his thesis,‡ gave drawings of instruments for the removal of laudanum from the stomach, and at the same time published a case in which the experiment had been tried—though without success. "Quo laudani effectus leniores essent ei in ventriculum, instrumento in tab. XIV. depicto, per magnam aquæ tepidæ quantitatem injeci, faucibus simul per oris speculum diductis."§ It remained, however, there is reason to believe, for Dr. Physick to prove the utility of the invention; for until the successful issue of the

* A tube and syringe for removing poisons from the stomach, is recommended, as my friend Dr. Coxe informs me, in one of the editions of Boerhaave's Institutes.

† Experiences sur les contre poisons de l'arsenic, 8vo.

‡ De Dysphagia, Edinb. 1797.

§ De Dysphagia, p. 95.

experiment performed by him in 1812, on a child of three months old, poisoned by laudanum,* little importance was attached by the profession either to Renault's or Dr. Monro's proposal. Since that period every apothecary's boy in Philadelphia has become fully acquainted with the operation, which, perhaps, has been performed hundreds of times with the most favourable result. Strange as it may appear, European, or at least British surgeons are just becoming acquainted with the practicability of the operation, for we find from the statements of a Mr. Read, and from remarks in the periodical work called the "Lancet" that the proposal has been considered by Sir Astley Cooper, Messrs. Scott, Jukes, and other surgeons, as perfectly novel, and this so late as the year 1822!!

When called to a patient suffering from poison, whether corrosive sublimate, arsenic, or any other article of the kind, the surgeon should resort immediately to a powerful emetic, and, if this does not answer, to the gum elastic tube, (an instrument about two feet in length, and three-eighths of an inch in diameter,) and by means of a common pewter syringe applied to its upper extremity, inject into the stomach a quantity of tepid water. The water mixed with the contents of the stomach should be immediately afterwards withdrawn, and a fresh supply thrown in, and by this alternate injection and evacuation, the stomach may in a little time be thoroughly scoured out, the poison removed, and the patient recovered—provided there has not been too great delay. The common syringe and tube I prefer to the more complicated and expensive instruments

* See Eclectic Repertory, vol. 3, p. 111.

of Jukes and Read—after repeated comparative trials with each.

Consult *Monro's Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p.* 79—*Thomas's Modern Practice of Physic, edit.* 7. *p.* 311—*Dictionnaire des Sciences Medicales, tom.* 43. *p.* 525—*Orfila on Poisons*—*Chisholm on the Poison of Fish, in vol.* 4, *of the Edinburgh Medical and Surgical Journal, p.* 393—*Brodie's Observations on the action of Poisons on the Animal System, in Transactions of the Royal Society of London,* 1812—*Bostock's Experiments, Showing that a Mineral Poison may produce Sudden and Violent Death, and yet be Incapable of Detection in the Contents of the Stomach, in Edinburgh Medical and Surgical Journal, vol.* 5, *p.* 14—*Account of a New Mode of Extracting Poisonous Substances from the Stomach, by P. S. Physick, in the Eclectic Repertory, vol.* 3, *p.* 111 *and* 381—*Read's Appeal to the Medical Profession, on the Utility of the Improved Patent Syringe, &c.*—*The Lancet, vol.* 1, *No.* 8.

Section III.

Hernia.

A protrusion of any of the abdominal viscera, covered by the peritoneum, through natural or preternatural apertures in the tendinous or muscular parietes, may be denominated hernia. The term has been extended, though improperly to several other diseases bearing no analogy to the one under present consideration.

Hernia is a very common disease; so much so, that one-eighth of mankind, it has been imagined, is troubled with it—a proportion, however, immensely overrated. Certain general appellations expressive of the particular condition or contents of a hernial tumour, are employed by most modern surgeons—reducible, irreducible, and strangulated hernia, enterocele, epiplocele, and entero-epiplocele. By *reducible* hernia is understood a tumour easily replaced by pressure, or by laying the patient in the horizontal position, but descending again as soon as the pressure is discontinued, or the upright posture resumed. The term *irreducible* hernia implies permanent protrusion from adhesion between the sac and its contents, or from extraordinary bulk. *Strangulated* hernia is that state of the disease in which the parts are confined by stricture, and are liable to mortify, unless the stricture be speedily removed. When the protrusion consists of intestine alone, the disease is denominated *enterocele;* when it contains omentum

merely, it is called *epiplocele;* and if intestine and omentum together, *entero-epiplocele.* Herniæ are, also, designated according to the situation they happen to occupy. Thus we have *bubonocele* or inguinal hernia, *oscheocele* or scrotal hernia, *merocele* or crural or femoral hernia, *exomphalos* or umbilical hernia, congenital hernia, ventral hernia, ventro-inguinal hernia, and several other varieties of comparatively rare occurrence.

Every hernia is furnished with a peritoneal investment, or *sac;* this is pushed before the protruded viscera, and passes through a natural or preternatural opening, to the margins of which it speedily forms an intimate adhesion. That portion of the sac communicating directly with the abdomen, is called its *mouth*, its lower extremity, or that most remote from the internal surface of the belly, its *fundus*, and the part immediately surrounded by the aperture in the tendinous parietes, its *neck.* The sac, although originally thin as the rest of the peritoneum, soon acquires an increased thickness, and in herniæ of long standing, is sometimes greatly condensed. On the other hand, it is frequently found attenuated to an extreme degree or entirely wanting—as the result of absorption. That it is susceptible of extreme extension, is proved by those enormous hernial tumours, so common in very warm climates, and sometimes met with in this country.

The *causes* of hernia are very numerous, and are either exciting or predisposing. Severe exercise on foot, or on horseback, lifting heavy weights, playing on wind instruments, vomiting, costiveness, strictures of the urethra, the hooping-cough, crying, parturition, tight clothes,

jumping, often produce the complaint either immediately or remotely. Among the predisposing causes of the disease, hereditary conformation and preternatural laxity of the abdominal apertures, may be considered the most common.

Reducible hernia is distinguished from other varieties of the disease by the following symptoms. The tumour, as already mentioned, descends in the erect, and retires within the abdomen during the recumbent position, or when pressure is made upon it. If the sac should contain intestine, a peculiar rumbling or guggling noise will be perceived both by the patient and surgeon, at the moment the gut slips into the abdomen. The tumour will also be tense and elastic to the feel. Omentum, on the contrary, communicates to the finger a doughy sensation, and is with greater difficulty restored to the abdomen. Besides these indications, a reducible hernia may be distinguished from other diseases by the circumstance of its being larger after a meal than when the stomach and intestines are empty, and by an impulse being communicated from the tumour to the surgeon's finger when the patient is directed to cough. If suffered to increase, the reducible hernia may in time become enormously large, and the patient will not only experience great disorder of the digestive organs, but his life will be endangered by strangulation of the gut.

Irreducible hernia may arise from three different causes —from adhesion between the sac and its contents—from the formation of membranous bands across the sac—and from an extraordinary enlargement of the omentum, or great increase in volume of the intestines. The two last

causes are more common than the first. Effusion of lymph upon the inner surface of the sac, and upon the outer surface of its contents, gives rise to the bands that intersect the intestine and omentum, and fasten them at different points to each other. When the omentum has resided for a long time in a hernial sac, it is apt to become enlarged and indurated, and in this state cannot pass through the neck of the sac and be restored to the abdomen. Sometimes a mass of hardened omentum serves as a truss, and prevents the descent of the intestines. Slow inflammation, from neglect, from blows upon the tumour, and other injuries, is the most frequent cause of hernia being changed from the reducible to the irreducible state.

The symptoms of *strangulated* or incarcerated hernia, are, in most instances, so strongly marked, as to admit of no deception; yet it happens, now and then, that the disease is confounded with ileus and other intestinal affections. If, from irregularities of diet, violent corporeal exertions, injuries, and other causes, the contents of a reducible or irreducible hernia should become constricted, the fæcal evacuations will be suppressed, the patient will complain of general soreness of the abdomen, of pain around the navel, resembling the sensation produced by a tight cord, of sickness of the stomach, and of severe pain in the tumour itself. To these symptoms are speedily added, vomiting of bilious or stercoraceous matter, hiccup, a quick, hard pulse, an increase of tension in the abdomen, cold sweats, great anxiety of countenance. If by this time the patient does not experience relief, a remarkable change in the symptoms will soon take place. The pulse becomes small and thready, the patient feels suddenly easy, the tu-

mour when pressed upon crackles beneath the fingers, and assumes a leaden colour. To these succeed enormous distention of the abdomen, a fluttering, intermittent pulse, and death. When examined by dissection, the intestine will be found of a dark brown or chocolate colour, interspersed with black or mortified spots, and coated in particular places with a brownish or bloody lymph. The omentum is seldom altered in appearance. The sac contains, in proportion to its size, and the duration of the strangulation, more or less of a bloody fluid. At the strictured part, the intestine is generally ulcerated or detached. Throughout, the peritoneum exhibits marks of high inflammation, and in numerous places the intestines are glued together, and their surface streaked with red vessels.

It might, perhaps, be supposed that a stricture upon the omentum *merely*, would not give rise to constipation and the other symptoms of strangulation above enumerated. Experience, however, proves the contrary. With regard to the length of time, strangulation may continue, much will depend upon the age and size of the tumour, and upon its contents. Recent and small herniæ, generally speaking, are more dangerous, and terminate sooner, when strangulated, than the old and large. An intestinal hernia, also, runs its course quicker, and is more violent in its symptoms than an omental hernia. Some strangulated herniæ prove fatal in six or eight hours; others continue for as many days. The disease, when left to itself, is not invariably mortal. On the contrary, the parts exterior to the stricture, in some instances, mortify, and are thrown off in the form of slough, an artificial anus is established, and the patient recovers. The seat of the stricture in strangulated hernia

must depend upon the particular situation the hernia happens to occupy.

General Treatment of Hernia.

Reducible, irreducible, and strangulated herniæ all require distinct and particular modes of treatment.

For reducible hernia, an appropriate *truss* is the only remedy, and the sooner this is applied the better. Formerly an opinion prevailed that such instruments were not adapted to infants; the error has been amply rectified by modern experience, and much mischief thereby prevented. Trusses are either elastic, or non-elastic; the latter are now seldom employed, and never can be to advantage. A well constructed steel truss often effects a perfect cure, especially in children and young subjects, by exciting a degree of inflammation sufficient to agglutinate the sides of the sac, or the edges of the opening through which the hernia has passed. To accomplish this purpose, great attention must be paid by the surgeon in adapting the instrument to the parts, and by the patient in wearing it without intermission. The best mode of fitting a patient with a truss, is to try a number of instruments, and select the one that adapts itself best to the hollows and projections about the abdomen and pelvis, and can be worn with the least inconvenience. When no opportunity of selection offers, a measure may be taken by means of annealed wire, doubled and passed around the body, taking care to leave the wire an inch or two longer than the size of the

patient—to allow for the stuffing of the instrument. A well contrived truss will fit accurately in every part, and set closely to the body, neither bulging in particular places, nor binding too closely. Every patient should be provided with a spare truss—in case of accident. To prevent the pad of the truss from imbibing perspiration and becoming hard, a bit of calico, muslin, or rabbit skin should be placed between it and the tumour. With a view, also, of obviating rust, to which the spring is very liable, the instrument may be thickly covered with durable leather, or some similar material, and with oil-cloth when the patient has occasion to bathe. A truss, to derive full benefit from it, must be worn night and day, and for months and years together. Particular varieties of truss will be noticed when the different species of hernia are described.

Irreducible hernia, particularly that variety of it, dependant upon adhesion between the sac and its contents, very seldom admits of relief. Cases are recorded, however, by Arnaud, Ledran, and Hey, of the diminution and final restoration to the abdomen, of immense hernial tumours, by low diet, blood-letting, purging, and confinement, for many months together, to the horizontal position. In most cases, a suspension of the tumour by a bag truss, and strict attention to diet, are all that can be done.

For *strangulated* hernia, various remedies have been employed—such as blood-letting, purging, the cold and warm baths, opium, fomentations and poultices, the application of cold, the taxis, tobacco injections, and an operation. The three last only are to be relied upon. By *taxis*

is understood an effort to restore the protruded intestine or omentum, by manual pressure, to the cavity of the abdomen. This should be attempted always before any other plan, and is frequently successful. To increase the chance of success, the surgeon must endeavour to relax the abdominal muscles as much as possible—by elevating the shoulders and pelvis with pillows, bending the patient's legs on his thighs, and his thighs on the pelvis, and at the same time drawing them towards each other. Upon the tumour, steady, but not violent pressure, should then be exerted and kept up unremittingly with the fingers or hands for half an hour. If this fail, the taxis must be discontinued, lest it increase the inflammation in the protruded parts. The surgeon may next have recourse to the tobacco enema, which, (as it is a very powerful and dangerous medicine if incautiously administered,) should be carefully prepared by infusing two drachms of tobacco in a pint of boiling water for a quarter of an hour. When cool, the liquor may be strained, and one-half of it thrown up the rectum by a syringe, and the remainder half an hour afterwards, should the first prove inefficient. The effect of tobacco, thus administered, is to prostrate the system, excite the action of the intestines, and relax the abdominal muscles. As soon as these ends are accomplished, a slight effort, in the way of taxis, will often succeed in overcoming the stricture, and in restoring the parts to the abdomen. If the tobacco fail, the knife is our only resource; but in the use of this, the surgeon must be governed by the particular seat of the hernia—as will be explained in the ensuing sections.

Section IV.

Inguinal Hernia.

After the general account given of hernia and its treatment, it will be proper to consider the varieties of the disease, the principal of which are inguinal, crural, umbilical and congenital hernia. To each of these, it will be necessary to prefix a short account of the anatomy of the parts.

When the integuments of the abdomen are turned back, a thin but compact sheet of cellular substance, described by modern anatomists under the name of *superficial* fascia, will be found to cover the whole surface of the abdominal muscles. Not only does it cover these muscles, and their tendons, but extends upwards to the chest, and downwards to the thighs, and in fact may with propriety, perhaps, be said to form a sort of general investment to the body. Its attachment to Poupart's ligament, and to the surface of the spermatic cord, is particularly close. On the surface of the fascia, and running over Poupart's ligament towards the umbilicus, an artery and vein may be observed. These are branches of the external pudic, and from being concerned in the operations for strangulated inguinal and crural hernia, should be noticed in the dissection of the parts. Besides these vessels, numerous inguinal glands will be seen lying beneath the fascia, and intermingled with its fibres.

Under the superficial fascia, lies the tendon of the *exter-*

nal oblique muscle. The lower margin of this constitutes Poupart's ligament, which extends from the anterior superior spinous process of the ilium, to the pubes; and as it approaches this part, splits into two columns, the upper of which is inserted into the symphisis, the lower into the tuberosity of that bone—leaving between them a triangular space, called the *external* abdominal ring, out of which emerges the spermatic cord.

When the tendon of the external oblique is cut away, or turned down upon the thigh, the *internal oblique* muscle is brought into view. The lower margin of this arises from the outer half and inner surface of Poupart's ligament, and passing above the spermatic cord, in a vaulted form, is fixed by a tendon into the symphisis pubis. From the edge of the internal oblique, the *cremaster* muscle arises, is inserted into the spermatic cord, and descends with it into the scrotum.

The lower edge of the *transversalis* muscle, like that of the internal oblique, arises from the outer portion of Poupart's ligament, crosses over the spermatic cord, and uniting its tendon with that of the internal oblique, is inserted into the pubis.

These three muscles—the external oblique, the internal oblique, and the transversalis—serve to cover in the abdomen, and support the viscera. From the manner, however, in which the two last are formed, (being deficient as it were in part, or not wholly inserted into Poupart's ligament,) this support would be very inadequate, were it not

for the co-operation of an additional structure—the *fascia transversalis.*

This fascia consists of condensed cellular membrane, lines the internal surface of the transversalis muscle, and is interposed between it and the peritoneum. Its extent is very considerable, for it not only covers the whole of the lower part of the abdomen, and passes out along with the femoral vessels upon the thigh, but ascends to the diaphragm. In this fascia, an opening is left for the passage of the spermatic cord—called the *internal* abdominal ring.

The *spermatic cord*, consisting of arteries, veins, lymphatics, nerves, the vas deferens, and a membranous sheath, enters the internal abdominal ring—which is situated about half an inch above Poupart's ligament, and midway between the spine of the ilium and symphisis pubis—and taking a course inwards and downwards, passes along the edges of the internal oblique and transversalis, and finally emerging at the external ring, descends nearly in a perpendicular direction into the scrotum. Along the under and inner side of the spermatic cord, and between it and the pubis, passes the *epigastric* artery, a vessel materially concerned in the operation for strangulated inguinal hernia.

From the above account of the structure of the parts immediately concerned in inguinal hernia, it will appear—that there are two abdominal rings, the *external*, formed by a splitting of the fibres of the external oblique tendon, the *internal*, by an opening in the fascia of the transver-

salis muscle. To make this structure more intelligible to the student, it will be proper to observe that these rings are distant from each other, in most full grown subjects about an inch and an half, that between them there is a *canal* for the passage of the cord, that the cord enters the internal ring, passes obliquely downwards under the internal oblique and transversalis muscles, (not through them as was formerly supposed,) until it reaches the external ring, after which its course is perpendicular. To understand the reason of the cord not perforating the internal oblique and transversalis, it will only be necessary to remember that these muscles are not attached to the whole of Poupart's ligament, but only to the outer half of it, and consequently that they may be said to be wanting from this part as far as the symphisis pubis.

In most instances, the hernial sac and its contents enter the internal abdominal ring anterior to the spermatic cord, and having reached the origin of the cremaster muscle, pass between it and the cord. Sometimes, however, the cord is placed on the side of the sac, at other times on its front. The epigastric artery runs along the under and inner side of the sac, and between its mouth and the symphisis pubis. In immediate contact with the sac, and on its anterior surface, is spread out, from pressure, the cremaster muscle, which forms one of the coverings of the sac. Above the cremaster is the superficial fascia, and next to this the integuments. If a dissection, therefore, is made of the coverings and contents of the inguinal hernia commencing at the skin, the parts will be presented in the following succession—the integuments, superficial fascia,

the cremaster muscle, the hernial sac, omentum or intestine, and perhaps both.

The *symptoms* of reducible, irreducible, and strangulated inguinal hernia do not differ from those of hernia in general, and these have been already pointed out in the preceding section. But it is important to distinguish between this disease, and others bearing to it some similitude. Inguinal hernia may be confounded with hydrocele, cirsocele, enlarged testis, and some other affections. From hydrocele, it may be distinguished by the circumstance of the tumour commencing above the abdominal ring, and descending towards the scrotum, whereas hydrocele always begins in the lower part of the scrotum, and gradually ascends. Cirsocele sometimes bears a striking resemblance to inguinal hernia, but it may be distinguished from it by placing the patient in the recumbent position, pressing firmly upon the upper part of the ring, and then directing him to rise, when if it be cirsocele, the tumour will reappear, and of an increased size; if hernia, it will be retained within the ring until the finger be removed.

An inguinal hernia is sometimes contained within the canal leading from the internal to the external ring. It is then called *concealed* inguinal hernia. As in cases of this description, there is commonly no external tumour, the surgeon should be on his guard, and suspect the existence of this disease, if the symptoms of strangulation be present. The hernial sac in such cases is generally covered, in addition to the usual investments, by the tendon of the external oblique, and edges of the internal oblique and trans-

versalis. Scrotal hernia in shape is commonly pyriform, and in size is very various, descending in some instances to the patient's knees, at other times not much larger than a natural scrotum. Occasionally, the disease is met with on both sides. Males are more subject to the disease than females, and when it occurs in the latter, the tumour bears the same relation to the round ligament that it does to the spermatic cord in the male.

Treatment of Inguinal Hernia.

For reducible inguinal, or scrotal hernia, an appropriate elastic truss should be selected. Above most other instruments of this description, I prefer that of Wright of Liverpool, formed upon the principle of Whitford's truss, described in the work of Mr. Lawrence on hernia. The peculiarity of these instruments consists in their not forming a perfect oval, but in being straight or nearly so behind, where they cross the small of the back, and rising from the posterior part of the pelvis, and descending in front towards the groin. Of the truss of Hull, of New York, I have also a favourable opinion. This, instead of passing entirely around the pelvis, is formed of a semicircle of steel, with a pad at each extremity—one of which is adapted to the groin, the other to the back. In fitting a patient with a truss for inguinal hernia, the surgeon should take care to adapt the instrument to the lower part of the internal ring; for if it be placed, as is too often done upon the external ring, it not only presses upon the cord, gives unnecessary pain, and injures the function of the testicle,

but does not answer the purpose of supporting the hernia. Every patient should habituate himself to return his own hernia and to apply the truss; and the most convenient time for effecting this, is in the morning before he rises, as the intestines and omentum, during the night, generally retire within the abdomen.

The *irreducible* scrotal rupture subjects the patient, when it attains a large size, to great inconvenience, by impeding copulation and by arresting the flow of urine, which, from the penis being buried among the integuments, excoriates the parts, and gives rise to small abscesses. To prevent the growth or increase of the swelling, *a bag truss* is the only remedy.

Strangulated inguinal or scrotal hernia, should the taxis and tobacco injection fail, will require an operation, and the sooner this is performed, after it has been determined upon, the better; for there is reason to believe that many lives have been lost by delay, and few, if any, from the operation itself. The patient being placed upon a table of ordinary height, with his thighs somewhat separated, and each foot resting upon a chair, the surgeon sits before him, and grasping the tumour with one hand, makes an incision with the other, commencing at the upper part of the tumour, and extending downwards nearly to its base. Having divided the integuments, a branch of the external pudic artery generally springs, and may require the ligature. Immediately beneath the integuments, lies the superficial fascia; this should be divided by successive touches of the knife, until the cremaster muscle appears, the fibres of which may be elevated carefully by the dissecting for-

ceps, or by running the directory beneath them, until the whole are cut through, and the sac exposed. To open this without risk of injuring the intestine, a portion of it may be pinched up and rubbed between the fingers previously to its division. As soon as the sac is opened, a quantity of fluid gushes out, and part of the intestine or omentum appears at the opening. Fluid, however, is not invariably met with, and it is highly important that the operator should be aware of this, otherwise he might, in expectation of finding it continue to penetrate with the knife, until he wounds the intestine. The opening in the sac should be enlarged upwards and downwards to the extent of two or three inches, and if its contents are found in a proper condition to be returned into the abdomen, the next step of the operation is to carry the forefinger of the left hand upwards between the sac and protruded parts, and search for the stricture, which will be found either at the edges of the external ring, the internal ring, or the mouth of the sac. In very old and large herniæ, the external ring is the most common seat of the constriction, but, in ordinary cases, the internal ring. By gentle pressure with the fingers upon the intestine or omentum, these parts may sometimes be restored without dividing the stricture; if the attempt fail, however, the operator then introduces a common curved probe-pointed bistoury, (the edge of which, with exception of half an inch of its extremity, is covered by a piece of ribbon or muslin,) with its flat surface between the sac and its contents, and with the forefinger as the guide, carries its point beneath the stricture, turns up the edge of the instrument, and divides it. A very slight incision, even the eighth or sixteenth part of an inch in extent, will be often sufficient to liberate the parts. The moment this is accom-

plished, repeated and gentle efforts should be made to return them to the abdomen, after which the edges of the wound must be brought together and retained by adhesive straps. In the course of three or four hours after the operation, should the patient not have a stool within that time, a dose of castor oil must be administered. During the cure, the patient should be confined to bed, and not suffered to rise until the parts are so completely cicatrized, as to bear the pressure of a truss—an instrument still more necessary after an operation for strangulated hernia, than before.

In dividing the stricture, in all cases of strangulated inguinal hernia, whether seated at the external or internal ring, or at the mouth of the sac, there is one rule extremely important to observe—to carry the knife directly upwards, (a practice first suggested by Rougemont, and afterwards adopted by Sir Astley Cooper,) by which we avoid wounding the epigastric artery. If, in the ordinary situation, for example, of this variety of hernia, the stricture be divided upwards and inwards, or towards the linea alba, and the incision prolonged to any extent, the epigastric will, almost to a certainty, be cut across. On the other hand, if the knife be carried upwards and outwards towards the ilium, and the hernial sac should descend, as it sometimes does, on the inner side of the epigastric, this vessel may possibly be divided. It is proper to observe, however, notwithstanding these precautions, that there are few examples of fatal hemorrhage from wounds of the epigastric, although the vessel has been cut in numerous instances by awkward and careless operators.

With regard to the condition of the intestine or omen-

tum, it may be observed—that if mortified spots appear on the former, they should be included in a fine ligature before returning them to the belly, and that if the omentum be in an indurated state, and form too large a protuberance to admit of repassing the ring, it should be retrenched, taking care to tie up any particular vessels that may spring, instead of including the whole mass in a ligature as was formerly practised.

Sir Astley Cooper, and some other surgeons have recommended, in large herniæ especially, to divide the stricture on the outside of the sac—leaving the sac unopened. To this plan, however, there are many objections.

The operation for small, or *concealed* inguinal hernia, does not differ materially from that of the common variety of the disease.

If the operation for strangulated inguinal hernia has been so long delayed as to permit the parts to fall into gangrene, and they are found in this condition by the surgeon after having opened the sac, he should not think of pushing them, in this state, into the abdomen, even if he could effect it, because they would then act as extraneous bodies, and excite irritation. By the time, however, the process of sloughing is completed in the parts exterior to the stricture, it generally happens that the parts within the abdomen or its immediate vicinity are united by adhesion to the internal surface of the ring, and therefore that the protrusion could not be returned without previously breaking up those adhesions, upon which, indeed, the safety of the patient must now in a great measure depend.

Some surgeons have attempted to cure inguinal and other varieties of hernia *radically*—by relieving the stricture, returning the protruded parts, and afterwards dissecting up the hernial sac, and either restoring it to the abdomen, or removing it entirely, and tying its mouth with a ligature. The practice I conceive, is seldom justifiable. Many years ago I performed the operation, but the case terminated fatally. Experience proves, moreover, that a new sac, even if the patient recover, is almost sure to form.

Section V.

Femoral Hernia.

The contents of a femoral or crural hernia, instead of passing through the abdominal rings, are protruded beneath Poupart's ligament through an opening termed the *crural* ring. This ring is bounded on the outer, or iliac side, by the femoral vein, on the inner, or pubic side, by Gimbernat's ligament, anteriorly by Poupart's ligament, and posteriorly by the pubes. Poupart's ligament arises from the spine of the ilium, and is implanted by a broad insertion into the symphisis pubis, into the tuberosity of the pubes, and into the ligament of the pubes over the linea ileo-pectinea. By this last insertion a sharp crescentic edge is formed, the concavity of which looks towards the crural vein, and is supposed by most writers, to contribute mainly to the constriction in cases of strangulated crural hernia. From having been particularly described by Gimbernat, a Spanish surgeon, it is frequently called *Gimbernat's* ligament. There are two margins to Poupart's ligament, an anterior and posterior, the former of which is straight, the latter concave, in the vicinity of the pubes.

The *fascia lata* of the thigh, as it approaches Poupart's ligament, divides into two portions—the *iliac* and *pectineal*. The former is connected to Poupart's ligament throughout the greater part of its extent, the latter is attached to the pubes, covers the muscles that spring from that bone, and

unites with the iliac portion below, at the spot where the vena saphena major enters the femoral vein. In thickness and strength the iliac portion of the fascia lata greatly exceeds the pectineal portion. It lies, moreover, considerably above the plane of the latter, and covers the femoral vessels, the anterior crural nerve, and the iliacus internus and psoas muscles. Towards the pubes its edge is concave, and on this account was denominated by Burns, of Glasgow, the *falciform process.* Its superior horn received from Mr. Hey the appellation of *femoral* ligament, and is at the present day commonly known under the name of *Hey's* ligament. "It has already been stated," says Colles, "that the iliac portion of the fascia lata passes before the femoral vessels. We observe in this part of its course, that it loses somewhat of its strength and firmness of texture; however, in general, it retains a good deal of its ligamentous nature even when it has reached the pubic side of these vessels; except in the immediate neighbourhood of the vena saphena, where it differs but little from the cellular substance. Having passed before the femoral vessels, we find it now to descend on their pubic side; and here we see it attach itself very intimately to the pectineal fascia. This attachment is made in a straight line along the pubic side of the vein, from the place of the insertion of the saphena to within a quarter of an inch of Poupart's ligament. At this place we observe, that the line of attachment is curved; and having here formed a sweep towards the pubes, that the attachment now takes place in a line across the top of the thigh."*

* Surgical Anatomy, p. 68.

Beneath the fascia lata and in immediate contact with the femoral vessels lies the *fascia transversalis.* This fascia, as formerly mentioned, under the head of inguinal hernia, not only lines the internal surface of the abdomen, but passes out upon the thigh under the posterior edge of Poupart's ligament. Descending in front of the crural artery and vein, it becomes united to their sheath and forms for them an additional investment. On the inner side of the crural vessels numerous absorbents may be observed passing through the transversalis fascia on their way to the abdomen.

The *fascia iliaca* is but a continuation of the fascia transversalis, and differs from it only in situation. It lines the surface of the iliacus internus and psoas muscles, adheres to the posterior margin of Poupart's ligament, descends with the crural vessels to the thigh, and affords them posteriorly a strong investment. The union of the fascia transversalis and iliaca has been compared,* not unaptly, to a compressed funnel, the expanded part of which may be said to occupy the lower part of the abdomen and hollow of the ilium, while the pipe is represented by the prolongation which covers the femoral vessels and forms their anterior and posterior sheaths.

Although the space between the os innominatum and Poupart's ligament is filled up by the iliacus internus and psoas muscles, these would not prove a sufficient barrier to the descent of a femoral hernia in various situations between the spine of the ilium and symphisis pubis. Such

* Colles, p. 63.

descent, however, is effectually guarded against, except at the crural ring itself, by the union of the fascia transversalis and iliaca. These fasciæ, indeed, are so closely connected with each other, with the posterior edge of Poupart's ligament, and with the surface of the psoas and iliacus internus muscle, and send off so many partitions between the crural artery and vein, and the adjoining parts, as to preclude effectually the escape of any of the viscera between them.

In dissecting the parts concerned in crural hernia, it is important to notice particularly the situation of the spermatic cord and epigastric artery. The former lies about half an inch from the mouth of the sac, above Poupart's ligament; the latter runs upon the outside of the hernial sac, and takes a course upwards and inwards on its way to the rectus muscle. Sometimes the *obturator* artery is sent off by the epigastric, and running along the inner margin of the sac is liable to be wounded, in performing the operation for strangulated femoral hernia, if the incision be prolonged too far inwards or towards the pubes.

A portion of omentum, or intestine, surrounded by the peritoneum, having entered the sheath of the femoral vessels, formed by the union of the iliac and transversalis fasciæ, passes along the inner edge of the crural vein, and carries before it the loose cellular membrane that naturally occupies the orifice of the crural ring. This membrane, (which has received from Sir Astley Cooper the name of *fascia propria,)* being pushed forward by the hernial sac, is carried along with it through one or more of the holes on the inner side of the crural sheath, and uniting with

that sheath the two fasciæ are "consolidated into one." Above the fascia propria will be found the superficial fascia and the integuments. If a dissection, therefore, be made of a femoral hernia commencing at the surface of the bend of the thigh, the parts will be presented in the following order:—the integuments, superficial fascia, fascia propria, hernial sac. This last will be found resting in the hollow between the iliac and pectineal portions of the fascia lata, and consequently on the *outer* surface of that aponeurotic expansion. There is a variety, however, of femoral hernia, (in which the sac and its contents, not passing through the absorbent holes, is continued along the sheath of the femoral vessels,) *covered* by the fascia lata.

Women are more subject to femoral hernia than men, owing partly to the great breadth of the female pelvis compared with that of the male. In shape femoral hernia differs entirely from inguinal—its longest diameter being placed transversely with respect to the thigh. In general, moreover, the tumour is much smaller than that of the inguinal. On this account it is particularly liable to be confounded with other diseases, especially with enlargement of one or more glands of the groin, with varicose enlargement of the crural vein, psoas abscess, &c. Not unfrequently it is mistaken for inguinal hernia—owing to the tumour rising from the oval space in the fascia lata, upon Poupart's ligament. The edge of this ligament, may, however, in femoral hernia, always be traced above the tumour, while in bubonocele it is below it. A very common symptom of reducible femoral hernia, is pain in the groin, from extending the thigh, which is sometimes so severe as to produce nausea and vomiting.

Treatment of Femoral Hernia.

The truss for *reducible* inguinal hernia, will answer also for femoral, provided the pad of the instrument be bent downwards about an inch, in order that it may rest on the top of the thigh instead of the groin. *Irreducible* femoral hernia, when its contents consist chiefly of omentum, sometimes attains such a bulk as to prove very inconvenient to the patient. Under these circumstances, it has been advised by Sir Astley Cooper to apply a hollow truss to the tumour, (taking care previously to reduce the intestine,) with a view of promoting, by pressure, the absorption of the protruded parts.

Strangulated femoral hernia must be treated upon the principles formerly laid down. Instead, however, (in performing the operation of taxis,) of pressing the tumour directly upwards, as in strangulated inguinal hernia, the surgeon should first endeavour to disengage it from the edge of Poupart's ligament, by pressing it downwards and inwards; after which a slight pressure upwards will often succeed in restoring the omentum or intestine to the abdomen. If the taxis should fail, and an operation become necessary, there should be the least possible delay; for the disease runs its course with much greater rapidity than most other varieties of strangulated hernia.

The patient being placed horizontally on a table, the shoulders elevated by a pillow, the thighs somewhat relaxed and brought near to each other, and the diseased parts shaved, an incision is made, commencing about an inch above Pou-

part's ligament and extending downwards to the middle of the tumour, through the integuments. At right angles with this another cut is made—the two representing in form the letter T reversed. The superficial fascia being exposed and carefully divided, the fascia propria is brought into view. This being likewise divided, more or less adipose substance will be generally found between it and the sac. To open the sac, which should next be done, without risk of injuring the intestine, (for in this variety of hernia there is seldom much fluid in the sac,) a portion of it should be carefully pinched up and rubbed between the finger, and divided by carrying the knife horizontally through it. As soon as the intestine, or omentum, is discovered, a finger may be introduced into the opening, and upon this a curved bistoury, with which the sac may be enlarged to the extent of several inches. The next object of the operator will be to ascertain the seat of the stricture. This will be found either at Hey's ligament, in the crural sheath, at Gimbernat's ligament, or in the mouth of the sac. When the hernial tumour is large, more or less constriction will always be made upon it by the falciform process of the fascia lata, and particularly by that portion of it called Hey's ligament. In ordinary cases, however, I am inclined to believe that the sharp posterior border of Poupart's ligament, or the ligament of Gimbernat, as it is called, contributes more than any other part to keep up the symptoms of strangulation. But be this as it may, the surgeon must proceed in his operation until he has removed every obstacle. With this view, passing the forefinger of his left hand gently between the sac and its contents, he carries it upwards until he meets resistance. The bistoury should then be passed, with its flat edge towards the finger, until it is fairly within

the strictured part, when its edge may be turned up and pressed lightly against the obstruction. If the parts are not sufficiently liberated to be returned by moderate pressure, the finger should be carried higher, and other obstructions sought for. These, if found, must likewise be divided, taking care in making each incision to carry the bistoury *upwards* and slightly *inwards*. The operator, if regardless of this rule, might by prolonging his incision outwards, or upwards and outwards, injure the crural vein and epigastric artery. On the contrary, by directing the knife too far inwards or towards the pubes, the obturator artery, in case it should happen to spring from the epigastric and take an inward course, would be endangered. By the inward incision, moreover, there is great risk of wounding the intestines. Having relieved the stricture and restored the contents of the sac to the abdomen, the after treatment will not differ from that pointed out in some of the preceding sections.

Section VI.

Umbilical Hernia.

The umbilical vein, and its two arteries, in the fœtus, perforate the tendons of the abdominal muscles about the centre of the linea alba, and leave an opening called the *umbilical* ring. Soon after birth these parts are consolidated, and a firm cicatrix is formed, externally, by the contraction of the integuments, internally by the peritoneum, and between the two, by the remains of the umbilical vessels. The ring being thus closed and fortified, protrusions of the abdominal viscera, in most subjects, are guarded against. Sometimes, however, it happens, that the ring is imperfectly closed, or its edges so weak, as readily to yield to any force the viscera may exert against it. Under these circumstances, an umbilical hernia will be produced. It is still a disputed point whether the protrusion takes place at the centre of the umbilical ring, or at its edges. Sir Astley Cooper inclines to the former opinion. There is reason to believe, however, that both occurrences are not unfrequent. Many of the older writers believed the umbilical hernia to be destitute of a sac or peritoneal covering; erroneously supposing that the umbilical vessels were naturally situated behind that membrane, and consequently that the abdominal contents were protruded through the imaginary opening in the peritoneum for the transmission of these vessels. The fact, however, that the arteries and vein, while on their way to the

umbilical cord, lie between the abdominal tendons and peritoneum, has long been known. The inference, therefore, is not less plain than true,—that the umbilical, like most other varieties of hernia, is covered by a peritoneal sac.

There is some variety in umbilical hernia, according as it occurs in the infant at birth, in the young subject, or the adult.

The *congenital* umbilical hernia, as it is called, is often complicated with spina bifida, and with extraordinary enlargement of the liver and other abdominal viscera. The contents of the abdomen are protruded through the umbilical ring into a transparent bag, formed out of the cellular membrane that connects the vessels of the cord. So transparent, indeed, is this investment, that throughout the greater part of the tumour, the hernial sac may be distinctly seen.

The umbilical hernia of *young subjects* is, unlike the congenital variety, covered by the common integuments of the abdomen, and generally makes its appearance about the third or fourth month after birth. It seldom attains, unless very much neglected, a large size; indeed, in many instances, the tumour scarcely exceeds a common marble in bulk, and when pressed upon, readily retires into the abdomen—returning again, however, as soon as the pressure is discontinued. Its figure is commonly round. A fold of intestine generally occupies the hernial sac, and omentum is scarcely ever met with. The disease is often accompanied by disorder of the bowels and digestive organs.

Amongst *adults*, the most common causes of umbilical hernia are, pregnancy, laborious parturition, and inordinate fatness. Hence, women, and especially those who have borne many children, are the most subject to the disease. The tumour may, perhaps remain stationary, or nearly so, for years; in the end, however, it is almost sure to attain considerable bulk, and sometimes exceeds in magnitude the patient's head. Nausea, eructations, constipation of the bowels, are very common attendants upon this variety of hernia. In general, the omentum constitutes a very large proportion of the contents of an old umbilical hernia, and the colon is oftener found in the sac than any other intestine.

Treatment of Umbilical Hernia.

Congenital umbilical hernia, provided there be no extraordinary deficiency of the tendinous parietes, or other morbid complication, may be cured frequently by a well contrived bandage, or by surrounding the sac and integuments, (having previously reduced the intestine,) with a ligature—drawn with sufficient firmness to occasion the parts included in its embrace to slough, and the edges of the umbilical ring to cicatrize. The last is the most certain and expeditious mode of effecting a cure. Instead of the simple ligature, Dr. Hamilton of Edinburgh approximates the edges of the ring by silver pins and adhesive straps. His example, however, should not, I conceive, be imitated.

The ligature was frequently employed by the ancients,

in the cure of umbilical hernia of *young subjects*, and in modern times has been extensively used and highly extolled by Desault. In several instances I have performed the operation with complete success, and with little pain or inconvenience to the patient. There is no risk in the operation, provided the surgeon succeeds perfectly in restoring the protruded parts to the abdomen, before he ventures to apply the ligature; which should be of considerable thickness and strength, and drawn so firmly as to insure the speedy destruction of the parts surrounded by it. After the slough is detached, the sore that remains may be dressed with dry lint or some mild ointment until perfectly healed. For two or three months afterwards it will be proper to support the new formed cicatrix by a compress or truss, to guard against its laceration and the consequent reproduction of the disease

To the reducible umbilical hernia of *adults* the ligature is not adapted. In such cases the surgeon must depend upon a *truss*, which so long as it keeps the intestine or omentum within the abdomen, will at least prevent the increase of the tumour, and may eventually, perhaps, by exciting a slow inflammation, effect a cure. Sir Astley Cooper, in small herniæ, prefers the common inguinal truss, which, if it form a perfect oval, will without difficulty adapt itself to the body and furnish the requisite support to the tumour. For large umbilical herniæ, however, the trusses invented by Morrison, or Eagland, of Leeds, and described in most modern systems of surgery, will be found to answer a better purpose than any others. When the hernia is irreducible, and of very large dimensions, a

hollow truss, or a wide belt, carried under the tumour and over the patient's shoulders, may be resorted to advantageously.

Strangulated umbilical hernia very frequently proves fatal, as much from disorder of the intestinal functions, as from the strangulation. When the usual remedies fail, an operation should be resorted to. This may be done in the following way. An incision, several inches long, is made, very cautiously, through the integuments and superficial fascia, when the sac, if not absorbed, as is often the case, will appear. Into this a small opening should be made, from which fluid in considerable quantity generally issues. The opening may then be enlarged, and a finger carried upwards between the omentum and intestine as high as the umbilical ring. Upon the finger a bistoury is next carried through the linea alba, to the extent of an inch, which in most cases will relieve the stricture sufficiently to enable the operator without much difficulty to restore the parts to their former situation.

To guard against peritoneal inflammation, which is sometimes apt to follow the operation just described, Sir Astley Cooper, in two instances, adopted the following mode of procedure. "As the opening," says he, "into the abdomen is placed towards the upper part of the tumour, I began the incision a little below it, that is, at the middle of the swelling, and extended it to its lowest part. I then made a second incision at the upper part of the first, and at right angles with it, so that the double incision was in the form of the letter T, the top of which crossed the middle of the tumour. The integuments being thus di-

vided, the angles of the incision were turned down, which exposed a considerable portion of the hernial sac. This being then carefully opened, the finger was passed below the intestine to the orifice of the sac at the umbilicus, and the probe-pointed bistoury being introduced upon it, I directed it into the opening at the navel, and divided the linea alba *downwards* to the requisite degree, instead of *upwards.*"

Dr. Physick has proposed, in strangulated umbilical hernia, to make a crucial incision through the integuments, as far as the neck of the sac, then open the sac at its upper part to an extent sufficient to enable the operator to examine its contents, and reduce them, if possible, without dilating the umbilical ring. Should the latter expedient, however, become necessary, the stricture must be divided on the outside of the sac. After the omentum and intestine are restored to the abdomen, a ligature should be drawn around the neck of the sac with a view of closing the cavity and obviating peritoneal inflammation. The late Dr. Wistar once performed the operation with success.

Section VII.

Congenital Hernia.

This, as its name implies, is met with at birth, or, as generally happens, a short time after birth. It differs from common inguinal hernia, in being destitute of a distinct peritoneal sac, and in being lodged in the tunica vaginalis, in contact with the testicle. "In a common rupture," says Mr. Samuel Cooper, "the viscera push out with them a portion of the great bag of the peritonæum, which thus forming one of the most regular investments of the displaced bowels, is called the hernial sac. But in the congenital inguinal hernia, the sac, in which the viscera lie, is not thrust forth in this manner, by the displaced bowels: on the contrary, it is a production of peritonæum originally formed, and placed ready for the reception of the testes on their descent from the loins, but into which the bowels are sometimes accidentally propelled, before the passage leading into it from the belly is duly closed. The congenital inguinal hernia, therefore, differs from the generality of ruptures in having no hernial sac, formed and produced by the peritonæum being thrust forth from the belly by the displaced bowels themselves. There is, indeed, one very uncommon species of scrotal hernia, contained in the tunica vaginalis, yet included, also, in a common hernial sac, so that the protruded bowels neither lie in contact with the preceding membrane, nor with the albuginea. This particular case was first noticed and described by the

late Mr. Hey. It seems to be formed, after the communication of the cavity of the peritonæum with that of the tunica vaginalis has been obliterated, but previously to the closure of the passage lower down."* In most respects, the anatomy of congenital hernia resembles that of the inguinal. The spermatic cord and the spermatic artery lie behind the hernia. The testicle, from being surrounded by the intestine or omentum, can seldom be distinctly felt.

Congenital hernia sometimes resembles hydrocele so closely as to be mistaken for that disease—owing to water accumulating in the abdomen and passing along with the hernia into the tunica vaginalis. It is very important to distinguish the one disease from the other; which may generally be done by placing the patient in the horizontal position, returning the hernial contents to the abdomen and there retaining them by a finger pressed upon the abdominal ring. In the mean time the water alone remaining in the tunica vaginalis may be easily distinguished by its transparency and peculiar feel.

Treatment of Congenital Hernia.

The reducible congenital hernia, if attended to soon after the disease is discovered, may be readily cured by a well constructed truss—inasmuch as there is a strong disposition in the tunica vaginalis at the ring to close of itself after the descent of the testicle. A spring truss can seldom be used

* First Lines of the Practice of Surgery, vol. ii. p. 23. edit. 4th.

in a child immediately after birth, but a linen compress covered by a bandage, if well applied, will generally answer every purpose; and after the lapse of a few months a truss with a weak spring may be employed. It sometimes happens that the testicle is detained at the ring, and that the omentum or intestine is placed above or along side of it. In such a case a truss should not be applied, as it will either prevent the descent of the testicle, or bruise the hernial contents.

Strangulated congenital hernia, if not relieved by the usual remedies, will require an operation, which differs from that of common inguinal hernia, chiefly in this particular—that the incision of the sac should never be prolonged further than the upper part of the testicle, in order to obviate inflammation of the tunica vaginalis, to which this membrane is particularly prone. In large congenital herniæ that have long remained irreducible, Sir Astley Cooper advises the return of the parts without inspection, provided the stricture can be removed without opening the tunica vaginalis.

Section VIII.

Artificial Anus.

When the operation for strangulated hernia has been too long delayed, and the intestine has mortified, it sometimes happens that an artificial anus is formed. In such cases, the inflammation, instead of extending throughout the peritoneum and producing the patient's death, is limited to the neighbourhood of the stricture, and terminating in the adhesive stage, glues the sound portions of intestine to the hernial sac. This adhesion becomes firmer and firmer, in proportion as the sloughing process going on in the protruded parts, advances, until the sloughs are thrown off and fæces are discharged externally. By this provision of nature effusions into the cavity of the abdomen are, in nine cases out of ten, effectually guarded against. As in every case of hernia the intestine is doubled upon itself, it follows that the two portions must lie parallel, or nearly so, with each other, and that when an artificial anus is formed, an intermediate ridge or projection will be the result. To the free admission of the fæces from the upper to the lower part of the canal this ridge will prove, in general, a serious obstacle; in most cases, indeed, there is a total cessation of fæcal discharge by the rectum; so much so, that the intestine is constantly empty, or, at most, contains only a glairy mucus. After a time, however, fæces in small quantity occasionally pass through the lower part of the canal, and are discharged from the rectum. This is owing, in

part, to the contraction of the *external* orifice of the artificial anus, and, at the same time, to an enlargement of the passage between it and the orifice of each gut. As soon, therefore, as the fæces leave the upper intestine, they fall into a "funnel-shaped" cavity, and meeting with some resistance from the contracted mouth of the opening in the integuments, are propelled by a circuitous route towards the orifice of the lower gut.

An artificial anus, whether induced by a wound of the abdomen, or by hernia, is a very grievous disease, not only subjecting the patient to great inconvenience, but endangering his life. Most patients, labouring under the infirmity, are troubled with colic and other derangement of the intestinal functions. Besides, they have no control, for want of a sphincter, over the fæcal discharge. A prolapsus from one or both openings of the intestine, is by no means uncommon, and is sometimes exquisitely sensible. Artificial anus, when situated high up, or among the small intestines, is apt to terminate fatally—from inanition.

Treatment of Artificial Anus.

Nature will often make surprising efforts towards restoration, and is sometimes abundantly successful. Aware of this, the surgeon must not be officious, but patiently wait, so long as there is any prospect of a favourable termination. In the mean time, the patient should be supplied with a common truss, the pad of which must be broader than usual, and covered with a piece of bladder or

oiled skin. This serves the purpose of restraining the fæces, and at the same time contributes, by blocking up the external opening, to direct them to the lower intestine. If it should be found, however, after the lapse of months, that there is no prospect of amendment, an operation may be attempted for the relief of the sufferer. The indication to be fulfilled by this is to overcome the ridge-like barrier situated between the two intestines, and which prevents the direct descent of the excrement from one to the other. Desault, with this view, introduced into each orifice of the gut, plugs of lint or linen, and by these means frequently succeeded. A more expeditious, effectual, and less troublesome operation, was proposed and successfully executed by Dr. Physick, between the years 1808 and 1809. A crooked needle, armed with a ligature, was passed for some distance within the orifice of one gut, and brought out at the other—traversing in its passage the coats of each. The ends of the ligature were then tied at the external opening, and formed a loose loop. This being suffered to remain for a week, caused the sides of the two intestines to adhere to each other. Through the consolidated ridge thus formed, an incision was afterwards made, a direct communication established between the upper and lower intestine, and the external orifice closed, when a perfect cure soon followed. An operation, similar to that of Dr. Physick, was afterwards performed by Dupuytren, in Paris, and to him the merit of the proposal is awarded by European writers—without the slightest foundation.* Dupuytren has since in-

* Dr. Physick's claim to priority, as respects the operation for artificial anus above described, has been contested by some European surgeons. The following statement on the subject from the able pen of

vented a forceps of peculiar construction, called *enterotome*, for the purpose of bruising and breaking down by

Dr. Benjamin H. Coates, of this city, must carry conviction to the mind of every unprejudiced person.

"John Exilius, a Swedish sailor, aged nineteen years, was admitted into the Pennsylvania Hospital on the morning of the 20th of October, 1808, affected with a congenital hernia. He stated that he had passed the last fourteen days without having had a stool, and that on the 29th, he had been affected with stercoraceous vomitings. These were renewed after his admission. After several other means had been employed to produce a reduction of the hernia, the operation was proceeded to at half past three o'clock the same afternoon, by the late professor Wistar, in the presence of Dr. Physick. The sac being opened, the intestines were found firmly adherent to the testicle, and partially so, but with equal firmness to the abdominal ring, so as to account for the impossibility of effecting a reduction by the taxis—they appeared to be a part of the ilium. A perforation existed in the side of one of them of sufficient magnitude to permit the discharge of a considerable amount of fæces. There were, however, no marks of mortification found, and the opening appeared to be the product of mere ulceration. After the removal of the stricture, and the application of a dressing, a dose of laudanum was administered, and the patient was returned to his bed. Much enlargement of the abdomen continued, accompanied with great general restlessness, and but a small quantity of the fæces was discharged from the wound, though various means were employed to procure their expulsion. On the 22d and 23d, stercoraceous vomiting returned, and it was not till the 23d that much relief was obtained. This was the result of a copious discharge produced by the injection into the bowel of an infusion of senna. On the 24th, Dr. Wistar divided a small portion of the tendon of the transversalis abdominis, as well as of the neck of the sac, from which ensued much greater facility for the escape of the fæces. On the 30th of October, the patient, by the regulations of the hospital, came under the care of Dr. Physick. On the 24th of December, the projecting portion of intestine was cut off close to the ring. This was done under the expectation that the open orifices thus left in the in-

force the sides of the two intestines, and in this way opening a passage from one to the other. Dr. Physick's opera-

testine would gradually be retracted within the abdomen. On applying a ligature to a divided mesenteric artery, severe pain was produced in that cavity, which was relieved by rhubarb, laudanum, and aniseed. After waiting some time, and finding that the retraction did not take place, as hoped for, another process was resorted to. A roll of waxed linen, such as is used in making bougies, and of the size of the forefinger, was bent double, and each end introduced into one of the orifices of the intestine. The dresser then pressed the angular part of this tent backwards, in such a manner as to approximate the adherent intestine to a straight position. So much pain of a kind similar to colic was produced by this pressure that the plan was necessarily abandoned. The two ends of the intestine were found, by a careful examination to adhere to each other for some distance, and the form thus presented, has been compared in this case to that of a double barrelled gun. The next method proposed by Dr. Physick, was to cut a lateral opening through the sides of the intestine where they were adherent. But not knowing the extent of the adhesion inwards, he thought it necessary to adopt some preliminary measure for insuring its existence to such a depth as might admit of the contemplated lateral opening, without penetrating the cavity of the peritoneum. By introducing his finger into the intestine through one orifice and his thumb through the other, he was enabled to satisfy himself that nothing intervened between them but the sides of the bowels. He was thus enabled without risk, to pass a needle, armed with a ligature, from one portion of the intestine into the other, through the sides which were in contact, about an inch within the orifices, which ligature was then secured with a slip-knot. This operation was performed on the 28th of January, 1809. The ligature was merely drawn sufficiently tight to insure the contact of those parts of the peritoneal tunic, which were within the noose. When drawn tighter, it produced so much pain in the upper part of the abdomen, of a kind resembling colic, that it became necessary immediately to loosen it. The ligature, in this situation, gradually made its way by ulceration through the parts which it embraced, and thus loosened itself. It was at several periods again drawn to its original tightness.

tion, it appears to me, in every respect, merits the preference.

After about three weeks had elapsed, concluding that the required union between the two folds of peritoneum was sufficiently insured, Dr. Physick divided with a bistoury all the parts which now remained included within the noose of the ligature. No unfavourable symptom occurred in consequence. On the 28th of February, the patient complained of an uneasy sensation in the lower part of the abdomen, and on the 1st of March he extracted with his own fingers some portions of hardened fæces from his rectum. On the 2d of March two or three evacuations were produced in this manner. On the 3d, an enema consisting of a solution of common salt was directed to be given twice every day. The first of these occasioned a natural stool, about two hours after its administration. The same effect was produced on the 4th, 5th, and 6th, and the discharges from the orifices in the groin now became inconsiderable. Adhesive plasters, aided by compresses, were employed, not only to prevent the discharge of fæces from the artificial opening, but with the additional object of procuring the adhesion of the sides. This last effort was unsuccessful. On the twenty-fourth of June, an attempt was made to unite them by the twisted suture. Pins were left in for three days, and adhesion was in fact effected; but owing to the induration of the adjacent parts, the wound again opened. On the 27th of July, a truss of the common construction, furnished with a very large pad, and surmounted by a large compress, was applied to the wound. By these means the discharge of fæces from the groin was completely prevented, and the patient had regular evacuations per anum, except when from improper diet or cold, he became affected with diarrhœa. At such times, a small portion of the more fluid matter escaped by the sides of the compress. Not satisfied with this state of things, Dr. Physick made several attempts to improve the patient's condition. On the 2d of August a mould of the parts was taken in plaster of Paris, and being covered with buckskin, was employed as a pad for the truss. This expedient answered extremely well, as long as the patient continued in the same posture in which the mould was made; but as soon as the form of the parts was altered by a change of position, fæces escaped from the orifice. A bandage was then applied to the body, furnished with a thick compress, and hav-

ing that part of it which crossed the patient's back formed of elastic, extensible wire springs, such as are used in suspenders. This, also, however, proved ineffectual. The truss, with a compress and a large pad, stuffed in the common way, was then reapplied, and found to answer completely the purpose of preventing the discharge of fæces, the hope of an entire closure of the orifice being abandoned. On the 10th of November he was discharged from the hospital in good health and spirits, and applied himself with very good success, to acquire the profession of an engraver."—*Account of a case in which a new and peculiar operation for Artificial Anus was performed, in* 1809, *by Philip Syng Physick, M. D. then Professor of Surgery in the University of Pennsylvania. Drawn up for publication, by B. H. Coates, M. D. in North American Medical and Surgical Journal, vol.* 2, *p.* 269.

On Hernia, consult—*Pott's Works, by Earle, vol.* 2—*Hey's Practical Observations in Surgery, edit.* 3—*The Anatomy and Surgical Treatment of Inguinal and Congenital Hernia, by Astley Cooper, fol. Lond.* 1804—*Ditto the Anatomy and Surgical Treatment of Crural and Umbilical Hernia, part* 2. 1807—*Lawrence on Ruptures, edit.* 3—*Scarpa's Treatise on Hernia, translated from the Italian, by John Henry Wishart, Edinburgh,* 1814—*J. Cloquet, Recherches Anatomiques Sur les Hernies,* 1817—*A Treatise on Surgical Anatomy, part the first, by Abraham Colles, Philadelphia,* 1820—*C. Bell's Surgical Observations.*

On Artificial Anus—*Desault's Works, by Smith, vol.* 1. *article Preternatural Ani, p.* 306—*Travers on the Intestines, p.* 295—*Scarpa on Hernia, Memoir* 4*th, p.* 288—*Hennen's Military Surgery,* 2*d edit. p.* 407—*Dorsey's Surgery, vol.* 1. *p.* 96.

CHAPTER XII.

DISEASES OF THE RECTUM.

It is but too common for students to pay particular attention to favourite subjects, and neglect others not less important. The diseases of the rectum, I have frequently perceived, are little relished ; being considered not only loathsome and uninteresting, but very simple in their nature, and easily cured. Experience teaches the reverse. Many a patient has lost his life from an ill managed fistula in ano, or from an operation upon it, unnecessary, or improperly performed. A small portion of dissecting-room labour, (too often wasted upon the muscles,) is the proper corrective for this error.

Section I.

Prolapsus Ani.

From habitual costiveness, straining at stool, diarrhœa, dysentery, hæmorrhoids, strictures in the urethra, stone in the bladder, drastic purgatives, irritation from ascarides, and various other causes, the lining membrane of the rectum, immediately above the sphincter, is sometimes inverted, and protruded to a greater or less distance beyond the verge of the anus. Infants, and very old people, are most liable to the complaint; which, if the tumour be large, recent, and accompanied by much inflammation, may terminate in gangrene, or give rise to symptoms of strangulated hernia. In general, however, this result is not to be apprehended, and the disease must be considered as rather inconvenient and troublesome than dangerous. In some cases, there is reason to believe that there is an *intus-susception* of the gut itself, instead of an inversion of its lining membrane.

Treatment of Prolapsus Ani.

In the treatment of this disease, it is highly important to return the protruded parts as speedily as possible. This is best accomplished by placing the patient on his back, elevating the hips and shoulders, and pressing gently with the fingers, (previously oiled,) upon the tumour. Should the parts be very tender and inflamed, and offer much resistance, the efforts towards reduction must be disconti-

nued, until full benefit has been derived from general and local blood-letting, mild purgatives, cold poultices, astringent washes, &c. To support the protrusion, after it has been reduced, and to prevent its recurrence, a piece of lint, covered with some mild ointment, should be applied to the anus, and over it a soft sponge and bandage. Rest, also, for some time in the horizontal position, will prove essential. Dr. Physick has sometimes cured prolapsus ani by confining the patient for a considerable time to a diet of rye mush and sugar. It must be obvious, however, from what has been stated, that much will depend upon the cause of the disease, as respects the prospect of a permanent cure; and that so long as many of the causes pointed out continue to operate, little advantage can be gained by any mode of treatment that may be instituted. The protruded parts, now and then, become indurated and incapable of reduction. Under such circumstances, it may be necessary to remove them, either with the ligature or knife. The former I should prefer. Mr. Hey, after dissecting off a tumour of this description, found great difficulty in arresting the hemorrhage. In general, however, no difficulty of the kind will be encountered. Dupuytren has lately proposed to cut off the projecting folds about the verge of the anus in cases of prolapsus, and seems to consider the operation as novel and peculiar to himself. But it does not differ in any respect from the operation long ago performed in numerous instances by Hey. Perforated ivory balls, gum elastic pessaries, &c. (advised by some writers,) introduced into the rectum, never answer a good purpose—inasmuch as they act as suppositories, and keep up incessant irritation.

Section II.

Tumours within the Rectum.

Sarcomatous and other tumours occasionally sprout from the surface of the lining membrane of the rectum, and according to their bulk and figure, excite more or less irritation, diarrhœa, &c. Sometimes they originate between the coats of the intestine. Mr. John Bell* speaks of enormous tumours of the rectum, soft, woolly, lubricous, of a shining red colour, involving the whole circle of the anus, extending beyond it many inches, and retiring deeply within the cavity of the gut. Such I have not seen.

Treatment of Tumours within the Rectum.

When the tumour originates by a very narrow pedicle, and moves freely about, it may sometimes be pulled away with a pair of forceps; but when its base is broad, the ligature will prove the safest and most effectual remedy. It will answer no purpose, however, merely to encircle the swelling with a single cord. Many years ago, I was consulted by a gentleman in Maryland, on account of a fleshy excrescence, about the size of an egg, which arose from the walls of the rectum an inch and a half above the sphinc-

* Principles of Surgery, vol. iii. p. 188.

ter ani. A surgeon of eminence had undertaken to remove the tumour by a single ligature; but, unable to noose the base of the swelling, its anterior part only was destroyed, and the operation proved fruitless. I determined to proceed in a different way. Directing the patient to sit for half an hour over a tub of warm water, and, by straining, to force the tumour as far as possible below the sphincter, I passed a crooked needle, armed with *two* ligatures, through its substance, as near as possible to the coats of the bowel, and tied one on each side. In four or five days the diseased mass sloughed away, and a perfect cure followed.

Section III.

Hemorrhoids.

Hemorrhage, occasional or periodical, from the verge of the anus, or from the cavity of the rectum, is very common among persons of indolent and sedentary lives, and of full habits of body. Costiveness, pregnancy, severe exercise on horseback, and many other causes may give rise to the complaint. It is still a disputed point whether the blood proceeds from varicose distention of the hemorrhoidal veins, or is poured into cysts formed of the cellular membrane, between the coats of the bowel, or beneath the integuments of the anus. Both opinions are probably well founded. Hemorrhoidal tumours, so long as they remain within the cavity of the rectum, are mostly free from pain; when they protrude, however, beyond the anus, and are compressed by its sphincter, they frequently become exquisitely sensible, and greatly enlarged. The margin of the anus is sometimes surrounded by a cluster of tumours of a dark red or purple colour; at other times only a single protuberance is visible.

Treatment of Hemorrhoids.

The remedies for this disease are either palliative or radical. Among the former may be enumerated leeches,

cold astringent washes, astringent ointments, rest in the horizontal position, mild laxatives, general blood-letting. In several instances I have derived great benefit from a poultice made of the pulp of the green persimmon, and also from a decoction of the bark of the persimmon tree. The extract of stramonium, as a local application, I have likewise found, in particular cases, soothing and useful. Internally administered, there is nothing better than the old remedy extolled by Benjamin Bell—the balsam copaibæ.

When hemorrhoids become large and troublesome, or irreducible, an operation will be required. The knife or ligature will prove equally successful. The use of the former, however, is sometimes followed by profuse hemorrhage, violent inflammation, and even death. Three instances of fatal termination are related by Sir Astley Cooper. The first was that of a lady, who died in a week from peritoneal inflammation, induced by the removal of a single pile by the scissors; the second that of a gentleman who died from hemorrhage on the second day after the operation. In the third case, Sir Astley removed a large hemorrhoid by the scissors from the anus of a nobleman. "In about ten minutes after the operation he said, 'I must relieve my bowels,' and he rose from his bed and discharged into the close stool what he thought to be fæces, but which proved to be blood. In twenty minutes he had the same sensation and evacuated more blood than before, in about the same lapse of time: he again rose, and soon became very faint from the free hemorrhage. I therefore opened the rectum with a speculum, and saw an artery throwing out its blood with freedom. I therefore requested

him to force down the intestine as much as he could, and raising the orifice of the bleeding vessel with a tenaculum, secured it in a ligature and also compressed the artery with a piece of sponge. His lordship bled no more. On the following day he was low, his pulse very quick, and he had a shivering; on the next day he complained of pain in his abdomen; he had sickness and tenderness upon pressure, and in four days he died." On this account, the preference should be given to the ligature, and especially to the mode of using it advised by Dr. Physick, and already described under the head of *enlarged tonsils.** But the cannula for hemorrhoids should not exceed *two* inches in length.

* See page 237.

Section IV.

Fistula in Ano.

When an abscess forms in the cellular membrane surrounding the rectum, or about the verge of the anus, and leaves, after its contents are discharged, one or more small openings communicating with its cavity, the disease is denominated fistula in ano. Other appellations have also been invented, expressive of the particular situation of the fistulous orifice, and the extent of the disease. If the fistula opens upon the surface of the integuments, it is called an *external* fistula; if it communicates with the rectum, and not with the integuments, an *internal* fistula; and when there is an opening in the gut and another through the skin, a *complete* fistula.

The formation of a fistula in ano is often denoted by rigors, a painful swelling about the ischium or perinæum, difficulty of passing urine, and by irritation in the rectum and neck of the bladder. During the progress of the disease, the patient, in many instances, suffers immensely; at other times the abscess forms and breaks almost without the patient being aware of its existence. Generally the abscess communicates with the integuments by a single opening; occasionally three or four are met with; and I once attended a case of long standing in which there were no less than fifteen. In healthy constitutions the abscess does

not differ from that of the common phlegmon, met with in other parts of the cellular tissue. In consumptive and scrofulous patients, however, the disease often assumes a different shape. The surface of the integuments is covered with an erysipelatous inflammation, the fever, sickness, and pain are very considerable, the matter is discharged in small quantity, and from a sloughy, ill-conditioned opening, or from a ragged unhealthy surface.

The origin of fistula in ano cannot be always satisfactorily traced. Sometimes it arises from irritation about the rectum, from local injury, from the lodgement of undissolved articles of food taken into the stomach, and passed through the intestines as far as the rectum, such as the bones of fish or fowls. Severe and long-continued exercise, on rough going horses, I have sometimes known to lay the foundation of the complaint. Hemorrhoids, there is reason to believe, often contribute to the disease. The same may be said of severe colds and coughs.

Treatment of Fistula in Ano.

An opinion very generally prevails that every fistula in ano requires an operation. There cannot be a greater mistake. So far from it, almost every sinus, I am inclined to think, in a patient tolerably healthy, might be healed, if attended to in the commencement, and judiciously managed. Nothing will contribute more to this end than absolute rest, simple dressings, moderate diet, and mild laxatives. I have known a fistula, (protracted and kept open

for months while the patient walked about,) healed in a week by perfect quietude, and the horizontal position.

It frequently happens, however, that the surgeon is not called until the disease is firmly established, and an operation urgently demanded. But, before he undertakes it, the operator would do well to soothe the parts, and reduce the inflammation and callosity about the sinus by emollient poultices, and after the irritation has subsided, gradually enlarge the fistulous orifice by bougies, (if necessary,) before an examination with the probe is entered upon. If these precautions are neglected, and the fistula probed at once, the patient will suffer, as I have often witnessed, immensely, and, indeed, will experience infinitely greater pain than from the operation itself. It will still remain to inquire concerning the patient's general health. If consumptive, the operation can answer no good purpose; on the contrary, it will aggravate, if the fistula should be healed, all the pectoral symptoms.

When determined upon, the operation may be performed by a common probe-pointed bistoury, by the sheathed bistoury of Dr. Physick, or by the knife of Cruikshank. The objection to the *probe* bistoury is, that it will sometimes be necessary, when there is no opening between the gut and sinus, to *make* one. For this purpose, an instrument with a sharp point will be required. Dr. Physick's instrument was constructed with this view, and possesses the additional advantage, from being covered by a silver sheath, blunt on its edges, of not cutting the tract of the sinus whilst passing along, until the operator desires so to do. Cruikshank's bistoury is constructed with a moveable

stilet, that can be pushed forward or retracted at pleasure, the point of which is intended to pierce the gut, and then to be withdrawn that the surgeon's finger may rest on the blunt extremity of the knife.

Previous to the operation, the rectum is emptied by a glyster, and the buttocks being turned towards the light, are held asunder by assistants, while the patient stoops forward and rests his body and arms upon a table. The surgeon introduces a forefinger, oiled, into the rectum, passes the probe into the sinus, examines carefully its situation and extent, and having satisfied himself thoroughly in this respect, carries the sheathed bistoury, (for example,) as high as the naked outer surface of the intestine, then disengages the sheath from the bistoury, and removes it from the sinus. The point of the bistoury is next pushed through the gut, and made to rest on the finger within the rectum. Both the finger and knife are next withdrawn, the latter dividing in its passage downwards the whole tract of the sinus, the intestine, sphincter ani muscle, and integuments, and leaving a chasm of considerable extent. A dossil of lint should be next introduced between the lips of the wound, and the patient put to bed. The cure is afterwards completed by mild dressings.

In performing the operation for fistula in ano, simple as it is considered, the operator must remember, that if he prolongs his incision too far upwards from an over anxiety to trace every ramification of the sinus, (a very unnecessary piece of work,) he may wound the peritoneum, lay open the cavity of the abdomen, and also divide the internal hemorrhoidal artery.

The *ligature*, or leaden wire, is sometimes employed instead of the knife, in the cure of a fistula in ano; but it is painful, tedious, and in many other respects, inconvenient.

Consult *Colles' Surgical Anatomy, p.* 128—*Hey's Practical Observations in Surgery, edit.* 3. *p.* 438—*Richerand's Nosographie Chirurgicale, tom.* 3—*Abernethy on Hemorrhoidal Diseases, in Surgical Works, vol.* 2—*Earle on Hemorrhoidal Excrescences,* 1807—*Kirby on the Treatment of Hemorrhoidal Excrescence—Ware on the Treatment of Hemorrhoids—C. Bell's Operative Surgery, vol.* 1. *p.* 143, *article Fistula in Ano—Dorsey's Surgery, vol.* 2—*Pott's Works, by Earle, vol.* 3. *p.* 45—*Desault's Works, by Smith, vol.* 1. *p.* 330—*Copeland's Observations on some of the Principal Diseases of the Rectum and Anus, Philadelphia,* 1811—*Practical Observations on the Symptoms, Discrimination, and Treatment of some of the most Common Diseases of the Lower Intestines and Anus, by John Howship, London,* 1820—*A Treatise on the Diseases of the Urethra, Vesica Urinaria, Prostate, and Rectum, by Charles Bell, with Notes, &c. by John Shaw, Surgeon; Demonstrator of Anatomy, in the School of Great Windmill Street, London,* 1820, 8*vo. page* 297—*A Practical Treatise on Hæmorrhoids or Piles, Strictures, and other important Diseases of the Rectum and Anus; being with some additions, a Treatise to which the Jacksonian Prize was adjudged by the Royal College of Surgeons, by George Calvert, &c.*

CHAPTER XIII.

DISEASES OF THE TESTICLE AND PENIS.

HAVING treated upon a former occasion* of cancer of the testicle and penis, and of cirsocele,† and described the treatment and operations necessary for each, some other affections of these organs will now be noticed. These are hydrocele, hæmatocele, fungus of the testicle, phymosis, and paraphymosis. Among surgical writers, accounts will be met with, of the œdematous hydrocele or dropsy of the scrotum, of hydrenterocele or hydrocele combined with intestinal hernia, of encysted hydrocele of the spermatic cord, of the congenital hydrocele. These, however, are either the result of other diseases, or are so analogous, in many respects, to common hydrocele, as not to require in this place a separate consideration.

* Vol. 1. pages 245 and 241. † Vol. 2. page 120.

Section I.

Hydrocele.

The tunica vaginalis is naturally bedewed with a thin serum, which, by lubricating its surface and that of the testicle, enables them to move freely upon each other. This fluid when secreted in undue quantity, constitutes hydrocele—a disease of frequent occurrence, and met with in patients of every age and constitution. If attended to in the commencement, the tumour will be found to occupy the lower part of the scrotum, and gradually to extend towards the abdominal ring. In shape it is pyriform, and to the touch elastic—feeling like a bladder distended with water. When pressed upon, little or no pain is experienced by the patient, except at the posterior part of the swelling where the testis is situated. The rugæ of the scrotum generally remain unaltered, even in hydroceles of the greatest magnitude, and sometimes the tumour attains an enormous bulk. In ordinary cases, however, the tunica vaginalis seldom contains more than a pint of fluid. This fluid in colour is either perfectly limpid, or else yellowish. The disease is usually confined to one side. It is sometimes difficult to distinguish between hydrocele and other complaints that bear a resemblance to it. Much may be learned from the history of the disease. The hydrocele invariably begins below, and very gradually ascends. The swelling in sarcocele, or scirrhus testicle, is uniform throughout, is accompanied with pain, is inelastic, and heavier when

handled than hydrocele. When recent, hydrocele is generally transparent, if examined by placing the tumour between a lamp and the surgeon. From hernia it differs materially—the one commencing above, the other below. In hernia, moreover, an impulse is communicated to the finger when the patient is directed to cough. This is not the case with hydrocele. The *causes* of hydrocele are very uncertain. By some the disease is attributed to urethral excitement, by others to varicose enlargement of the spermatic vessels, to blows upon the scrotum, to rheumatism, cold, &c. I have met with it in infants immediately after birth. Hydrocele is often conjoined with enlargement of the testicle—constituting the disease called *hydro-sarcocele.*

Treatment of Hydrocele.

In very young subjects, and in recent cases, I have sometimes succeeded in removing the disease by purgatives, and by bathing the tumour repeatedly with a mixture of sal ammoniac and vinegar. In the majority of instances however, an operation will be required. This is either *palliative* or *radical.* The former may prove necessary when there is any doubt respecting the nature of the disease, or it may be performed to diminish the size of the swelling, and thereby enable a patient to pursue a journey without interruption. In a short time the fluid accumulates again; and, if necessary, the operation may be repeated. A common lancet, or a small trocar, answers equally well for the operation.

The *radical* cure of hydrocele has been attempted in various ways—by *laying open* the tunica vaginalis, by passing a *seton* through it, by applying *caustic* to the surface of the tumour, by *extirpating* a part of the tunica vaginalis, by the introduction of a *tent*, and by the *injection* of the cavity of the sac, after having drawn off its contents. The latter operation is the only one now practised by the generality of modern surgeons, and when properly performed, is almost uniformly successful.

The patient being seated on the edge of a bed, or table, with his thighs separated, the operator sits before him, and grasps the tumour so firmly with one hand as to render it perfectly tense, while with the other he introduces a trocar of moderate size, covered by its cannula, obliquely upwards and inwards, into the front of the tumour, near its lower part.* The trocar, thus held, is made to penetrate the integuments of the scrotum, and the tunica vaginalis, to the depth of an inch and a half, and is then withdrawn, leaving the cannula behind, through which the fluid is immediately discharged. The nozle of a syringe, or gum elastic bag, is next adapted to the mouth of the cannula, and an injection consisting of two parts of water and one of port wine, thrown into the tunica vaginalis until it is distended to the size of the original tumour. The length of time the injec-

* The opening is made in this situation, and the instrument directed *obliquely* with the view of avoiding the testicle, which is usually situated *posteriorly*. But it should be remembered that the testicle is sometimes placed in front, and will, therefore, be wounded if the above direction is followed. To avoid so unpleasant a consequence, the operator must endeavour beforehand to ascertain, if possible, its exact position.

tion should be permitted to remain, must depend upon the patient's feelings. In general a pain will be felt along the cord, extending into the abdomen; and when this becomes very severe, the wine and water must be evacuated; on the contrary, if the patient, as I have sometimes noticed, should experience no pain whatever, the injection may be renewed, and its strength increased. It only remains to withdraw the cannula, and close the wound by a bit of lint. In a few hours the parts swell, sometimes enormously, and may require the application of a poultice, the antiphlogistic system, and the recumbent posture. But the swelling usually subsides in four or five days, and a cure is accomplished through the medium of adhesion—the tunica vaginalis being made to coalesce with the proper coat of the testicle.

This operation, trifling as it is usually considered, is sometimes, from inattention on the part of the surgeon, followed by serious consequences, owing to the end of the cannula being permitted to slip from the cavity of the tunica vaginalis, and rest among the cellular membrane of the scrotum, into which the vinous injection will pass, and by exciting most violent inflammation, cause gangrene and sloughing of the scrotum, and denudation of the testicles. This has repeatedly happened to surgeons of the first eminence, and should be most carefully guarded against. Sir Astley Cooper mentions an instance in which a patient from this cause, died in about a week after the operation.

If the operation of hydrocele, above described, should fail, as sometimes happens, it may be repeated; or the plan of Hunter may be pursued—which is, simply to make an

incision, an inch long, into the upper and front part of the tunica vaginalis, evacuate the water, and fill its cavity with Indian meal or dough. This generally excites the requisite degree of inflammation, and after this purpose is accomplished, the meal may be washed out, or permitted to escape along with the pus.

Section II.

Hæmatocele.

This disease, as its name implies, is a collection of blood —situated either in the tunica vaginalis testis, within the tunica albuginea, or in the cellular membrane of the scrotum. It may arise, according to writers, from several different causes—from wounding one or more of the large veins of the scrotum, in performing the operation for hydrocele, from wounds of the vessels of the scrotum during the operations of lithotomy and castration, from rupture of branches of the spermatic vein, from spontaneous rupture of a vessel within the tunica vaginalis, after the water of hydrocele has been drawn off, from injury of the vessels of the testis, and consequent extravasation of blood within the tunica albuginea. The disease, under any circumstances, must be considered, I am inclined to think, rather uncommon.

Treatment of Hæmatocele.

Unless the extravasation of blood should be very considerable, it will probably be absorbed in a short time. If, in this respect, however, the surgeon is disappointed, an incision may be made into the part that contains it, and the coagulum extracted; after which the parts will granu-

late and fill up. If any particular vessel continue to pour out fresh blood, it must be searched for and secured by ligature. Effusion of blood under the tunica albuginea, is considered by Pott and most other writers, as requiring castration.

On Hydrocele and Hæmatocele, consult *Pott's Works, by Earle, vol.* 3—*A Treatise on Hydrocele, by Sir James Earle,* 1803—*Bell's Operative Surgery, vol.* 1. *p.* 193—*Ramsden's Practical Observations on Sclerocele,* 1811—*Dorsey's Surgery, vol.* 2—*Richerand's Nosographie Chirurgicale, tom.* 4. *p.* 262 *and* 258—*Scarpa on Hernia, by Wishart.*

Section III.

Fungus of the Testicle.

This disease differs essentially from the common sarcocele. It was first particularly described by Mr. Lawrence, and chiefly with a view of preventing castration—an operation formerly practised for its removal. The disease sometimes arises spontaneously; in other instances it proceeds from a blow, from hernia humoralis, &c. A general and painful swelling of the testicle is the first symptom. This is followed by an abscess in the scrotum which discharges a small quantity of matter; from the ulcerated opening a fungus quickly sprouts, and upon dissection will be found to proceed from the glandular substance of the testicle, the tunica albuginea of which has previously taken on ulceration. After the fungus once makes its appearance, the size of the testicle and the pain both diminish.

Treatment of Fungus of the Testicle.

Escharotics, the ligature, and the knife, may each, under particular circumstances, be employed in the removal of this fungus. When the fungus is small, the lunar or vegetable caustics, will serve to repress or eradicate it; but when far advanced, and of large dimensions, the knife I look upon as the most expeditious and effectual remedy.

The tumour should be sliced from the surface of the testis, and as much of the latter saved as possible. The edges of the scrotum soon approximate and heal.

See *Observations on a Peculiar Affection of the Testis, attended with the Growth of Fungus from that Organ; illustrated with Cases, by William Lawrence, Demonstrator of Anatomy, in St. Bartholomew's Hospital; in the Edinburgh Medical and Surgical Journal, vol. 4. p. 257 —Wadd's Cases of Diseased Bladder and Testicle—S. Cooper's First Lines of the Practice of Surgery, vol. 2. p. 131. edit. 4.*

Section IV.

Phymosis.

There are two varieties of this disease—the *natural* and *preternatural.* The former exists at birth, and is therefore congenital; the latter may occur at any period of life. In both cases the prepuce is contracted in front, and cannot be drawn backwards over the glans penis.

Natural phymosis is a very common complaint, and met with under two or three different forms. Sometimes, though rarely, the extremity of the prepuce is perfectly closed, and the urine cannot pass off, but collects between the glans and prepuce, forming a large bag or tumour. The disease is of course discovered a short time after birth, but is often not understood, and from this cause several infants have perished that might have been saved by a trivial operation. Another form of natural phymosis is that in which an opening exists at the extremity of the prepuce, but so small, as not to permit the urine to escape from it with the same rapidity it issues from the urethra. Consequently, it collects between the prepuce and glans, and distending the former to a great size, is then forced off gradually in a very fine stream, and to a great distance. If the disease should continue in this state for several years, as I have known to happen, pus and calculi may collect within the cavity of the distended prepuce, and keep up a constant irritation. But in most in-

stances, there is no impediment to the flow of urine, no extraordinary elongation of the prepuce; yet the skin is so closely contracted around, as to prevent the patient from uncovering the glans penis. From this, other inconveniences result. A whitish sebaceous matter collects in large quantity between the glans and prepuce, and excites so much irritation, as to produce a disease resembling gonorrhœa—with which it is often confounded. Besides this, the inflammation excited by this, or any other cause, may produce an adhesion between the glans and prepuce, which can only be relieved, and that not always, by a most severe and tedious dissection.

Preternatural phymosis is commonly the result of inflammation of the prepuce, by whatever cause induced. The disease often accompanies severe gonorrhœa, extensive chancres, and venereal warts. Sometimes matter accumulates behind the corona glandis, and is followed by ulceration of the prepuce, and a protrusion of the glans through the opening. The inflammation attending preternatural phymosis, is sometimes of the erysipelatous kind. Extensive sloughing of the prepuce is frequently the consequence, in bad constitutions, of the continued exhibition of immoderate quantities of mercury.

Treatment of Phymosis.

Natural phymosis, if it exist at birth, and be complete, will require an immediate operation, in order to save the infant's life. A puncture with a common lancet in the

most prominent part of the tumour, may answer every purpose, as the stream of urine will afterwards prevent the opening from closing. When the prepuce has become distended, from repeated collections of urine, the small opening in its extremity may be either enlarged, or the superfluous bag amputated. The latter will prove the most effectual, and should be, generally, resorted to.

A simple phymosis, when only inconvenient to the patient by impeding copulation, may be relieved by slitting up the prepuce at its middle as far as the corona glandis. The operation can be performed with a sharp pointed bistoury, or still better by the sheathed knife employed by Dr. Physick for fistula in ano. Hemorrhage sometimes follows the incision, but in general is easily suppressed by a dossil of lint. Before the parts are dressed, the surgeon must take care to tack the two layers of skin to each other by a single stitch of the interrupted suture. The edges of the prepuce, thus divided, retire from each other, and after they are healed, become continuous, and resemble the borders of a prepuce naturally formed. This has been denied by some surgeons, who allege that two flaps or angles are left, which afterwards prove very inconvenient to the patient. I have performed the operation very frequently, and never experienced such a result.

Preternatural phymosis, when complicated with gonorrhœa or chancres, and attended with high inflammation, should never be touched with the knife. The best remedies, under such circumstances, are local blood-letting, emollient poultices, fomentations, and accurate ablution of the glans by means of a syringe. The continuance of

mercury will prove immensely injurious. After the inflammation has entirely subsided, if adhesions should have formed between the glans and prepuce, uniting them firmly to each other, an attempt may be made to separate them by dissection, provided the patient is willing to encounter a most severe operation, (one compared by Petit "to the skinning of an eel,") rather than submit to his misfortune.

Section V.

Paraphymosis.

Paraphymosis is the reverse of phymosis—the prepuce being retracted behind the corona, leaving the glans uncovered. The disease may be either congenital or acquired, but the latter is the most common. Sometimes it is the result of the successful retraction of the prepuce in cases of phymosis; but generally it proceeds from inflammation induced by syphilis or gonorrhœa. So extensive is the swelling, in some instances, and so great the constriction produced by it, that the glans penis, or prepuce, occasionally mortifies and drops off. This termination, however, must be considered as comparatively rare.

Treatment of Paraphymosis.

If called in time, or before the swelling attains a great height, the surgeon may often succeed in restoring, by steady pressure with the fingers, kept up for several minutes without intermission, the prepuce to its natural situation. The application of very cold water to the parts will also contribute towards the same end. Punctures, too, when there is much œdema, as generally happens, afford great relief, by evacuating the serum and reducing the swelling. This treatment, together with an observance of the anti-

phlogistic system, will usually effect a cure in a short time; should this not prove to be the case, and gangrene of the parts be likely to follow, the division of the stricture must be attempted. To accomplish this, a fold of the skin should be raised and cut through, a director pushed beneath the stricture, and the latter divided by a bistoury.

On Phymosis and Paraphymosis, consult *Petit's Traité des Maladies Chirurgicales, et des Operations qui leur Conviennent, tom.* 2—*Hunter on the Venereal—Cooper and Travers's Surgical Essays, part* 1. *p.* 145.—*Richerand's Nosographie Chirurgicale, tom.* 4. *p.* 328.—*S. Cooper's First Lines of the Practice of Surgery, vol.* 2. *p.* 176.

CHAPTER XIV.

DISEASES OF THE URETHRA AND BLADDER.

Volumes have been written on these subjects; and there is scarcely an eminent surgeon of any age who has not devoted some portion of his writings to their explanation. This will show the importance of these diseases, and the difficulties encountered in their treatment. In a work professedly elementary, it will not be expected that more than a very general sketch on such topics can be furnished. Ample scope, however, must be taken in the lectures—such I trust, as will abundantly supply any deficiency that may be here met with. The diseases of the urethra and bladder, that remain to be considered, are stricture, fistula in perinæo, enlarged prostate, retention and incontinence of urine, and stone in the bladder.

Section I.

Stricture of the Urethra.

This is a very common complaint; more common, indeed, than is generally imagined. It may proceed from various causes—from gonorrhœa, or the remedies employed in the cure of that disease; from external violence; from irritation within the urethra produced by the passage of calculi, or the application of blisters to the perinæum or other parts of the body; from excessive indulgence in venery, or unnatural prolongation of the venereal act; from enlargement of the prostate gland; from stone in the bladder, &c. It is somewhat remarkable, however, that the disease seldom makes its appearance until years have elapsed, and the effect of the causes above enumerated has appeared to cease. Many surgeons question the propriety of referring the origin of stricture to gonorrhœa, without, I conceive, sufficient foundation; though it must be acknowledged that the disease is sometimes met with in very young boys, and in adults who have led the most exemplary lives.

Strictures have usually been divided into two kinds—the permanent and spasmodic. To these Mr. Hunter added a third variety—which is alleged to consist in a combination of the two. Permanent stricture may be said to consist of a thickening or change of structure in the urethra, induced by preceding inflammation. That spasmo-

dic stricture frequently exists, there cannot be the smallest doubt, though it is still a question whether the spasm should be referred to the muscularity of the urethra itself, or to the muscles surrounding that canal; a question, however, in a practical point of view, of comparatively small importance. Yet I must confess my willingness, for various reasons, to subscribe to the latter doctrine.

There is seldom much variation in the *seat* of a stricture; which is usually found behind the bulb of the urethra—about seven inches from the extremity of the glans. At the distance of four or five inches, also, and three inches and a half, measuring from the outer orifice of the urethra, strictures may be often discovered. Sometimes the orifice itself is the seat of stricture. Most patients have but one or two strictures, others four or five.

Strictures differ from each other in *extent* and *consistence*. The most common form of the disease is that which resembles the effect of a thread tied around the canal; it is likewise the most simple variety of stricture. Sometimes the canal of the urethra is irregularly contracted or thickened, in one or more places, to the extent of an inch and upwards. The simple thread-like stricture, which does not always run in a circular direction, but sometimes splits and branches, may by irritation or bad treatment be converted into a callous induration. When examined by dissection, most permanent strictures will be found to consist of a dense, pure white, fibrous substance, like gristle—the result of previous and repeated depositions of coagulable lymph.

The *symptoms* of stricture of the urethra, are *constitu-*

tional and *local.* Among the former may be enumerated, disorder of the digestive functions, general irritability of the system, various mental emotions, severe chills followed by high fever and profuse perspiration. All patients, however, are not subject to the febrile paroxysm. The most common local symptoms are, a slight discharge of matter from the urethra; a frequent desire to evacuate the urine, which issues in drops, or in a forked, twisted, wiry, or thread-like stream; nocturnal emissions; scalding of the urine; uneasiness about the anus and perineum. Persons troubled with strictures, are extremely liable to cold, which greatly aggravates the symptoms. Excess in eating or drinking will produce the same result. During copulation, it frequently happens that a stricture, by interrupting the flow of semen, occasions it to be forced backwards into the bladder, from which it is afterwards discharged the first time the patient makes water.

Stricture is often confounded with other diseases; especially with gonorrhœa, gleet, stone in the urethra or bladder, enlarged prostate, spasm of the muscles of the perineum, irritation or inflammation of the lacunæ, intermittent fever, &c.

Treatment of Stricture of the Urethra.

In the treatment of this disease, the first object of the surgeon should be to ascertain the situation and extent of the stricture. This may be done by a bougie, catheter, or

urethra sound.* A soft white bougie of moderate size, well oiled, will excite as little irritation as any other instrument, and is well calculated, when softened by the heat of the urethra, to take an exact impression, with its point, of the form of the obstruction, and of its precise situation. Over the bougie, however, in many instances, the urethra sound possesses a decided advantage, since from its metallic nature, and the small size of the wire rod, it communicates a vibration to the surgeon's finger, and passes readily along the urethra, while the ball at its extremity catches readily upon any irregularity of the canal, and in this way detects the slightest obstacle. With this instrument, moreover, the situation of several strictures may at the same time be ascertained—an advantage which the bougie does not combine.

Having satisfied himself of the nature of the stricture, its position and extent, the surgeon must next determine upon the means to be employed for its removal. There are three or four methods in common use—dilatation of the stricture by waxen, metallic, or gum elastic bougies, destruction of it by the lunar or vegetable caustics, and its division by a stilet. Each is adapted to particular cases. When the strictures are numerous and of considerable length, neither the caustic nor stilet can be employed to advantage, and dilatation by the bougie must be mainly depended upon. In using this, the surgeon should make it a rule to proceed as gradually and cautiously as possible,

* An instrument invented by Mr. Charles Bell, made of silver wire, twelve or fourteen inches long, having at one end a ball, at the other a ring; the former intended for the stricture, the latter for the surgeon to hold by while the instrument is introduced.

commencing with an instrument of moderate size, such as will pass readily through the strictures without giving pain or exciting hemorrhage. It should be worn morning and evening while the patient is in bed, or at regular intervals during the day, taking care not to continue it too long, but on the contrary to withdraw it when undue irritation is excited by its presence. Having derived full benefit from the use of one instrument, others should be introduced, proportioned in size to the extent of the dilatation—being gradually increased. In many instances, the constant use of these instruments for a few weeks will effect a perfect cure; in other cases months or years will elapse, before the patient derives the necessary relief. Waxen bougies, when well made, are better adapted to the dilatation of a stricture than any others. Many patients, however, experience great benefit from the use of the flexible metallic bougie. For very long and narrow strictures, I have used, with much advantage, for many years past, fine, highly polished, and very flexible whalebone bougies.

Caustic has long been employed in the cure of strictures. It was a favourite practice with Mr. Hunter, and has since been highly extolled by his relation Sir Everard Home. I have employed the remedy for many years, sometimes advantageously, at other times with manifest aggravation of the symptoms. From all I have seen, I am disposed to conclude, that it is only adapted to strictures of small extent—such as the thread-like stricture. That much mischief has resulted from its indiscriminate and injudicious application, I well know; but its strongest advocates, also, confess, that in their own hands, false passages, hemorrhage, great irritation, severe paroxysms of fever,

and other ill consequences, have often been induced. These remarks will apply to the vegetable as well as lunar caustic, although the former has been considered by some writers to be milder in its operation, and to act upon a different principle from the lunar caustic. When a stricture is very small, and situated near the extremity of the urethra next to the glans penis, and there is reason to believe that one or two applications of the caustic will go through, it may be applied in the following way. The surgeon takes a common soft bougie, oils it, carries it nimbly down to the stricture, keeps it in contact with it a few seconds, and marks with his finger nail the bougie at the external orifice of the urethra before he withdraws it. Another bougie, composed of firmer materials, is next taken; a hole, about the eight of an inch in depth, scooped from its extremity by a sharp penknife, and a portion of lunar caustic inserted into it, and secured by squeezing together the edges of the hole—leaving the central part of the caustic a little exposed. A mark corresponding to that on the soft bougie, (which is intended to designate the depth of the stricture from the external orifice,) is then made upon the caustic bougie, and the latter at once oiled and carried down to the stricture, and kept in contact with it, for one or two minutes, or for a shorter period, should the patient complain of its severity. In two or three days time the operation may be repeated, and occasionally within the same period until the stricture gives way, or is entirely removed.

The *stilet*, although used by some of the older surgeons in the cure of stricture, was not practised in modern times, until recommended by Dr. Physick. In 1795, he first performed the operation, and has ever since continued to em-

ploy the same means, and oftentimes with the greatest success. I myself have likewise succeeded in a great many instances, in effecting a perfect cure, after bougies, the caustic, and other means, have entirely failed. Before the clinical class in the Alms-House Infirmary, some years ago, I perforated, with the stilet, a stricture of long standing, near the bulb, which had resisted for seven years the united efforts of several surgeons, to introduce an instrument of any description into the bladder. In three minutes after the division of the stricture, a catheter entered, and the patient experienced the greatest possible relief. What renders this plan of treating strictures the more valuable, is the circumstance of the operation being attended with very little pain, and with no risk, provided the operator possess an accurate knowledge of the structure of the parts. The instrument used by Dr. Physick, is a sort of lancet concealed in a cannula, that may be pushed forward or retracted at pleasure. When it becomes necessary to pierce a stricture situated near the bulb of the urethra, a curved instrument should be used.* Upon several occasions, I have used with success, in strictures seated near the anterior part of the urethra, a common couching needle, rendered blunt at the point, and sharpened at its edges. After the division of the stricture, a bougie or catheter must be worn for some time, to prevent the passage from closing again.

From the use of bougies or the caustic, it very often happens that an unnatural route or *false passage* is created.

* Drawings of these instruments may be seen in Dorsey's Surgery, vol. 2.

This is owing, generally, to unskilfulness on the part of the surgeon, or patient himself, or to the use of instruments so small as to enter the lacunæ of the urethra, instead of following the natural course of the passage. When once established, a false passage is extremely difficult to remove, and on this account great pains should be taken to guard against its formation. To the patient the disease is inconvenient, chiefly by preventing the easy introduction of the bougie or catheter, and sometimes, on this account, dangerous, in cases of retention of urine. The best plan, in general, of destroying the unnatural route, is to use a bougie larger than the one by which the disease was created, and to bend its point towards that part of the urethra opposite to the false passage. A large catheter, very much curved, will also pass, in many instances, where no other instrument can be made to follow the natural course of the urethra. Mr. Hunter was in the habit, sometimes, of performing an operation for the removal of this disease; fortunately, however, such an expedient can rarely, if ever, prove necessary. But in three or four instances, I have succeeded in establishing the natural course of the urethra, where the false passage depended upon the resistance of a stricture, by piercing the stricture with the stilet, and afterwards passing a catheter through it, and suffering it to remain in the bladder for several days.

Formerly, a few English surgeons of eminence were in the habit of *forcing* strictures, by driving bougies and catheters through them, and making an entrance by violence into the bladder. A similar practice for several years past has prevailed in France, where an instrument called *sonde conique*, is much in vogue. I will not con-

demn the proceeding, because I do not know it, from experience, to be hurtful; but I confess I have a feeling amounting to prejudice against it. Of Mr. Arnott's method of curing strictures, by the peculiar instruments named *dilators*, I have nothing to say—having never tried the plan.

Section II.

Fistula in Perinæo.

From strictures of the urethra, from blows, and other injuries, fistula in perinæo is frequently produced. In proportion as a stricture increases, the urethra, at the diseased part, is diminished; while that portion of the canal immediately behind the obstruction, by the efforts of the bladder and the continual propulsion of the urine against it, is enlarged. The irritation thus kept up gives rise to inflammation and ulceration, and an opening is at last made through the urethra, and communicates with the cellular membrane surrounding it. Into this opening the urine finds its way and lodges, and by its acrimony increases the irritation until an abscess is formed, which gradually enlarges, and finally discharges itself externally. The urine then passes out mixed with matter, both from the opening in the perinæum and from the external orifice of the urethra. In the course of time, however, it frequently happens that the strictured part of the canal, no longer feeling a forcible impulse from the stream of urine, gradually closes, and is finally obliterated, after which the whole of the urine is evacuated through the fistula. Sometimes, instead of the ulcerative process first commencing on the internal surface of the urethra, an abscess is formed from irritation in the cellular membrane exterior to the canal, into which the ulceration at last extends, and throws the two cavities into one. Fistula in perinæo sometimes

proceeds from a rupture of the urethra, (produced by external violence, or by the force of the urine upon the inflamed and tender part of the canal behind the stricture,) and the urine is instantly sent abroad into the loose cellular membrane of the perinæum and scrotum, where it forms an enormous distention or tumour, and excites most violent inflammation, that terminates in a few hours in gangrene and sloughing of the scrotum—leaving in many instances, the testicles and urethra bare, and endangering the patient's life. There is seldom more than one fistulous opening communicating immediately with the urethra, but from it numerous sinuses generally extend in various directions; and in cases of long standing, it is not unusual to find the cellular membrane of the scrotum, and of all the other parts through which the urine meanders, greatly condensed and converted into indurated tumours, upon the surface of which may be found innumerable small holes, that discharge offensive urine and matter—rendering the patient disagreeable to himself and disgusting to his neighbours.

Treatment of Fistula in Perinæo.

It will appear obvious, from what has been stated, that when fistula in perinæo depends upon stricture, the first indication in the treatment of the disease should be to get rid of the obstruction, and enable the stream of urine to regain its natural route. This, if the canal anterior to the fistula is obliterated, can be accomplished only by an operation, and the one which I have usually performed, and frequently with success, is as follows.

The urine being retained in as large quantity as possible, the patient is placed upon his back on a table, covered with a mattress or blankets, the thighs bent upon the pelvis, and the legs upon the thighs, separated and supported by an assistant on each side. A female catheter or sound is then carried down to the stricture, and there held firmly by another assistant, while the surgeon introduces a probe into the largest fistulous orifice he can find, and the one nearest to the stricture, and endeavours to feel with it the extremity of the sound, through the walls of the urethra. An incision, proportioned in length to the extent of the disease, is next made into the perinæum, along the course of the probe, until the urethra or its remains are laid bare, when the operator will be enabled to cut upon the extremity of the sound, and divide the stricture. The sound may be, afterwards, withdrawn, and a gum elastic catheter introduced at the glans penis, and carried along the urethra into the bladder, where it should be suffered to remain for several days. As soon as the natural route for the urine is thus re-established, the fistulæ diminish, the indurated cellular membrane contracts, the wound begins to fill up, and is finally closed, and, through the medium of granulations, which form around the catheter, a new urethra is created; after which, the sinuses all heal, and the patient recovers. In many instances, the operation is extremely difficult, and very painful, especially in irritable patients, and those who have suffered a long time from the complaint. Cases, indeed, are reported of patients who have died under the operator's hands.

When a fistula in perinæo is complicated with *pervious* stricture, an attempt should be made by bougies, caustic,

and other means, to destroy the stricture, or enlarge it, and afterwards to heal the fistulous opening by escharotics; the best of which, for this purpose, is the argentum nitratum. Sometimes a fistula in perinæo will contract to the size of a hair, and in that state remain for years, now and then shedding a few drops of urine. For this state of the disease, I have found a blister the best remedy.

Effusions of urine into the cellular texture of the scrotum, from rupture of the urethra, require very decisive measures. Aware of the nature of the disease, the surgeon should lose no time in making very free punctures and incisions into the skin and cellular membrane, from which he will soon find the urine to issue in considerable quantity. When performed in time, the operation may save the parts from sloughing. This, however, is seldom the case. But it is astonishing how much nature does for the patient under these circumstances; for even after the testicles have been entirely divested of integument, a new scrotum is almost always formed out of the adjoining parts. The fistula, in general, heals spontaneously.

Section III.

Enlarged Prostate.

Although the prostate gland is subject to inflammation, abscess, scrofulous enlargement, and collections of urinary calculi within its substance, these affections are rare, compared with that commonly known under the name of scirrhus. To this disease old people are almost exclusively liable, and so frequent is it among them, that, according to Sir Everard Home, few subjects beyond the age of eighty are exempt from it. The middle lobe, as well as the two lateral, is often the seat of the disease; but the symptoms differ, in some respects, according as the former or latter happens to be affected. In proportion as the middle lobe enlarges, it pushes before it the internal membrane of the bladder, and by projecting into the cavity of that viscus, immediately behind the inner orifice of the urethra, obstructs the flow of urine; which, when the tumour, as it often does, attains considerable bulk, may be entirely suppressed. The enlarged lobe also, in many instances, becomes ulcerated, and gives rise to severe pain after passing urine, and to spasm about the neck of the bladder.

When an enlargement of one, or both, of the lateral lobes of the prostate is conjoined with that of the middle lobe, the symptoms are still more urgent. A discharge of a viscid, ropy mucus, is another attendant upon enlarged prostate, and a very common symptom of disease of the

lateral lobes. The left lateral lobe is more frequently enlarged than the right. When the lateral lobes attain a considerable size, they project towards the rectum so as to diminish the capacity of that bowel, and may be distinctly felt by the finger per anum.

The *causes* of enlarged prostate are exceedingly obscure. By many the disease is attributed to syphilis, repeated attacks of gonorrhœa in early life, strictures of the urethra, inordinate indulgence with women, high living, intemperance, &c. But these inferences are rather supposititious and gratuitous, than founded upon any certain data.

Treatment of Enlarged Prostate.

The remedies for this disease are palliative only. Opium, internally administered, and in the form of enema, will prove highly serviceable in subduing spasm about the neck of the bladder, and thus enabling the patient to pass urine. Frequently, however, every effort of the kind will be unavailing, and the catheter must be employed. One of elastic gum, without the stilet, very flexible at the point, and of large size, will be found to give less pain, and enter with greater facility than a metallic instrument. It should be kept in the bladder for several days in succession, and after the urgent symptoms have somewhat subsided, introduced occasionally. In addition to this treatment, the use of mild purgatives, and attention to diet, will be required.

Section IV.

Retention and Incontinence of Urine.

From severe gonorrhœa, strictures in the urethra, enlargement of the prostate gland, spasm at the neck of the bladder, stone in the bladder, hemorrhoids, fistula in ano, rupture of the urethra, blows upon the perinæum, stimulating diuretics, the application of blisters, injuries of the spine, paralysis of the bladder, stones in the urethra, and some other causes, a retention of urine frequently arises.

The disease, when it occurs amongst old people from paralysis, is not often followed by serious consequences, unless it should be mistaken for an *incontinence* of urine; a mistake which is apt, among the inexperienced, to arise from the circumstance of the urine constantly passing off by drops or in a small stream—one of the most decided symptoms of *retention*. Persons advanced in age are extremely apt to neglect the calls of nature, and suffer the urine to collect in the bladder in large quantity, or when they do make water are not particular enough in discharging the whole of it. From these and other causes, the bladder at last loses its power of expulsion, and the urine accumulates. As a part of it, however, is in general continually passing off by the urethra, that in the bladder seldom exceeds a certain quantity, and in this way the disease may be kept up for weeks together.

The retention which takes place in young people, from gonorrhœa, strictures, or any inflammation or excitement about the urethra, neck of the bladder, or neighbouring parts, is very different in its character, and often in its result, from that just spoken of. The urine seldom escapes, even in the smallest quantity, by the urethra, and must of course accumulate, (unless the patient be relieved,) until some part of the bladder gives way—either by ulceration or sloughing. It is astonishing, however, to what an extent the bladder will yield in some cases before its parietes are destroyed. Some years ago I was called to a child about two years of age, supposed to labour under ascites, and so strongly did the enlargement and feel of the belly resemble that disease, that I at first took it to be a case of the kind. But upon inquiring into the history of the com plaint, I ascertained that its duration had not exceeded seven days, and that during this period the patient had passed no urine. This induced me to examine the urethra, in the mouth of which I discovered a calculus that blocked up the passage completely. Upon enlarging the orifice with a lancet, the stone was instantly pushed out, and followed, to the surprise of a medical attendant and myself, and to the great relief of the patient, in a little time by two quarts of urine. Many instances are related by writers, of the bladder becoming so distended by urine, as to rise above the umbilicus; and Sir Everard Home relates an instance in which the celebrated Mr. Hunter actually *tapped* the bladder, mistaking the swelling for a dropsy of the belly. But such cases are anomalous; and in most instances, long before the bladder is distended to a great size, it ulcerates or sloughs at the fundus or neck, and the urine is sent abroad into the peritoneum, or discharged through the rec-

tum, or into the cellular membrane of the scrotum or perinæum. In either event the patient generally dies. During the progress of the distention the patient suffers exceedingly, grinds his teeth in agony, tosses about the bed, or walks his room with his body almost bent to the floor, is seized with chills, cold sweats and fainting, which are followed by fever, great restlessness, extreme thirst, intolerable anguish, swelling of the abdomen, hiccup, delirium, and death. He seldom survives beyond the sixth or seventh day.

Incontinence of urine is the reverse of retention. There are two or three varieties of the disease. Sometimes the urine passes off by the urethra as soon as it is secreted; at other times the patient can retain it for a certain period, and is then obliged suddenly to evacuate. In a third variety of the complaint, the discharge generally takes place during sleep. This is commonly confined to young children, while the other varieties are chiefly met with in adults, and are dependent for the most part upon general or local paralysis, general debility, injuries, malformation of the urinary organs, hemorrhoids, stone in the bladder, &c.

Treatment of Retention and Incontinence of Urine.

When retention of urine arises from stricture of the urethra, or from any inflammatory affection of the canal, or parts adjacent, blood-letting, the warm bath, purgatives, and opiate enemata, should have a full trial. If these fail,

a gum elastic bougie may be carried down to the obstruction, and kept in contact with it a few seconds, after which, in many instances, the urine will flow. Should this, however, not produce the desired effect, the surgeon will then endeavour to introduce a catheter into the bladder. Than this, there is not, in all surgery, a more important, and, under certain circumstances, more difficult operation—an operation requiring the utmost gentleness, patience, perseverance, and skill. Rudeness and force, indeed, independently of the unnecessary pain and punishment they inflict, seldom contribute towards the end in view. It is true that some eminent surgeons, in difficult cases, advise the forcible entry of the catheter, but it should be remembered that a great majority of others, not inferior to them in authority, condemn the practice in the most pointed terms.

In general, the most favourable position for the easy introduction of the catheter, is the recumbent. But a good rule to observe on such occasions, is, if the surgeon does not succeed readily while the patient is in one position, to change it for another. The *curvature* of the instrument is also a matter of importance; on this account, the operator should be provided with a number, varying in shape and size. Gum elastic catheters, with or without the stilet, are better suited to most cases than metallic instruments. Sometimes, however, I have succeeded easily with a silver catheter, when a gum elastic would not enter. In using the latter, there is an advantage now and then obtained, especially when the middle lobe of the prostate is enlarged—in withdrawing the stilet an inch or two, so as to leave the extremity of the instrument more flexible than it otherwise

would be. With the same view, Dr. Physick* has long been in the habit of using a gum elastic catheter, with a flexible wax bougie fixed upon its extremity. Stilets made of brass, instead of iron wire, are in many respects the most useful.

Having oiled the catheter, the surgeon takes hold of the glans penis, on its sides, immediately behind the corona, enters the instrument, with its concavity towards the abdomen, at the urethra, carries it along steadily, and with one continued sweep, (the penis being drawn upwards at the same time upon the instrument, and laid nearly parallel with the abdomen,) until it reaches the bulb or triangular ligament of the urethra. Here the passage takes a sudden turn upwards, and it will be necessary to accommodate the point of the catheter to the curve. With this intention, the handle of the instrument is suddenly, but cautiously and without force, depressed. This manœuvre elevates the point, and causes it to start over the edge of the triangular ligament, and enter the bladder. Should much difficulty be experienced, however, in this stage of the operation, it may be often overcome by placing a finger in the rectum, and with it, lifting the end of the catheter. Whenever an obstruction is met with in the urethra, which the catheter does not readily pass, instead of attempting to overcome it by force, it will be proper always to withdraw the instrument a little, elevate its point, and then push it on again.

* For a description and drawings of this instrument, see Dorsey's Surgery, vol. 2.

In retention of urine from paralysis, the introduction of the catheter is seldom attended with difficulty, and on this account the operation may be repeated two or three times a day, or as often as may become necessary. But when the surgeon finds it inconvenient to attend for that purpose, a flexible catheter may be left in the bladder, for two or three days at a time, and the urine permitted to flow off, at stated periods, in place of dribbling away constantly. After the bladder has recovered its tone, the catheter should be discontinued. Having experienced considerable difficulty in introducing the catheter, in some obstinate cases of retention of urine, it occurred to me, in 1811, that the resistance might, perhaps, be overcome by introducing the pipe of a syringe into the orifice of the urethra, and throwing in gently a stream of tepid water. Having accordingly tried the plan successfully, in a few cases, I was induced to recommend the practice, for several years, in my lectures. Subsequent experience, however, taught me that very little reliance could be placed upon the method, and I have since abandoned it altogether. *Amusat*, of France, has, within the last few years, resorted to a similar expedient, and, according to his account, with great success.

If, in spite of the efforts of the surgeon to relieve the patient by the remedies pointed out, and it is found impossible to introduce the catheter, it will become necessary to *puncture* the bladder. The operation may be performed above the pubes, or through the rectum. But it will be proper to premise that neither one nor the other are indispensably necessary once in a hundred times.

The operation *above the pubes* is performed in the fol-

lowing way. The patient being laid upon a table, an incision, about an inch and a half long, is made in the linea alba, immediately above the pubes, through the integuments and fat, and between the pyramidales muscles, until the distended bladder is distinctly felt, when a curved trocar, six inches in length, covered by its cannula, is made to pierce the bladder as near the pubes as possible. A vessel being held between the patient's thighs to receive the urine, the stilet is withdrawn, and the fluid evacuated. To prevent the cannula from slipping out, tapes are fastened to its wings, and secured to a bandage passed around the body. Its extremity is also plugged up to prevent the perpetual flow of the urine. The greatest objection to this operation, is the liability of the urine to escape, (after the bladder becomes flaccid,) into the cavity of the abdomen. Besides this, the constant presence of the silver cannula is apt to excite irritation, especially when it is so long as to rest upon the back part of the bladder.

The puncture of the bladder, *through the rectum*, I should prefer in every instance, provided the prostate was not so much enlarged as to require the instrument to be introduced high up the intestine. To perform this operation, (which is still more simple than that above the pubes,) to advantage, the patient should be placed in the position for lithotomy, and the forefinger of the left hand carried up the rectum, as a guide to the trocar, which is held in the right hand, introduced into the rectum, and made to perforate the anterior part of that intestine, at its centre, immediately above the prostate. The stilet being withdrawn, and the urine evacuated, the cannula is plugged, and secured in its situation by tapes. The patient's bowels should

afterwards be kept in a soluble state, to prevent the cannula from being disturbed during an evacuation of the fæces. After the natural route through the urethra is restored, the cannula may be withdrawn, and the opening in the rectum allowed to heal. Whether the operation of puncturing the bladder be performed above the pubes, or through the rectum, it is very important that it should not be delayed beyond the *third* or *fourth* day; for it has been found by experience, that after this period, the case has usually terminated fatally.

For *incontinence* of urine, when it occurs in adults, and depends upon general or local debility, the internal use of cantharides, muriated tincture of iron, bark, and opium, conjoined with the cold bath, and blisters to the sacrum, will sometimes effect a cure. That variety of incontinence peculiar to children, gradually subsides spontaneously, as they increase in age. Parents, and children themselves, to guard against this infirmity, have sometimes most improperly, applied ligatures to the penis over night. From this practice, there are numerous instances on record, of ulceration of the urethra, or of sloughing of the penis, at the part embraced by the ligature.

On Diseases of the Urethra and Prostate Gland, consult *Hunter on the Venereal—Home on the Treatment of Strictures of the Urethra and Œsophagus*, 3 *vols. edit.* 4—*Whately's Improved Method of Treating Strictures of the Urethra, edit.* 2—*Letters concerning the Diseases of the Urethra, by Charles Bell—Principles of Surgery, by John Bell, vol.* 2. *p.* 209—*Howship's Practical Observations on Diseases of the Urinary Organs*, 1816—*Wilson's Lectures on the Structure and Physiology of the Male Urinary and Genital Organs, and their Diseases*, 1821—*Desault's*

Works, by Smith—C. Bell's Surgical Observations, p. 86*—C. Bell on the Diseases of the Urethra, &c. by J. Shaw—Bingham on Strictures of the Urethra,* 1821*—Home on the Treatment of Diseases of the Prostate Gland —Hey's Practical Observations in Surgery, article Retention of Urine, p.* 388*, edit.* 3*—Dorsey's Surgery, vol.* 2*—C. Bell's Operative Surgery, vol.* 1*—Colles's Surgical Anatomy, p.* 159*, article Passing the Catheter —Abernethy on the Operation of Puncturing the Bladder, in Surgical Works, vol.* 2*. p.* 189*—Cooper's First Lines, vol.* 2*. p.* 215*.*

Section V.

Urinary Calculus.

Most calculous concretions are formed originally in the kidney, and thence find their way, along the ureters, to the bladder, and, when too large to pass off with the urine, remain in that viscus and serve as nuclei for other sabulous depositions. But any extraneous body, accidentally lodged in the bladder, may lay the foundation of a stone. A drop of blood, a portion of inspissated mucus, a pin, a piece of bougie or catheter, a musket ball, has often produced the disease. Many years ago I operated on a boy four years old, and took from his bladder a stone, as large as a pullet's egg, in the centre of which was found the greater part of a needle.

Urinary calculi vary exceedingly in form, size, colour, consistence, and chemical composition. Some are very rough on the surface, others perfectly smooth; in shape most of them are oval, a few quite round, whilst others are oblong or angular. The difference in magnitude is not less remarkable—being met with from the size of a pea to that of a cocoa-nut. Calculi differ from each other in colour as much as in size and form; the most common variety is generally of a yellowish brown tint; some are nearly as white as chalk, and others again red or of a deep chocolate brown. In consistence also there is the utmost variation; for, at the slightest touch some crumble into dust, whilst

others almost resist the stroke of a hammer. Scheele and Wollaston were among the first to investigate the chemical composition of urinary calculi, and their discoveries have led others to pursue the same path. According to the latest and best writers, these substances are found to consist of the following materials: 1st, of lithic acid; 2d, of the lithate of ammonia; 3d, of the phosphate of magnesia and ammonia; 4th, of the phosphate of lime; 5th, of the oxalate of lime; 6th, of the triple phosphate of magnesia, ammonia and phosphate of lime; 7th, of the carbonate of lime. Of these the lithic acid calculi are by far the most numerous.

Urinary calculi may be contained in the kidney, ureter, bladder, prostate gland, or urethra; but the bladder is their most common receptacle. Generally they lie loose within the cavity of that viscus, and at its most depending part. Sometimes they are contained in *cysts*, formed between the coats of the bladder at the termination of the ureters, or between the folds of a contracted bladder; at other times they are fixed upon a fungous excrescence, the granulations from which shoot into the interstices of a rough stone, and hold it fast. The bladder may contain a single stone, or a great number. Upwards of a hundred have been found. When numerous, they are generally smooth upon their surface, and sometimes, in particular places, highly polished, from continued friction upon each other.

The *symptoms* of stone must depend, in a great measure, upon the particular situation it happens to occupy. When detained in the pelvis or infundibulum of the *kid-*

ney, the concretion sometimes attains a large size, without subjecting the patient to much pain or inconvenience; on the other hand, its presence is occasionally productive of so much irritation as to excite suppuration of that gland. During the passage of a calculus along the ureter, the patient suffers in most instances excruciating pain, has a frequent desire to make water, and can pass only a few drops at a time, and that very high coloured and sometimes mixed with blood. So severe is the pain in some cases, that the patient finds it impossible to leave his bed, and is obliged, in order to obtain temporary relief, to bend himself almost double. Fever, eructation, nausea, vomiting, and spasmodic retraction of the testicle, are common accompaniments of the disease. As soon as the stone drops into the bladder, the symptoms subside. Sometimes, however, the patient becomes easy for a few hours, even before the stone leaves the ureter, and then has a relapse. This may occur repeatedly.

An *encysted* stone, so long as it continues encysted, seldom gives rise to any severe symptoms; but a stone that lies loose in the bladder, and is liable to move about, must always excite more or less uneasiness, whether it be rough or smooth, large or small. One of the first symptoms of stone in the bladder, is a frequent desire to pass urine, and severe pain upon voiding the last drops of it. About the same period, also, the patient complains of an itching at the glans penis, to relieve which, he soon gets into the habit of pulling or elongating the prepuce. Another symptom, is the sudden stoppage of the urine while passing in a full stream. This arises from the stone being carried, by the contraction of the bladder, or by the stream of

urine, to the neck of the bladder, where it blocks up the inner orifice of the urethra; in proof of which, if the patient lie down or change his position, the water flows again. After these symptoms have continued for some time, the patient becomes troubled with tenesmus and prolapsus ani, induced by the constant straining and efforts to empty the bladder. When the stone is rough on its surface, there is often a good deal of mucus discharged along with the urine, which is now and then mixed with blood. Sometimes the patient is very sensible, when he turns upon his side, or suddenly changes his position, of something rolling in his bladder. The same sensation is experienced whilst on horseback, or in a carriage. Under the sufferings occasioned by the symptoms enumerated, the patient may live for a great number of years. Gradually, however, his health declines, the bladder contracts to a very small size, becomes thickened and diseased, and at last death takes place from long continued irritation and derangement of most of the bodily functions.

When the *prostate gland* contains a number of stones, it may be possible to feel them through the coats of the rectum, by passing the finger within the gut. Dr. Marcet mentions a case in which Sir Astley Cooper was able, by this expedient, to detect a number of calculi moving in a cyst within the prostate, and to hear a distinct clashing as their surfaces were pressed together.* Calculi, when detained in the *urethra,* generally stop behind the bulb, or at the external orifice of the passage. From being pressed upon by the stream of urine, they are sometimes imbedded

* Marcet on Calculous Disorders, p. 19.

in the substance of the penis, and afterwards do not obstruct the urethra.

The *causes* of the formation of urinary calculi, although frequent attempts have been made to investigate them, have never been unravelled. We know, indeed, little beyond this—that the disease prevails in certain countries and districts, more than in others, and that in some climates, especially very warm ones, it does not exist. Throughout the United States, which embrace a very extensive tract of country, fugitive cases may be every where seen, but upon the whole, the complaint must be considered by no means common, if we except some portions of the western country, especially Kentucky, Alabama, and Tennessee, where it is exceedingly frequent, and usually attributed to the use of limestone water.

Treatment of Urinary Calculus.

When a patient is suffering from a fit of the gravel, as it is usually called, or in other words, from the passage of a calculus along the ureter, the most decisive treatment must be at once adopted. If robust and vigorous, several ounces of blood may be taken from the arm, and a brisk purge administered immediately afterwards. These should be followed by immersion of the whole body in a warm bath. If by these means the pain is not diminished, ten or fifteen drops of spirit of turpentine may be given, three or four times a day. This remedy has been used by Dr. Physick, for many years, with the greatest success. A combination of turpentine and opium, according to Dr.

Marcet, was formerly employed, as a quack medicine, in England, with great benefit in this complaint. By the advice of Dr. Physick, I prescribed, two or three years ago, the tincture of pokeberry juice, in an obstinate case of lithiasis, and with the most decided relief to the patient. It should be administered in doses of a desert spoonful two or three times a day. Sometimes I have known the patient much relieved by suddenly throwing up the rectum a stimulating enema. Opiate injections, also, in some cases, prove highly beneficial.

The existence of a stone in the *bladder*, can only be determined, positively, by *sounding*. This preliminary operation should, therefore, always be performed before the surgeon enters upon the treatment of the disease. By sounding is meant the introduction of a steel instrument, resembling a catheter, (but solid instead of hollow,) into the bladder. The rules formerly pointed out for the management of that instrument, in cases of retention of urine, should also be observed in the introduction of the sound. Very often the stone cannot be felt, in consequence of its lodging in a depending part of the bladder, below the reach of the instrument. In such cases, the finger is put into the rectum, and the lower part of the bladder pressed upwards, and the stone being carried by this manœuvre along with it, rubs against the instrument. But this expedient sometimes fails; in that event, the practice first pointed out by Dr. Physick should be pursued—by placing the patient "nearly on his head," so as to render the fundus of the bladder the lowest part, and thus bring the stone in contact with the point of the sound. The surgeon should take care not to mistake a stone in the urethra, or prostate

gland, for one in the bladder. He must particularly remember, moreover, never to sound a patient during a fit of the stone, or immediately after his arrival from a journey. Having ascertained that the bladder contains a stone, its removal should next be determined upon. This can be accomplished only by the operation of *lithotomy*. But, before this is resorted to, the surgeon must endeavour to mitigate the symptoms as much as possible, or in other words, to prepare the patient for the operation. Formerly many attempts were made to destroy a stone, either by the use of internal medicines, or by the injection of fluids into the bladder. The practice, however, has long been abandoned—having been found ineffectual. But in another point of view it has proved highly useful—by relieving the symptoms, and thereby rendering the patient's chance of recovery after an operation more certain. The best medicines, for this purpose, in most cases, are the alkalies, especially in the form of soda water, or the carbonate of soda. Magnesia, also, has often proved very serviceable. Together with this treatment, the patient should be obliged, for two or three weeks before the operation, to live on a low diet, and take occasional purgatives. The operation should not, if it can be avoided, be performed during very warm, or very cold weather. A few hours previous to the operation, the rectum should be emptied by an enema, the perinæum shaved, and a tape tied around the patient's penis to prevent him from making water. The latter is so important, that to ensure its observance, a careful attendant should watch the patient from the time the penis is tied, until the operation. Various modes of performing lithotomy have been practised from time immemorial; but it is merely my intention in this place to describe the *lateral*

operation, as it is performed at the present day by the most eminent surgeons—with the *gorget.*

The *instruments* are two or three scalpels, a curved probe-pointed bistoury, a straight sharp-pointed bistoury, a staff with a large deep groove, Physick's gorget,* several forceps, smaller than they are usually made, a scoop, tenacula, ligatures, sponges, a curved needle and forceps for the pudic artery, a large pewter injecting syringe with a pipe six inches long, tepid barley water carefully strained, strong bands of woollen or muslin, two inches broad and three or four yards long, and a bowl of warm oil.

A narrow dining table is selected, and the leaves turned down. Over the table is placed a thick blanket, several times folded. On this the patient, dressed merely in a shirt and loose night gown, is laid—with a pillow under his head, his pelvis resting on the lower edge of the table, and his legs and thighs supported by an assistant, on each side. The surgeon unties the penis, dips his staff in warm oil, introduces it into the bladder, and having satisfied himself, and the other medical attendants, of the presence of a stone, gives the staff to a third assistant, with an injunction not to let its point slip from the bladder. He then passes each wrist through loops formed at the extremities of the bands or fillets, directs the patient to grasp the soles of his feet, and fastens them and the hands together by numerous turns of the bandage. The assistant holding

* This instrument differs from the common gorget in having a moveable blade, or one that can be separated from the back, for the purpose of sharpening it to greater advantage. For a particular description of it, see Dorsey's Surgery, vol. 2d.

the staff steadily with one hand, and standing on the side of the patient, is then directed to raise and support the scrotum and testicles with the other hand—taking especial care that the end of the staff is fairly within the bladder. The assistants, appointed to secure the patient's limbs, must each place a knee in their armpit, grasp a foot with their hands, and sustain the thighs nearly in a perpendicular position, separating them, at the same time, moderately. The surgeon then seats himself before the patient on a low stool, (having previously arranged his instruments in the order he will require them, on a small table placed within his reach,) takes a scalpel of moderate size, makes an incision in the left side of the perinæum, commencing a little below the arch of the pubes, extending downwards, with a slight obliquity, between the rectum and tuberosity of the ischium, and terminating opposite the lower margin of the anus. This first cut is made, not with the point of the knife, but with its convex edge, through the integuments, fat, and perinæal fascia. By repeated strokes of the knife the transversales muscles are next unbridled, and the membranous part of the urethra and prostate gland laid bare. At this stage of the dissection, the operator will sometimes find it necessary to stop, and take up the transversalis perinæi artery.* The membranous part of the urethra and staff being distinctly felt by the forefinger of the left hand, the surgeon next takes the *sharp-pointed* bistoury, carries it to the bottom of the wound, with its back towards the rectum, and opens the membranous part of the urethra, to the extent of half an inch or more, by cutting from behind forwards, or from the prostate to-

* Usually this vessel does not require the ligature.

wards the bulb. As soon as the urethra is opened, a stream of urine, (provided the patient has retained it,) issues through the wound. Without loss of time the surgeon next lifts the gorget, fixes its beak in the groove of the staff, takes the handle of the staff from the assistant, depresses it, balances for a moment the two instruments on each other, runs the beak of the gorget backwards and forwards, two or three times, to be certain that it is fairly in the gutter of the staff, then with a slow but steady and decided movement carries the instrument onwards to the bladder through the prostate gland. A sudden and impetuous gush of urine announces the completion of this stage of the operation. The gorget being withdrawn, the left forefinger of the operator is immediately introduced, the stone felt, and the staff taken away. Still keeping the finger in the bladder, the surgeon then takes a small pair of forceps, and with the blades shut, carries the instrument through the opening in the prostate, alongside the finger, touches the stone, removes the finger, expands the blades of the forceps, seizes the stone, (gently, lest it break,) parallel, if possible, with its longest diameter, and gradually extracts it. As soon as it is removed, an accurate examination should be instituted, in order to discover whether there be any other stones left behind. If so, the forceps must be again and again introduced, until the whole are extracted. To clear the bladder of any fragments, sand, or clotted blood, that may happen to remain, the pipe of the syringe should be introduced, and a quantity of tepid barley water thrown in, repeatedly, until the bladder is completely rinsed out. Any vessel of importance, that may happen to have been cut, will probably continue to bleed after the stone has been extracted, and should be secured by ligature without delay. If the

pudic artery is divided by the knife, or gorget, it will pour out blood copiously, and from this cause many patients have lost their lives. The forceps and needle* used by Dr. Physick, for deep-seated arteries, will be found the best instrument for taking it up.† As soon as the hemorrhage has stopped, a gum elastic catheter, of large size, should be carried through the wound into the bladder, the bandage removed from the hands and feet, and the patient laid in bed on his left side—the thighs being lightly bound to each other, by two or three turns of a roller. The gum elastic catheter, projecting from the wound, serves to carry

* See vol. 1st. p. 70.

† It sometimes happens that after the stone has been removed, and the patient put to bed, secondary hemorrhage takes place, and that the blood finds its way into the bladder, where it excites so much irritation as to cause a contraction of that viscus, and a sudden discharge of urine and coagulated blood through the wound. In fifteen or twenty minutes the same accumulation and expulsion again take place, and may continue until the patient is exhausted, unless the surgeon understands the nature of the accident and the mode of treating it. In all such cases I have reason to believe, from what I have seen, that the hemorrhage proceeds from the venæ vesicales, or from some of the arteries about the prostate. Under these circumstances, a very ingenious mode of arresting the flow of blood was executed many years ago by Dr. Physick, (in the case of a Dr. B.) by introducing a large gum elastic catheter into the bladder through the urethra, and at the same time a long slip of lint between the lips of the prostate, so as to keep them in accurate apposition. The flow of blood being thus stopped, and the urine passing off by the catheter, instead of flowing through the wound, it follows that the hemorrhage will not return, so long as the lint retains its position, and it is important that it should be left for several days, or until suppuration takes place. By adopting this plan, I have saved the lives of two patients, who otherwise I am sure must have perished.

off the urine, which being received in a dish, the patient is kept constantly dry and comfortable. For several days the urine continues to pass by the perinæum; at length, however, it is discharged through the penis, and very little runs through the wound. The catheter should then be removed, and, in a short time, the opening in the perinæum will heal. In a few rare instances, indeed, the incisions have healed by the first intention; but in general three or four weeks elapse before a cure is effected.

The operation of lithotomy, as I have described it, must be understood as adapted to the adult, and as calculated for cases unattended with difficulty. The same rules should be observed, in performing the operation on infants and children—the instruments and incisions, in such cases, being proportionally smaller. In such subjects, moreover, the surgeon may expect to experience some trouble, from a frequent protrusion of the rectum, during the operation, inasmuch as most children, afflicted with the stone, are subject to prolapsus ani. Upon the whole, however, the operation of lithotomy in children is, compared with that of the adult, attended with few difficulties.

To guard against accidents, and to prepare the young surgeon for difficulties, which at some period or other he may expect to encounter, the following mementos should be carefully attended to.

1st, To examine *minutely* every instrument, before it is used, especially the gorget and staff. If the cutting edge of the former be not extremely sharp, it will not divide the prostate gland, but pushing it forward, will pass be-

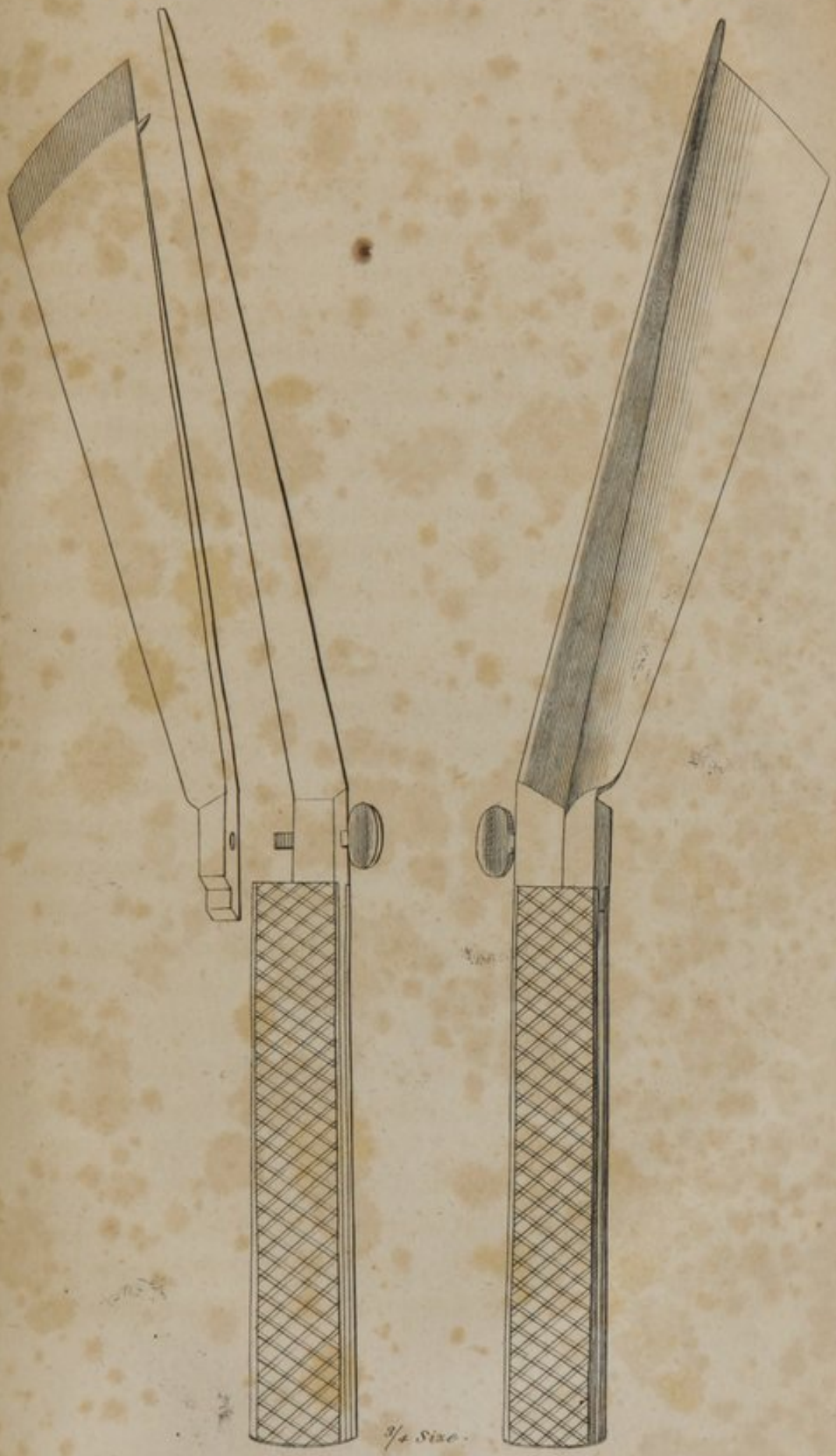
tween the bladder and rectum, and deceive the surgeon, who, supposing that he has opened the bladder, thrusts the forceps into the wound, makes fruitless efforts to extract the stone, and, perhaps, may tear away, as has happened, the prostate and part of the bladder. If the gorget be not accurately fitted to the staff, it may be discovered, during the operation, and at the critical moment of pushing the instrument into the bladder, that the beak is too large for the groove. Under these circumstances, should the operator persevere in his attempts to thrust the gorget home, great mischief may ensue. The *size* of the gorget must always be proportioned to the age and size of the patient. A gorget, for an adult, should never exceed in breadth three-quarters of an inch, and, for most patients, one five-eighths of an inch will answer. Children seldom require an instrument beyond three-eighths of an inch in width. An unusually wide gorget always endangers the pudic artery. The most experienced lithotomists, however, of modern times, have always inculcated, and, as I conceive, justly, a free incision of the prostate and neck of the bladder, rather than tear these parts, in attempting to get out a large stone. How then can this be accomplished unless a *broad* gorget be employed? The answer is very easy. The chief object of the gorget is to make an opening into the bladder; if this opening is sufficiently large to admit the finger of the surgeon and enable him to touch the stone, this is all he can require. Finding, by the feel, the stone too large to come away through the tract made by the gorget, the *curved probe-pointed bistoury* is at hand, and with this the wound may be instantly enlarged to the requisite extent, and without exposing the pudic artery. In running the gorget along the staff, through the pros-

tate and bladder, care should be taken to *depress* its handle, in order that the blade may be sufficiently elevated to pass in a line corresponding with the axis of the pelvis. This the operator sometimes finds it difficult to accomplish, owing to the blade of the gorget being made as broad near the handle of the instrument as at its point, and on this account not calculated to rest in the lower angle of the incision. To obviate this difficulty, I have, for several years past, had the blades of gorgets so constructed, as gradually to taper from the outer corner of the cutting edge to the handle of the instrument. *See Plate VIII. fig.* 1, *and* 2.

2d, If the surgeon from timidity, or any other cause, does not make his incisions in the perinæum ample, but leaves some of the fibres of the transversales perinæi muscles uncut, he will find, in attempting to extract the stone, great resistance, and a constant tendency in it to slip from the grasp of the forceps. This resistance usually arises from the fibres of the transversalis perinæi alter. In such a case the forefinger of the left hand should be carried towards the bottom of the wound to depress the rectum, while the remaining obstruction is removed by the knife. A wound of the rectum will not prove so serious an accident as some have represented; but it should nevertheless be carefully avoided.

3d, The lithotomy forceps are, in general, made unnecessarily large and clumsy; so large, indeed, as often of themselves to fill up the opening through the prostate. The teeth, too, on the inner surface of the blades, are often so large, as to act like wedges, and break the stone the moment it is grasped. For a child, a forceps very little larger

Plate 8. V. 2.



3/4 Size.

than the common pocket case instrument, will serve a better purpose than the one usually employed; and the smallest forceps contained in the lithotomy case, provided the handles be somewhat lengthened, will answer for an adult.* If a stone should be so large as to require breaking, a strong pair of forceps, with a screw in the handles, will prove more effectual than the complicated instrument of Mr. Henry Earle. Although I have had occasion, however, in three instances, to break large stones, I have never experienced any difficulty in effecting it with the common forceps. Frequently, a stone will break under very moderate pressure of the forceps, and when the surgeon is unwilling for it so to do. In this event, great patience and gentleness must be exercised in extracting the fragments by the scoop, and by injections of barley water. It sometimes happens that one portion of a stone is imbedded in a cyst in the coats of the bladder, while the other projects into its cavity. This happened in a case, upon which I operated, at Alexandria, under the care of two distinguished physicians of that place, Drs. Washington and Sims. Having seized the stone with the forceps, the projecting half broke off, and the remainder, with great difficulty, I was obliged to scoop out of the cyst with my finger. The patient had long suffered from the disease, was greatly exhausted before the operation, and died ten or twelve days after it. Some years ago, I operated on a young man in the Alms-House Infirmary, and took from his bladder a stone about the size of a wal-

* My colleague in the Alms-House Infirmary, Dr. John Rhea Barton, has invented a pair of lithotomy forceps, (with an oval hole in each blade, resembling the midwifery forceps, and not unlike the old polypus forceps of Heister,) well calculated, it appears to me, to hold a small stone, and prevent it from slipping.

nut, and afterwards introduced my finger to ascertain if there were any others left, when to my great surprise, I discovered that the fundus of the bladder, for a considerable extent, was encrusted with calculous matter, which I pealed off in successive layers, some of which were nearly half an inch thick. This patient perfectly recovered. Under circumstances such as I have detailed, the surgeon should never for a moment lose his self-possession, but proceed cautiously and gently, but firmly, until he has effected his purpose. In the common operation of lithotomy, too, it should never be necessary to pull violently with the forceps, but the instrument must be humoured, and its position changed, and twisted gently in a variety of directions.

4th, The *after treatment* of lithotomy is oftentimes more important than the operation itself; and the surgeon would do well never to operate, unless he could attend the patient throughout the whole course of his confinement. The shock communicated to the system by the severity of the operation, is sometimes such as greatly to endanger the patient's life, and, indeed, some have actually died on the table, or a few hours after—reaction having never been established. So long as this state of the system continues, stimulants must be employed. After reaction takes place, then inflammation must be guarded against, and to prevent this, the antiphlogistic system, to the necessary extent, will be naturally resorted to.

A Dr. *Civiale*, of Paris, has lately made his name very famous, by a proposal for removing the stone from the bladder, by what he calls the operation of *lithotritie*. His method

consists in the introduction into the bladder through the urethra, of a long straight silver cannula, containing a forceps with three blades, and a steel rod, formed at the point like a drill or perforator. Having passed the instrument, the blades of the forceps are expanded, the stone seized, and a rotatory motion communicated by a drill bow to the upper extremity of the perforating rod, by which means its point is made to bear upon the stone, and tear it into pieces sufficiently small to be carried off by the urine. The idea is a most ingenious and beautiful one, but like many others, I fear, not adapted to *general* practice. From accounts received, there is reason to believe, that Dr. Civiale has actually succeeded, by these means, in removing the stone, in two or three instances—but failed in many others.

During the winter of 1824, I was present at an operation of the kind, performed by Dr. Physick. With great difficulty, (and not without previously introducing a *curved bougie* into the cannula,) the instrument, after a trial of three-quarters of an hour, during which the patient suffered immensely, was gotten into the bladder; but the stone, owing perhaps to its lodgement in a pouch, as was afterwards ascertained, could not be touched.* The patient, from long and unavoidable exposure, took cold, was seized with intermittent, and died a few days afterwards. A similar operation was shortly afterwards attempted by Dr. Barton in the Pennsylvania Hospital, but the man suffered so much pain from the instrument, and the bladder contracted so closely around it, as to render it impossible to proceed. Drs. J. K. Mitchell and Harris soon after tried a similar experiment upon a patient in Delaware, but the man died

* The patient also laboured under enlarged prostate gland.

in a few days after the operation. In *three* instances I have introduced the instrument of Civiale into the bladders of different patients labouring under stone, none of whom could bear it to remain beyond two minutes. I mention these facts, not for the purpose of discouragement, but as an act of duty. Any expedient calculated to supersede so dreadful an operation as that of lithotomy, should be embraced with eagerness, and the time may come, perhaps, when the method of Civiale may be so modified and improved, as to deserve all the praises that in its present state have been so inconsiderately lavished upon it.*

* Since the publication of the above statement, it appears† that Dr. Civiale's opportunities of testing the merits of his operation have been very considerable, and that from the years 1823 to 1826, he has operated upon *forty-three* patients of different ages, constitutions, &c. all of whom, except six, recovered; out of which number, five died from causes unconnected with the calculous affection or the operation. This result of course is very flattering, and reflects great credit upon the skill and dexterity of Dr. Civiale; yet it is allowed on all hands by those who have seen him operate, (and with several of these we have conversed,) that the difficulties which he has experienced, have sometimes been very considerable, and moreover, that no other European surgeon, and many of the first reputation have attempted the operation, has hitherto been able to meet with any success. We are aware that the difficulty of an operation should never be a barrier to its performance, and we therefore still repeat the hope that those attendant on *lithotritie* may eventually be so far diminished as to render a resort to the measure within the reach of most members of the profession. Yet it may be confidently stated, that the operation can never entirely supersede that of *lithotomy*, inasmuch as cases will always be met with, in which the stone will be found of very large size, and the circumstances of the case, in other respects, so peculiar as to admit of its being extracted only by the knife.

† See De La Lithotritie, ou broiement de la pierre, dans la vessie; par le Docteur Civiale. 8vo. A. Paris, 1827.

The *high operation* of lithotomy, or that above the pubes, an account of which it is said was first given by Franco, in 1556, was formerly much practised, particularly by Frere, Côsme, Douglass, and Chesselden. The unfortunate termination, however, of numerous cases caused it to be abandoned almost entirely. Still it has been revived at different periods, and latterly by Souberlielle, of Paris, and Carpue and Sir Everard Home, of London. But, even under the most favourable circumstances, it is an operation greatly inferior to the *lateral*, and indeed should only be practised, I conceive, in cases where the stone is ascertained to be of extraordinary magnitude, or where the prostate gland is very much enlarged. The principal objections to the operation arise from the difficulty of preventing the escape of the urine into the cavity of the pelvis, and the danger of wounding the peritoneum. If the operation be determined on, I should prefer the mode of executing it devised by Sir Everard Home, and as described by him in the following case.

"An incision was made in the direction of the linea alba, between the pyramidales muscles, beginning at the pubes, and extending four inches in length: it was continued down to the tendon. The linea alba was then pierced close to the pubes, and divided by a probe-pointed bistoury to the extent of three inches. The pyramidales muscles had a portion of their origin at the symphisis pubis detached to make room. When the finger was passed down under the linea alba, the fundus of the bladder was felt covered with loose, fatty cellular membrane. A silver catheter, open at the end, was now passed along the urethra into the bladder, and, when the point was felt by the finger in the

wound, pressing up the fundus, a stilet, that had been concealed, was forced through the coats of the bladder, and followed by the end of the catheter. The stilet was then withdrawn, and the opening, through the fundus of the bladder, enlarged towards the pubes, by a probe-pointed bistoury sufficiently to admit two fingers, and then the catheter was withdrawn. The fundus of the bladder was held up by one finger, and the stone examined by the forefinger of the right hand. A pair of forceps, with a net attached, was passed down into the bladder, and the stone directed into it by the finger: the surface being very rough, the stone stuck upon the opening of the forceps, and being retained there by the finger, was extracted. A slip of linen had one end introduced into the bladder, and the other was left hanging out of the wound, the edges of which were brought together by adhesive plaster. A flexible gum catheter, without the stilet, was passed into the bladder, by the urethra, and kept there by an elastic retainer surrounding the penis. The patient was put to bed, and laid upon his side, in which position the urine escaped freely through the catheter."

Three or four years ago, I was called to Virginia to operate for lithotomy. I found the patient very far advanced in years, and labouring not only under stone, but morbid enlargement of the middle and lateral lobes of the prostate. Knowing the difficulties I should have to contend with under these circumstances, I determined instead of performing the *lateral* operation, to open the bladder above the pubes. Accordingly, assisted by Drs. Withers and James, two eminent practitioners of the neighbourhood in which the patient resided, I performed the opera-

tion after the manner of Sir Everard Home above described, and succeeded without difficulty in removing two calculi. The patient's chance of recovery, notwithstanding his age and the enlargement of the prostate was very favourable, so much so, that feeling himself, as he imagined, perfectly secure, and tired of restraint and confinement to bed, he insisted upon the catheter being withdrawn, (contrary to very strict injunctions I had left with him,) and in consequence soon after perished from peritoneal inflammation induced by effusion of urine into the cavity of the pelvis. This was the first instance, I believe, in which the *high* operation had been performed in America. It has since been done, successfully, by Dr. Carpenter, an eminent physician of Lancaster, Pennsylvania.

Females are subject to calculus as well as males, though the disease in the former is by no means so frequent as in the latter—owing to the female urethra being so short and large as readily to permit the escape of the calculous particles before they become so large as to form a stone. The *symptoms* created by the presence of a stone in the female bladder resemble those which have already been pointed out as characterizing the disease in males; in general, however, women suffer more than men from the disease.

There are two modes of extracting the stone from the female bladder—by *dilatation* of the meatus urinarius, and by *incision.* The former was often practised by the older surgeons, and within the last twenty or thirty years, has been occasionally resorted to. It should be preferred, in general, to the knife, (especially when the stone is

small,) inasmuch as it is not so liable to be followed by *incontinence* of urine. A bit of compressed sponge, or wax bougies gradually increased in size, will answer very well to dilate the passage with. When the stone is found to be very large, it will perhaps become necessary to divide the urethra, and the best mode of performing the operation, is, I think, the following. The patient is placed in the ordinary position for lithotomy, and her hands secured to the feet by bandages. The surgeon then introduces into the urethra a straight staff, with its groove directed towards the left ischium, and holding it firmly by the handle, passes with the right hand a straight bistoury through the urethra and neck of the bladder, obliquely downwards. The finger being introduced and the stone felt, it may be readily removed with the straight or curved forceps. As incontinence of urine has followed in all the cases in which Sir Astley Cooper has performed or witnessed the operation, he has expressed his determination, in future, to try the effect of a suture upon the edges of the wound.

The limits of this work will not allow me to enter, as I could wish, on several other modes of operating for the stone, particularly the *recto-vesical* operation, said to have been invented by Vegetius, during the sixteenth century. But those who may wish for particular information on this subject, and on lithotomy in general, will find it in the following works.

Carpue's History of the High Operation, &c. 1819—*Sanson des Moyens de Parvenir à la Vessie par le Rectum,* 1817—*Dictionnaire des Sciences Medicales, tom.* 28. *p.* 422—*Traité Historique et Dogmatique de*

l'Operation de la Taille, par J. F. L. Deschamps, Paris, 1796, 4 *tomes,* 8*vo.—John Bell's Principles of Surgery, vol.* 2. *part* 1*—Desault's Works, by Smith, vol.* 3*—C. Bell's Operative Surgery, vol.* 1. *p.* 329*—Earle's Practical Observations on the Operation for the Stone,* 1803*—Roux's Journey to London—Allan's Treatise on Lithotomy,* 1808*—Colles' Treatise on Surgical Anatomy, p.* 145 *and* 169*—Cooper's First Lines of the Practice of Surgery, vol.* 2. *p.* 320. *edit.* 4*—Dorsey's Surgery, vol.* 2*—Dorsey's Inaugural Essay on the Lithontriptic Virtues of the Gastric Liquor,* 1802*—Marcet's Essay on the Chemical History and Medical Treatment of Calculous Disorders—Prout's Inquiry into the Nature and Treatment of Gravel Calculus, &c.—Magendie on Gravel, &c.—Wilson on the Urinary and Genital Organs.*

CHAPTER XV.

AMPUTATION.

From the earliest periods, the question of the propriety or impropriety of amputation, in certain diseases and injuries, has been agitated with warmth, and even with acrimony—some contending that the operation was scarcely ever necessary, under any circumstances—others that patients were often suffered to die for want of it. Unfortunately, these points are almost as unsettled, at the present day, as at any former period; and so long as the constitutions of patients continue to differ, and the circumstances favourable, or unfavourable, to their recovery vary, it will, perhaps, be impossible to lay down definite rules adapted to every case. Still, however, much may be pointed out as approaching to certainty, and the rest must be left to the discretion and experience of the surgeon.

The injuries and diseases for which amputation may be required, may be arranged under the following heads:—1st, Gun-shot wounds and fractures. 2d, Mortification. 3d, Tumours. 4th, Diseased joints. 5th, Ulcers.

Military surgeons have been often accused of amputating limbs unnecessarily; but it should be remembered, that after a battle the wounded are liable to be hurried from post to post, and in carts or waggons, for days together. Under these circumstances, the patient would

not only suffer immense pain, but his life in many instances be sacrificed. The military surgeon, aware of this, amputates the limb on the field of battle, or as soon as possible afterwards, and dresses the stump. Thus situated, the patient may be moved about, with comparative ease, and with considerable prospect of eventual recovery. In civil life, on the contrary, with every convenience and comfort at hand, the removal of the limb, except in extreme cases, would be considered improper and unjustifiable. The distinction, therefore, should always be drawn between the two cases.

In all gun-shot and other wounds, whether accompanied with fractures or not, the first object of the surgeon should be to decide at once upon the treatment. As a general rule, it may be observed, that if the chief arteries of a limb are divided, the muscles lacerated, and the bones broken, there can be no question concerning the propriety of amputation. On this point all surgeons of the present day entertain but one opinion. When the injury is less extensive, a question will necessarily arise how far the surgeon may be authorized in risking the patient's life, in order to save his limb. This can of course only be determined by the peculiarity of the case; but experience, or the termination of former cases, will be the best guide. If a musket ball, for example, pass through the forearm, and the radial and ulnar arteries escape, amputation will seldom be required. On the contrary, if the ball should penetrate the wrist and fracture the bones, the operation will in most cases prove necessary. Wounds and fractures of the carpus, metacarpus, and metatarsus, rarely require amputation; but similar injuries of the tarsus, or of the ankle joint, al-

most invariably terminate unfavourably, unless amputation be performed. The same may be said of gun-shot injuries of the fingers and toes, from which tetanus is extremely apt to ensue. When balls lodge deeply in the tibia, when both bones of the leg are fractured, and their arteries at the same time are wounded, and when the injury has been inflicted upon the extremities of the bones, near the knee or ankle joints, nothing less, in most instances, than amputation, will save the patient. Gun-shot wounds of the knee, elbow, and shoulder joints, almost without exception, prove fatal, unless a timely removal of the limb be resorted to. Gun-shot fractures of the thigh bone are so extremely hazardous, that very few patients recover from them. Much will depend, however, upon the situation of the fracture. If the bone is broken below its middle, the necessity for amputation will not be so urgent, and perhaps a cure may take place without this operation. When the upper portion of the bone, however, is fractured, recoveries very rarely follow, owing to the shock communicated to the system, and to the high fever, and extensive abscesses which form among the muscles of the hip and thigh.

Admitting the above statements, however, to be correct, (and they correspond with the views of the best modern writers,) another question will naturally present itself:—At what period should the operation be performed? On this subject a great diversity of opinion has prevailed; some contending that immediate amputation, in the severer injuries, is indispensable; others, that a secondary operation is more likely to be attended by a favourable result. If the weight of authority may be deemed sufficient to settle the question, the number of advocates for immedi-

ate amputation will be found greatly to exceed that of its opponents. Among the former may be enumerated the names of Ledran, Boucher, Ranby, Pott, Schmucker, Mursinna, Boy, Percy, J. Bell, Larrey, Graefe, Guthrie, and Thomson—among the latter, Faure, Martiniere, Hunter, and Lombard. When *immediate* amputation, however, is spoken of, it must not be understood that the operation is to be performed instantaneously, or as soon as possible after the injury. On the contrary, it is agreed upon all hands, that the surgeon should wait until *reaction* take place, and that after this the sooner the operation is performed the better; inasmuch as symptoms of inflammation may afterwards be expected to supervene, and if the operation be performed during this stage, the patient's chance of recovery will be very much diminished. As regards the period at which reaction occurs, after injuries, this will depend altogether upon the extent of the injury, and the peculiarity of the patient's constitution. Some will recover from the shock communicated to the system in an hour or two; others will remain twelve or fifteen hours, with a cold skin and feeble pulse. So long, therefore, as the symptoms continue, it may be repeated, the operation must not be undertaken, otherwise the patient will be apt to die on the table, or a few hours after he is removed from it. Whenever the patient has so far recovered from the injury that his pulse becomes regular, his countenance lively, and he begins to complain of pain and stiffness in the part, this will be the most favourable period for the operation. Provided the operation be performed within forty-eight hours after the injury, it has been customary for military surgeons to denominate it *primary* amputation. On the contrary, when it is delay-

ed until the symptomatic fever has lessened, and the suppuration is copious, it is called *secondary* amputation.

From what has been stated, it will appear that amputation should be performed, in all those cases where the operation seems to be inevitable, before the accession of inflammation, and as soon as possible after reaction is completely established; but in slighter injuries, such as would seem not imperatively to demand the operation, and under circumstances calculated to favour the patient's recovery, it will become the duty of the surgeon to attempt to save the limb—calculating, if he should be disappointed in his expectation, upon *secondary* amputation as a resource. It should never be forgotten, however, that an operation, performed after the limb has passed through the stages of inflammation, cannot in general prove so successful as the primary one, because the muscles, cellular membrane, blood-vessels, and bone, have all taken on more or less disease. Independently of this, secondary amputation, performed upon soldiers who are crowded together in ill ventilated hospitals, is apt to terminate unfavourably, either from the stump being attacked by hospital gangrene, or from the prevalence of some epidemic disease. But one of the strongest objections that I know of to delay, and which has been particularly pointed out by Mr. Guthrie, is this: "When an amputation," says he, "is delayed from any cause, to the secondary period, a joint is most frequently lost; for instance, if a leg be shattered four inches below the knee, it can frequently be taken off on the field of battle, and the joint saved. Three or four weeks afterwards, the joint will in all probability be so much concerned in the disease, that the operation must be performed

in the thigh; the same in regard to the forearm and hand, and the upper part of the arm with the shoulder joint. This is a very important point for the consideration of military surgeons, in recommending delay in doubtful cases, as well as the knowledge that amputations in unsound parts are frequently fatal, and are always attended with danger." I might detail numerous cases that have fallen under my own care or notice, in proof of all the foregoing positions relating to amputation as a resource in gun-shot injuries; but so many of the kind are detailed in the works of military surgeons, as to render the relation unnecessary.

Mortification, when it attacks the extremities, may require amputation. But it has long been an established maxim among surgeons, not to operate for this disease during its progress, or until a line of demarcation has been formed, and the dead parts are about to separate from the living; when an amputation will become necessary to form a proper stump, and to remove the bone. If, as experience has proved, in innumerable cases, the surgeon were to apply the knife while the disease was advancing, no benefit would result, as the mortification would attack the stump, and continue to increase until it spontaneously ceased, or destroyed the patient. There are certain cases, however, in which it would be proper to deviate from this course, and perform the operation, notwithstanding the progression of the disease. If, for example, gangrene, from a gun-shot injury, has seized upon the leg, and is rapidly extending along the thigh towards the body, the patient's chance of recovery will at any rate be small, and under these circumstances, it is possible, though not very probable, that the

removal of the thigh may save his life. At all events, the operation should be tried, because it has sometimes proved successful, where death, without it, would speedily have happened. There is another case also, in which it will be proper not to wait for the line of separation. It is this. A man is shot through the thigh, the femoral artery and vein torn across, and being yet able to walk about, his wound is considered a slight one. About the third or fourth day, however, the toes and foot are found discoloured, and the limb cold and painful. The nature of the disease is then rendered evident, and if not speedily arrested by amputation above the wound, will soon have a fatal termination. For a knowledge of this fact, the profession is particularly indebted to Mr. Guthrie. Notwithstanding the axiom that amputation should not be performed during the progress of mortification in ordinary cases, it is proper to state that Larrey, Hennen, Hutchinson, Lawrence, and some other distinguished surgeons, have long been in the habit of deviating from the rule, and according to their accounts, with considerable success.

There are many *tumours*, most of which have been noticed in the preceding pages, that may require, (if they attain a large size, and seriously affect the patient's constitution,) amputation. These are, osteo-sarcoma, spina ventosa, exostosis, fungus hæmatodes, &c. The latter disease, as formerly stated, invariably proves fatal, unless arrested by a timely amputation, and indeed, in many instances, this will not insure the patient's life, even when resorted to in the very commencement. Formerly many limbs were sacrificed on account of aneurismal tumours, but the

improved methods of treating that disease may be said to have exploded the practice of amputation in such cases.

White swellings, as they are called, when neglected, or improperly treated, by exhausting the patient's constitution through the medium of hectic and diarrhœa, often prove fatal. To remove this constitutional disturbance, and to save the patient's life, amputation, in many instances, will unfortunately become necessary; and its benefit is surprisingly evinced upon many occasions, by the rapid amendment of the patient's general health, and early cicatrization of the wound. But there is reason to believe that the operation too often becomes a dernier resource, rather from the mismanagement of the surgeon, than the intractable nature of the complaint.

In civil life, old and inveterate *ulcers of the leg* very frequently call for the removal of the limb; and upon such occasions, the practice of amputation is, perhaps, as justifiable as in most other surgical diseases; for after having, for years, exhausted the resources of his art, the surgeon will find that the constitutional irritation and disturbance will carry off his patient, unless he can eradicate them by laying the axe at the root of the evil. There is one error, however, that an inexperienced surgeon may commit upon these occasions, and which it will be proper to point out. It may so happen that an incurable ulcer, accompanied by diseased bone, has existed for years, and has served in bad constitutions, especially the old and debilitated, as an issue or drain, which so long as it is kept open, tends to appease a cough or some other troublesome symptom. If, under

these circumstances, amputation be performed, and the stump heal up, the patient, perhaps, in a short time recovers his plumpness, and gets apparently well; but in the course of a few months, evident disorder of some of the internal organs, and of the lungs especially, shows itself, and death in a short time follows. I have witnessed too many examples of this sort, not to be fully aware of the danger of an amputation, when thus improperly performed. Mr. Guthrie, Dr. Hennen, and some other writers, notice such consequences, sometimes following secondary amputations, after gun-shot wounds.

The *instruments* and *dressings* required for most amputations, are two amputating knives, one rather larger than the other, a catling, two or three scalpels, the same number of tenacula, artery forceps, needles, ligatures, sponges, a large and small saw, bone nippers, two tourniquets, compresses, rollers, linen retractors, a Malta cross, lint, tow, adhesive straps, lint spread with cerate, two or three basins of warm water, wine and water in a tea-pot.

Formerly, amputating knives, extremely concave on the cutting edge, were employed. The modern knife is nearly straight, rather short, but substantial in the blade, and rough on the handle, to enable the operator to take a firm hold. The catling is a narrow, two-edged knife, tapering away to a point, and bears a strong resemblance to a dirk. It is intended to pass between bones, and separate the soft parts adhering to them. The amputating saw is about the size of a carpenter's dove-tail saw, and its handle should also

resemble, in some respects, that of the latter. The blade should be thinner as it approaches the back of the instrument, the teeth widely set, and so constructed as to cut with both edges as they are passed backwards and forwards. In using the saw, the surgeon will discover, after a little practice, that the instrument works to the best advantage when moved steadily by long strokes, always taking care to commence by applying the heel of the instrument first to the bone, and drawing thence to the point. When the bone is nearly cut through, the operator should move the saw cautiously and gently, lest the bone suddenly break and leave a projecting point or snag When this happens, however, it is commonly owing to the assistant not supporting the limb with steadiness. The *bone nippers* are designed to remove the projecting portion of bone, should it break, and are well calculated for the purpose. The handles of this instrument should be longer than they are usually made, and its cutting part placed obliquely upon the shafts. *Retractors* are made of linen, cotton, leather, and sometimes of metal in the form of plates; but the linen are the best. They are formed, by taking a piece of linen, eighteen inches or two feet in length, and a little broader than the stump, and dividing it along the middle ten or twelve inches. The use of the retractor is to draw up the muscles after they are divided, and prevent them from being torn by the teeth of the saw. The *Malta cross* is formed by sewing two pieces of a linen or cotton roller, each about two feet long, across each other at the centre. It serves the purpose of confining the lint or tow upon the front of the stump, and, in this way, assists the roller. A piece of lint, spread with cerate, and large enough to cover the whole

stump, will always be found extremely useful in preventing the ends of the ligatures from being glued to the surrounding dressings, by the matter that escapes from the wound. As the patient will have frequent occasion for drink during the operation, and cannot conveniently take it from a tumbler, whilst lying on his back, the spout of a tea-pot, or some similar vessel, applied to his lips, will be found to answer a better purpose than any thing else.

Section I.

Amputation of the Thigh.

The patient being seated on the edge of a strong table, with his back supported by pillows, and assistants on each side to take charge of his hands and arms, the tourniquet is applied by an assistant, about three inches below the groin—a small compress of muslin being previously placed under the frame of the tourniquet, while the pad of the instrument is fixed above the femoral artery. Having ascertained that the circulation of the blood in the limb is interrupted by the pressure of the tourniquet, the surgeon directs an assistant to elevate the leg, and support it nearly in the horizontal position, and then carrying the amputating knife under the limb, until it nearly reaches the side on which he stands, applies it to the thigh as low down as the disease will admit, and with one continued sweep divides by a circular cut, the integuments, fat and fascia. The large knife is then exchanged for a scalpel, with which the operator separates the loose cellular membrane, connecting the integuments to the muscles, and turns back the skin to the extent of two inches, in the same way that one would turn back the cuff of a coat. Having resumed the amputating knife, and keeping it close to the rounded margin of the inverted integuments, the surgeon next cuts through the muscles down to the bone. In making this incision, the edge of the knife should be inclined upwards, in

order, as it were, to hollow out the front of the muscles in the form of a cone. With the scalpel, the surgeon separates the muscles from the bone for two or three inches, after which, an assistant applies the slit of the retractor around the bone, twists its ends together, and forcibly pulls the muscles upwards. The bone is next divided by the saw, and the limb removed. A soft sponge is applied to the surface of the stump, and the blood being cleared away, the femoral artery, enclosed by its sheath, and lying near the bone, may be distinctly seen. With a tenaculum, it is drawn out, separated from its accompanying nerve, and tied with a strong round ligature. After this, the assistant slackens the tourniquet slightly, when a jet of blood will generally be perceived from some of the branches of the profunda and other arteries. These vessels must likewise be taken up successively, until the whole are secured. But often it happens that the vessels, from an approach to syncope, retract, and for a time do not bleed. The surgeon, aware of this, must not be too hasty in closing the stump, but should rouse the arterial action by wine and water, the admission of fresh air into the room, and solicit, gently, the extremities of the vessels on the stump, by warm water and the sponge. As soon as all danger of secondary hemorrhage is over, the stump may be dressed. The ligatures being brought out of the upper and lower corners of the wound, its edges are pressed together by an assistant, in such a way as to cover completely the extremity of the bone, and form a cushion for it out of the cut muscles and integuments. While thus held, the surgeon carefully wipes the surface of the skin, for several inches around, so as to render it perfectly dry and fit to receive the adhesive straps, which are next warmed and applied—with interspaces of

half an inch between them.* Over the straps is laid the cerate plaster, and above the plaster a thick pledget of tow. This last, in its turn, is secured by the Malta cross, and the ends of the latter fastened down by a roller, made to cover by circular turns the whole thigh, and kept from slipping downwards, by being carried once or twice around the patient's pelvis. The tourniquet being applied loosely about the limb, (that it may be suddenly screwed in case of secondary hemorrhage,) the patient is put to bed, laid on his back or side, and the stump supported by a pillow, and secured to it by pins and short strips of muslin. Over the stump is placed a frame to take off the weight of the bed clothes. If the patient is to lie on his back during the cure, the edges of the wound should be put together so as to form a perpendicular cicatrix, to allow the matter greater facility of draining off. On the contrary, should he be confined to his side, the edges must be approximated in a horizontal direction. During winter, the dressings may remain on seven or eight days, but in summer only two or three. They should be poulticed three or four hours previously to attempting their removal. The *after*-dressings may be repeated once in forty-eight hours. About the tenth day, the ligatures usually come away, and under favourable circumstances, the wound is healed in three or four weeks.

To prevent corners from being left, at the upper and

* To prevent the edges of the skin from uniting by the first intention, and before the wound closes from the bottom, and thereby to guard against the accumulation of pus beneath the integuments, Dr. Physick has been in the habit of sometimes interposing a bit of lint between the lips of the wound, and keeping it there for a few days.

lower angles of the wound, in consequence of the integuments being puckered in these situations, an inevitable consequence of the circular incision, as practised in the operation I have just described, Professor Davidge, of Baltimore, has long been in the habit of making his incision through the skin with a common scalpel, deviating above and below from the circular direction, and forming an angle which serves the purpose of rounding off the corners. The operation is not only neater than the ordinary one, but possesses an advantage over it as regards the facility of escape of the matter, which, instead of collecting in a pocket, formed by the pouting integuments, drains off as soon as secreted. It may be proper to observe, however, that after the stump has *healed*, the corners, (which always exist immediately after the common operation,) disappear and do not subject the patient to any inconvenience.

Section II.

Amputation of the Leg.

As much as possible of the thigh should in all cases be saved, but the rule does not always hold good in amputation of the leg. If, for example, the leg be amputated just above the ankle, the bone from the deficiency of surrounding muscle cannot be well covered, and is therefore not calculated to bear the pressure of an artificial leg. On this account, the patient is obliged to have an instrument of the kind adapted to the knee, and the leg, therefore, is carried out behind at right angles with the thigh, and by its weight greatly incommodes the patient—so much so, indeed, that I have known two or three submit to a second operation, for no other reason than to get rid of the incumbrance.

It is usual with surgeons, in amputating the leg, to perform the common circular operation, when it is desirable to take off the limb a few inches below the knee, and the *flap* operation when the leg is removed just above the ankle. I prefer the latter, however, in all cases. It is done as follows. The tourniquet being placed about the middle of the thigh, the leg is supported by an assistant holding at the foot, the surgeon calculates beforehand the quantity of soft parts that may be required to cover the bone, and passes the common amputating knife obliquely upwards on the back part of the leg through the skin, which being drawn up by an assistant, the knife is next carried along

the margin of the divided skin, through the muscles to the bone, then perpendicularly over the tibia, until it meet the oblique cut on the other side of the leg. The catling is next thrust between the bones, and the muscles and interosseous membrane divided, a retractor with *three* tails introduced, the integuments and muscles drawn up, and the bones sawed off. The arteries being carefully tied, and the nerves excluded from the ligature, the flap formed out of the muscles and skin is turned up in front of the bones, and forms over them a thick cushion, calculated afterwards to bear the pressure of a wooden leg. In dressing the stump, however, (in the way recommended for the thigh,) care should be taken not to press the flap too forcibly against the sharp edges of the tibia—lest ulceration be excited.

Section III.

Amputation of the Arm and Forearm.

When it becomes necessary to amputate the arm, the patient should sit on a chair, or lie over the edge of a bed, and while the limb is carried out at right angles with the body, and supported by an assistant, a circular incision is made through the skin and muscles, (according to the directions already given when treating of amputation of the thigh,) the bone sawed off, the vessels secured, and the dressings applied. If the operation is performed about the middle or the lower part of the arm, the tourniquet may be applied above; but when it becomes necessary to amputate very high up, there will be no space left for this instrument, and the surgeon must then trust to compression of the subclavian artery, where it passes over the first rib. Under these circumstances, Larrey and some other surgeons, advise the amputation of the arm at the shoulder joint, but I should prefer making a flap out of the deltoid muscle, and with this covering the extremity of the bone.

Amputation of the forearm may be performed either by the common circular incision, or by the flap. The former, in most cases, will answer extremely well, and as being more simple than the flap operation, should be preferred. As much of the forearm as possible ought to be preserved.

Section IV.

Amputation at the Shoulder Joint.

By a cannon shot, the head of the os humeri is sometimes carried away, or the bone so shattered, as to render amputation at the shoulder joint necessary. The same may be said of fracture from a bullet or grape shot. Various tumours, also, such as fungus hæmatodes, exostoses, &c. may give rise to this operation, which was formerly looked upon, under any circumstances, as hazardous in the extreme. The experience, however, of modern military surgeons, tends to prove its perfect safety as well as simplicity. There are various modes of performing the operation, but the old plan of La Faye, as modified by later operators, should, I think, in most cases be preferred. It is executed in the following way.

The patient is seated on a chair, whilst an assistant standing behind him, presses on the subclavian artery, where it passes over the first rib, by a boot hook, or large key, covered with a firm linen compress. A semicircular incision, with its convexity downwards, is then made, transversely with a large scalpel, through the integuments and deltoid muscle to the bone, three or four inches below the acromion process. This flap being turned upwards the tendon of the long head of the biceps is exposed and divided, the capsule of the joint opened, and the head of the bone turned out of its glenoid cavity. As soon as this

is accomplished, the soft parts beneath the arm are cut through, at a single stroke of the knife, the arm separated from the body, and the axillary artery instantly picked out by the tenaculum and tied. Any other vessels that may bleed being secured, in like manner, the edges of the wound are brought together, and dressed in the ordinary way. But it sometimes happens that the deltoid is shot away, and of course the surgeon cannot depend upon it for a flap. In that case the glenoid cavity may be covered by the muscles on the sides or under part of the arm. I have twice only, found it necessary to amputate at the shoulder joint.

In certain cases it may be possible to save the patient's arm, notwithstanding a gun-shot wound and fracture of the head of the humerus—by laying open the joint immediately after the injury, and removing the fragments of bone, or by waiting until suppuration is established, and the shattered pieces become loose. An operation of the kind, however, can only be depended upon when the fracture is comparatively limited, and the shaft of the bone not splintered. Baron Larrey, Mr. Guthrie, and other surgeons, have repeatedly succeeded under these circumstances, in preserving the limb, and saving the patient's life.

Section V.

Amputation at the Hip Joint.

This is, perhaps, the most formidable and terrific operation in surgery; yet there are several examples on record of its successful termination; though it must be confessed that it has failed in an immense number of cases. Having never performed the operation, I cannot from experience speak of the best mode of executing it, and shall therefore give it in the words of Mr. Guthrie, whose method, it seems to me, has at least simplicity to recommend it.

"The patient should be laid on a low table, or two field panniers placed together, covered with a folded blanket, to prevent the edges giving pain, and properly supported in a horizontal position. An assistant leaning over, and standing on the outside, should compress the artery against the brim of the pelvis, with a firm hard compress of linen—such as is usually used before the tourniquet; he should also be able to do it with his thumb, behind the compress, if it be found insufficient. The surgeon standing on the inside, with a strong pointed amputating knife of a middle size, with the back curved, makes his first incision through the skin, cellular membrane, and fascia, so as to mark out the flaps on each side, commencing about four fingers' breadth, and in a direct line below the anterior superior spinous process of the ilium, in a well-sized man; and continuing it round in a slanting direction, at an almost equal

distance from the tuberosity of the ischium, nearly opposite to the place where the incision commenced. Bringing the knife to the outside of the thigh, he connects the point of the incision where he left off with the place of commencement, by a gently curved line, by which means the outer incision is not in extent more than one-third of the size of the internal one. The integuments having retracted, the glutæus maximus is to be cut from its insertion in the linea aspera, and the tendons of the glutæus medius and minimus from the top of the trochanter major. The surgeon now placing the flat edge of the knife on the line of the retracted muscles of the first incision, cuts steadily through the whole of the muscles, blood-vessels, &c. on the inside of the thigh. The artery and vein, or two arteries and vein, if the profunda is given off high up, are to be taken between the fingers and thumb of the left hand, until the surgeon can draw each vessel out with the tenaculum, and place a ligature upon it. Whilst this is doing, the assistants should press with their fingers on any small vessels that bleed. The surgeon then cuts through the small muscles running to be inserted between the trochanters, and those on the under part of the thigh, not yet divided; and with a large scalpel opens into the capsular ligament, the bone being strongly moved outwards, by which its round head puts the ligament on the stretch. Having extensively divided it on the fore and inside, the ligamentum teres comes into view, and may readily be cut through. The head of the bone is now easily dislocated, and two or three strokes of the knife separates any attachment the thigh may still have to the pelvis. The vessels are now carefully to be secured. The capsular ligament, and as much of the ligamentous edge of the acetabulum may be removed as can

readily be taken away. The nerves, if long, are to be cut short, the wound well sponged with cold water, and the integuments brought together in a line from the spinous process of the ilium to the tuberosity of the ischium. Three sutures will in general be required, in addition to the straps of adhesive plaster, to keep the parts together; the ligatures are to be brought out in a direct line between the sutures, a little lint and compresses are to be placed over the wound, and on the under flap, to keep it in contact with the cotyloid cavity, and assist the union of the parts. A piece of fine linen is to be laid over them, and the whole retained by a calico bandage put round the waist, and brought over the stump."*

Amputation at the hip joint, can never be required, perhaps, except for a gun-shot wound, or some similar extensive injury, in which the muscles, large vessels, and nerves, are lacerated, and the head, neck, or superior part of the thigh bone, or part of the pelvis is crushed. Such effects generally arise from cannon, or grape-shot, or from the bursting of shells, and from machinery in motion.

* Guthrie on Gun-shot Wounds of the Extremities, p. 178.

Section VI.

Amputation of the Fingers and Toes.

When the hand and fingers are shattered by the bursting of a gun, by grape-shot, bullets, by machinery, or any other cause, amputation will often become necessary in order to guard against tetanus, and the effects of inflammation. Where it can be done, however, without risking too much the patient's life, an attempt should always be made to save, at any rate, one or more fingers, as the patient will find them, even when mutilated, extremely useful. In such cases, the mode of operating must depend very much upon the extent and shape of the wound and fractures. Instead of using the spring saw contained in most amputating cases, when the metacarpal bones are injured or diseased, and require extirpation, the semicircular trephine, of Mr. Charles Bell, will be found the most convenient instrument for removing the bone. Fingers and toes are generally amputated at the joints, and the following is the mode of performing the operation as usually practised.

While an assistant draws up the skin, the surgeon makes a circular incision three or four lines below the joint. The skin is next separated and turned back, the tendons surrounding the joint divided, the finger or toe bent so as to render the joint more conspicuous, the capsular and lateral ligaments cut through, and the extremity removed. It is seldom necessary to take up any vessels, but the ooz-

ing of blood should be allowed to stop, after which the surgeon may draw together the edges of the skin, so as to cover the end of the bone, and retain them by strips of adhesive plaster, and a narrow roller.

On Amputation, consult *Pott's Works, vol.* 3—*Hey's Practical Observations, edit.* 3—*Desault's Works, by Smith, vol.* 1—*J. Bell's Principles of Surgery, vol.* 1—*Larrey's Military Surgery, by Hall, vol.* 1 *and* 2—*C. Bell's Operative Surgery, vol.* 1—*Guthrie on Gun-Shot Wounds of the Extremities—Thomson's Report of Observations made in the Military Hospitals in Belgium, after the Battle of Waterloo; with some Remarks upon Amputation—Pelletan Clinique Chirurgicale, tome* 3—*Hennen's Principles of Military Surgery, edit.* 2—*C. Bell's Surgical Observations—Dorsey's Surgery, vol.* 2. *edit.* 3.

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