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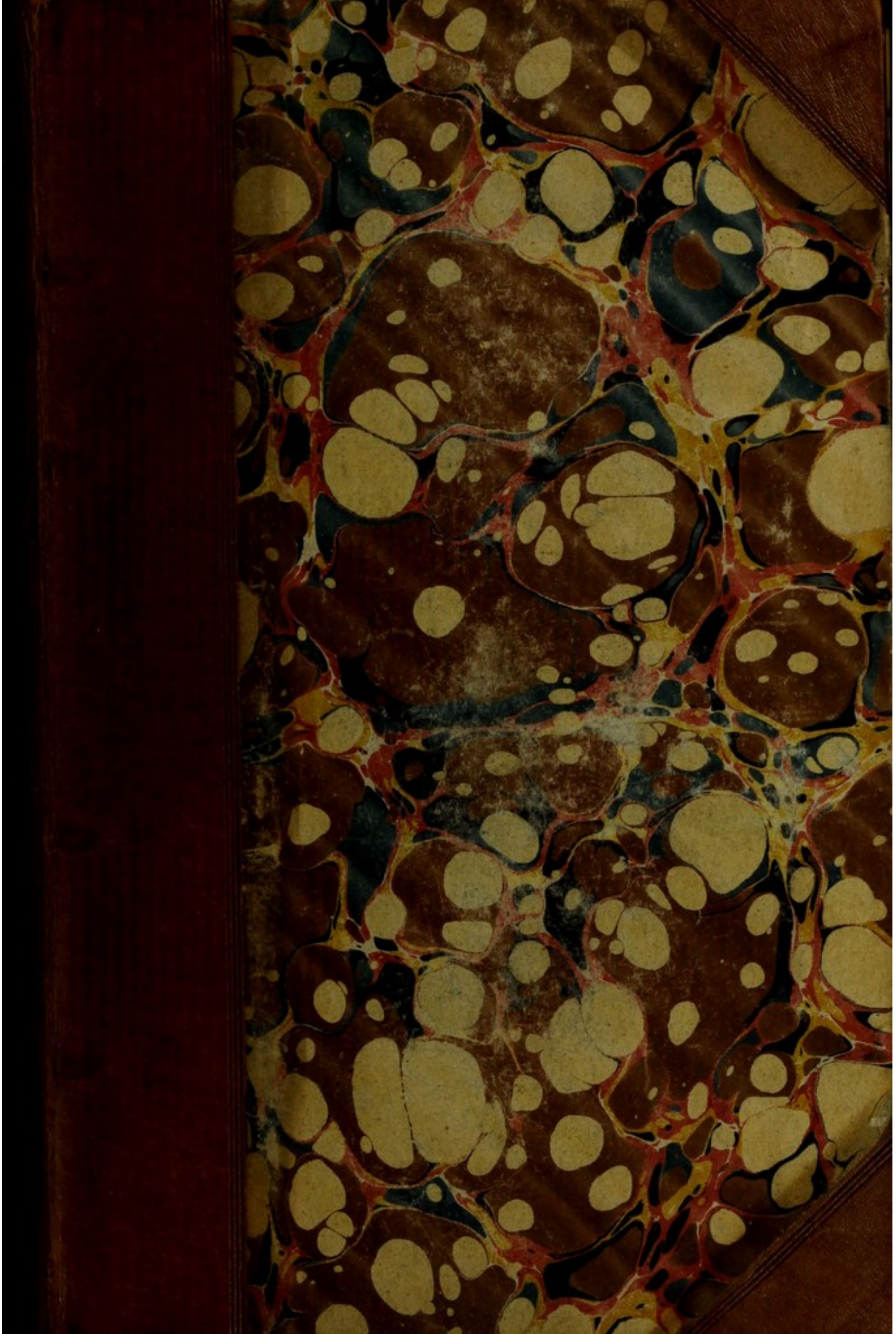

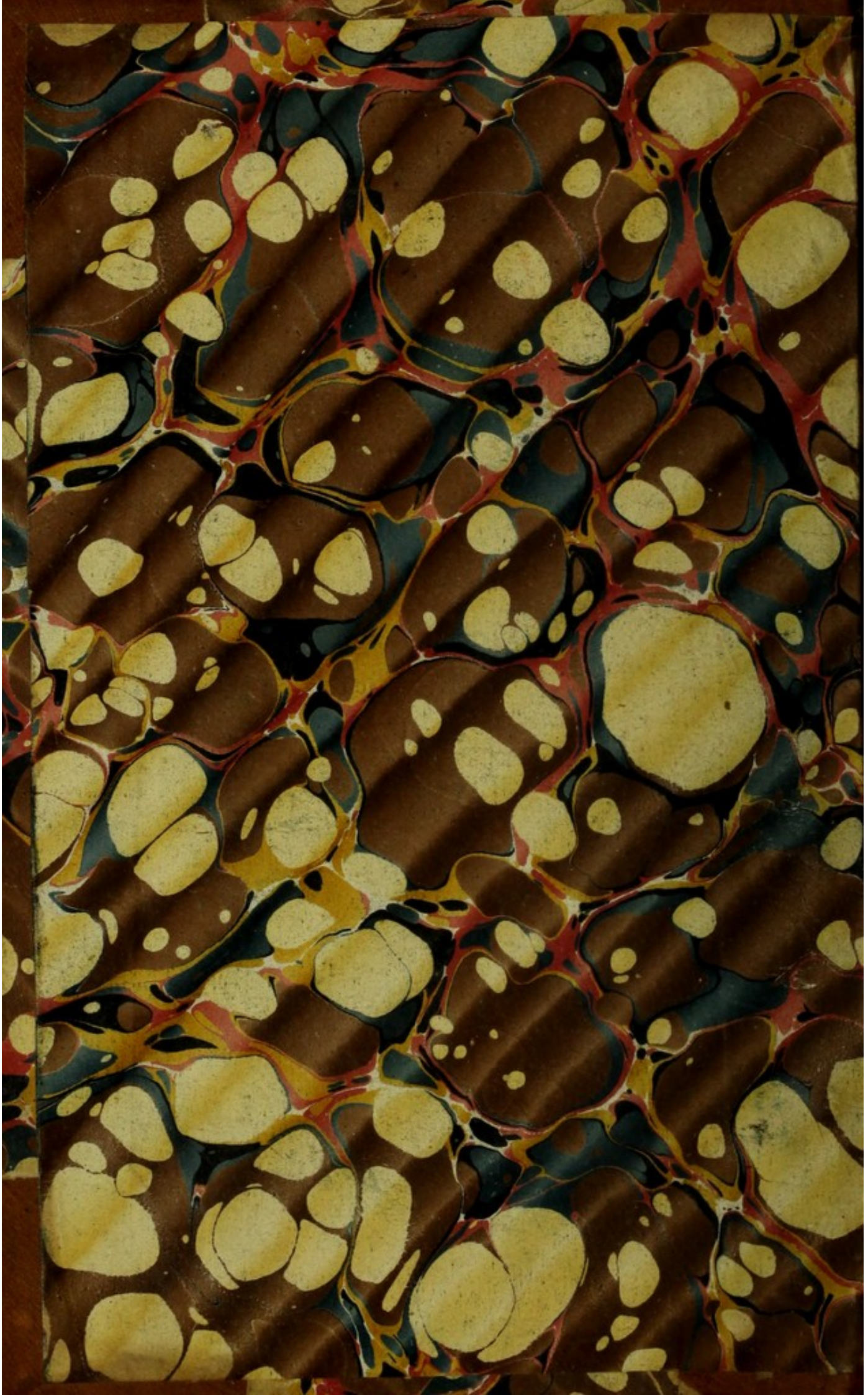

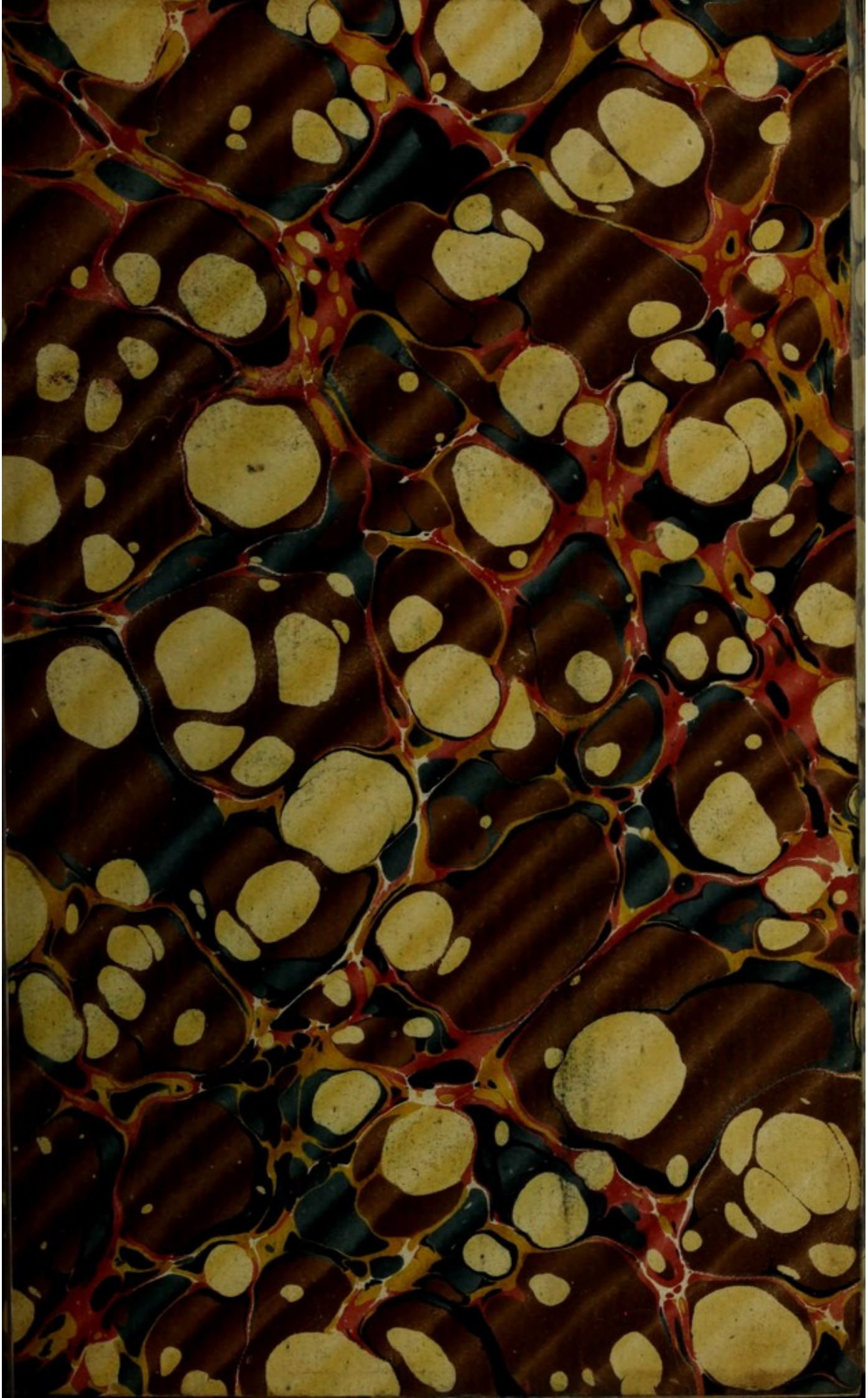

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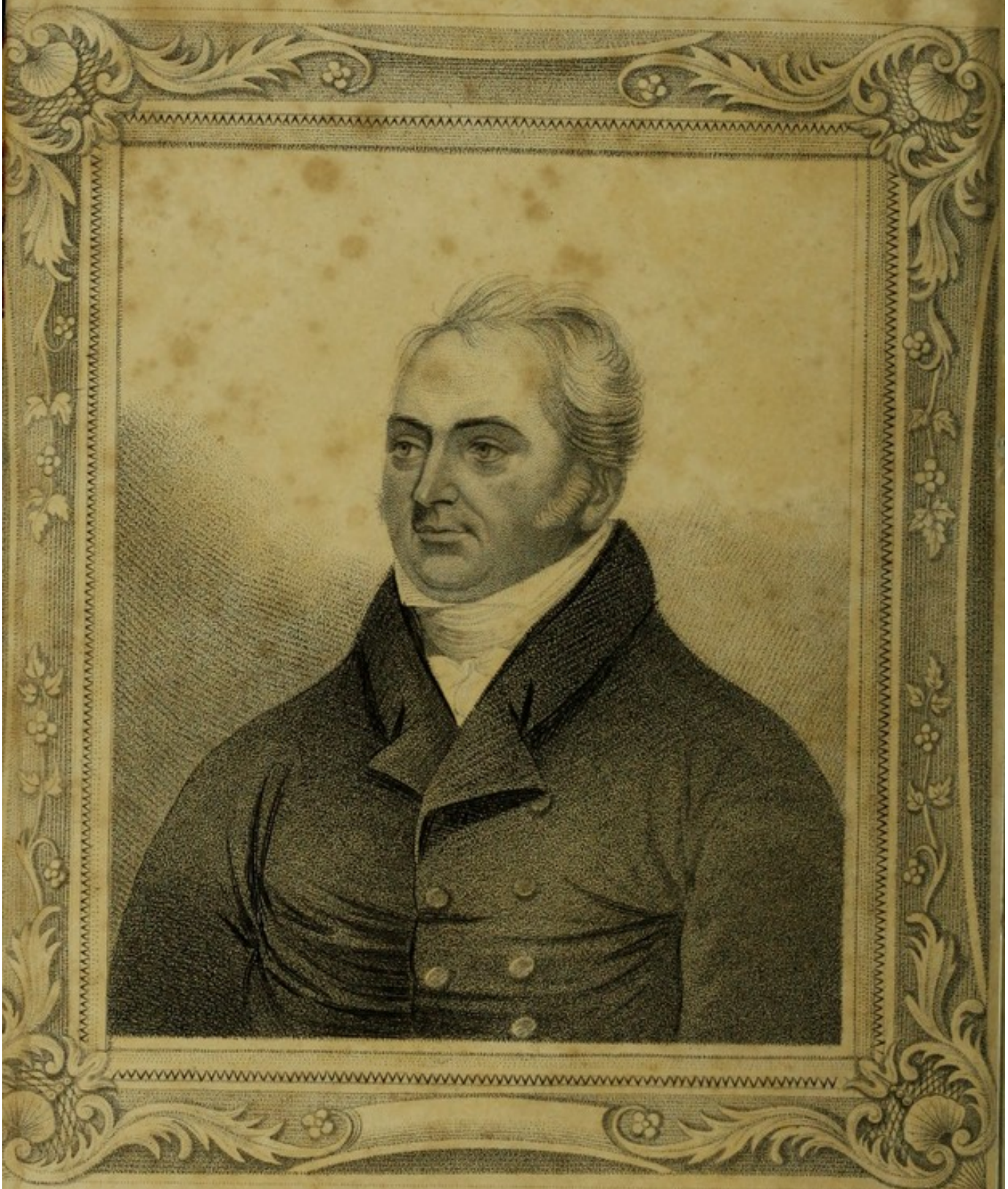

Sir Astley Cooper Bart.

THE

PRINCIPLES AND PRACTICE

OF

SURGERY,

FOUNDED ON THE MOST EXTENSIVE HOSPITAL AND PRIVATE PRACTICE,
DURING A PERIOD OF NEARLY FIFTY YEARS;

WITH

Numerous Plates,

ILLUSTRATIVE BOTH OF HEALTHY AND DISEASED STRUCTURE.

BY

SIR ASTLEY COOPER, BART., F.R.S.

SERGEANT SURGEON TO THE KING,

FORMERLY LECTURER ON ANATOMY AND SURGERY AT GUY'S AND ST. THOMAS'S HOSPITALS;
NOW CONSULTING SURGEON TO GUY'S.

Edited by

ALEXANDER LEE, M.A. M.D.

Editor and Translator of Celsus de Medicina, &c.

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TO

SIR ASTLEY COOPER, BART. F.R.S.

SERGEANT-SURGEON TO THE KING,

&c. &c. &c.

This Edition of his Surgical Works

IS MOST RESPECTFULLY INSCRIBED,

AS A JUST TRIBUTE OF THE MOST PROFOUND REGARD,

IN TESTIMONY OF MANY KINDNESSES RECEIVED

As a Pupil;

AND, THAT HE MAY LONG PRESIDE OVER A PROFESSION HE HAS SO MUCH ADVANCED, IS THE SINCERE WISH OF

HIS VERY HUMBLE

AND EVER GRATEFUL SERVANT,

ALEXANDER LEE.

PREFACE.

When we consider the unparalleled opportunities which Sir Astley Cooper has had for collecting valuable practical observations during a period of nearly half a century of unrivalled excellence, it is rather surprising that the result of his labours has been rendered only partially accessible to the Medical world at large. It is true that several Editions of his Lectures have been published in various forms; it is also true that Sir Astley himself has favoured the world with the result of his experience, by that great work on Inguinal and Congenital Hernia,—his work on Dislocations and Fractures,—his Treatise on Diseases of the Female Breast, and that splendid work of his, on the Anatomy and Diseases of the Testis, so justly admired by our Continental neighbours. But those rare Treatises are necessarily inaccessible to at least three-fourths of the profession. Under these circumstances, the Editor has been induced to undertake the republication of these Lectures, so deservedly sustaining the celebrity of their Author; and it

is to be hoped that this Edition of SIR ASTLEY COOPER'S PRINCIPLES AND PRACTICE OF SURGERY will be more in character than any former one with those great works which he himself has published, as well as a just tribute of respect to the Author. This Edition will consist of the following improvements :—

1. The Editor has availed himself of what he conceived to be the most correct text of the Lectures first published in the Lancet, comparing them with Mr. TYRRELL'S Edition as far as it extends, together with his own MS. Notes, and those kindly furnished him by his friends.

2. The diseases of the Testis are illustrated by highly finished Drawings, both of the morbid and healthy structure, preceded by the descriptive Anatomy of those organs from SIR ASTLEY'S work on the Testis.

3. The descriptive Anatomy of Hernia, with coloured drawings.

4. The Diseases of the Breast, with their morbid appearances.

5. Dislocations and Fractures will be fully illustrated in a similar manner.

The Editor being deeply impressed with the kind condescension and well known liberality of SIR ASTLEY COOPER, in his unwearied ardour and encouragement for the advancement of Surgical Science, most respectfully begs leave to return him his most grateful acknowledgements and sincere thanks for the use he has made of those splendid

works already mentioned. To Dr. Barker, the Curator of the Museum at St. Thomas's Hospital, he is also indebted for his politeness, and the prompt facilities which he has afforded in obtaining drawings of some preparations there: and, to B. Barton, Esq. for the beauty and great fidelity of his drawings. There is another friend to whose great professional talents and literary acquirements he would fain pay the tribute of respect, were it not for his extreme modesty. In conclusion; the editor begs leave to apologize for any errors, whether of omission or commission: he is at least conscious of having used his best endeavours to render the work worthy of the public confidence, and of the universal fame of its Author.

ALEXANDER LEE,

Three Crown Square,
Southwark.

December 5th, 1835.

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LECTURES ON SURGERY.

INTRODUCTORY LECTURE.

GENTLEMEN,—While it is the province of the physician to attend to internal diseases, it is the duty of the surgeon to attend to those that are external; to perform operations for the removal of diseased parts; and to know how to regulate the system by the use of medicine, when local diseases are produced by constitutional derangement.* Surgery is usually divided into the principles and practice. The first are learned from observations on the living when diseased, by dissection of the dead, and by experiments on living animals. Our deductions from these sources furnish us with the means of knowing a malady by its symptoms, the alteration of structure in a part when diseased, and the various ways in which Nature attempts the reparative process, both in external and internal parts. A man who has seen much of morbid preparations possesses great advantages; but his anatomical knowledge cannot be perfect unless he has frequently seen and assisted in the dissection of the human body. In surgical science, hypothesis should be entirely discarded, and sound theory, derived from actual observation and experience, alone encouraged. The first is an *ignus fatuus*, which is sure to mislead; the last a polar star, a never-failing guide. Experiments on living animals have been found of the greatest utility in directing us to a knowledge of the means by which Nature acts in the reparation of injuries, and in the restoration of lost parts. Thus the method she would adopt in uniting a fracture in the bone of a dog, will show you the manner in which union of a fractured bone

Definition.

Hypothesis.

* Ego eundem quidem hominem posse omnia ista præstare concipio: Sed ubi illi se diviserunt, eum laudo qui quam plurimum percipit. CELSUS, Lib. vii. 1.

would be effected in man; the secretion of ossific matter by the blood-vessels being in each case precisely the same.

Qualifications of a Surgeon.

In the *practice* of surgery, also, many essential qualities are requisite on the part of the surgeon. The first of which is neatness in the application of his remedies; awkwardness in this respect will frequently injure his professional prospects—the patient and his friends often judge of a man's skill by his manner of bleeding, or from the application of a bandage; and it sometimes happens that "the hand spoils the head."*

Gentleness of manner.

The next requisite is, gentleness of manner; patients having a natural dislike to operations, feel still more uneasy if they discover any thing in their practitioner's behaviour which makes them apprehend rough treatment.

Violence in all cases is bad, and is sometimes followed by fatal consequences.

I was invited by a surgeon, some years since, to see a patient who had a compound dislocation of the ankle joint: there existed a considerable degree of pain and inflammation; the surgeon at once suddenly introduced a probe, raised some of the parts by it, and, his Latin being as bad as his surgery, said with the utmost coolness, *Dedenda est Carthago*, "Carthage must fall!" thereby implying that amputation must be performed; indeed, from the rough manner in which he treated his patient, there seemed no other chance for the poor fellow's recovery. In this case, gentleness might have prevented the necessity for amputation.

Self-possession.

But the quality which is considered of the highest order in surgical operations, is self-possession; the head must always direct the hand, otherwise the operator is unfit to discover an effectual remedy for the unforeseen accidents which may occur in his prac-

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* Autem CHIRURGUS esse debet adolescens, aut certè adolescentiæ propior; manu strenuâ, stabili, nec unquam intremiscente; eaque non minus sinistra, quam dextra promptus; acie oculorum acri, claraque, animo intrepidus, misericors sic, ut sanari velit eum quem accepit, non ut clamore ejus motus, vel magis, quam res desiderat, properet, vel minus quam necesse est secet; sed perinde faciat omnia, ac si nullus ex vagitibus alterius affectus oriatur. CEL. Lib. vii. Pref.

tice. Without this quality, a man may do well enough in ordinary cases, but can do little on sudden emergencies; it inspires confidence, and almost insures the success of the operation. These qualities forward the interests of professional men, whilst they diminish the sufferings of human nature. Patients generally form an opinion of a surgeon's ability by his manner: if he be of a dry, morose turn, he is apt to alarm not only the patient, but his whole family; whereas, he who speaks kindly to them, and asks for particular information, is supposed to have more knowledge, and receives more respect.

Knowledge of Anatomy indispensable.

In all cases, it is the duty of the surgeon never to advise an operation unless there is a probability that it will be attended with success: he should here, as in every instance, "do to others as he would have others do unto him." Let it be always remembered, that operations cannot be *safely* undertaken by any man, unless he possess a thorough knowledge of anatomy. This is the real groundwork of all surgical science; and it has ever been found that half-anatomists are bungling practitioners; ignorance here, as it always will, gives confidence without power. But it is consolatory to know, that the human frame is better understood at the present epoch by *students*, than it was forty years ago by *professors*. With us, the march of improvement has been most rapid; and it has principally arisen from the assiduity with which the modern surgeons have pursued their avocations in the dissecting-room. A few years since, all operations were attended with hazard; those now undertaken commonly do well, which can only be explained by our increased information. An old surgeon, now deceased, said, "that operations for extracting stones from the bladder, put him in mind of sailing between Scylla and Charybdis." It was replied, "that not to attempt them was certainly resigning his patients to Scylla." It is true, these operations require the most perfect anatomical skill; as do those for hernia, aneurism, and fractures of the bones of the head, attended with depression. Anatomy likewise teaches us how to discriminate disease; in which, lies more than half the cure. Without this knowledge, dislocations frequently cannot be detected;

whereby patients may become miserable for life, and thus the reputation of the surgeon be for ever lost. Some years since, one of the profession, whom I had long known, but had not seen for many years, called on me; I naturally inquired respecting his success. He replied, that his life had been like April, sometimes sunshine, sometimes rain. I rejoined, "How so? you have brought up a family genteelly, and have, I understand, a respectable practice." "True," said he, "but a circumstance occurred some time ago which has given me much uneasiness; I was called to attend a case of dislocation of the shoulder joint, but it so happened that I could not discover it; after attending the patient for a considerable time, another surgeon was requested to see him, who at once pronounced the bone to be out, which in reality was the case, for in a very short time he reduced it. When the man recovered, he brought an action against me; I had to pay two hundred pounds damages, and the law expenses were two hundred pounds more. The loss of the money I did not feel, but I have severely felt being pointed at as an ignorant man."

Case of Malpractice.

Abraham and the Dresser.

A few years ago, one of the dressers in St. Thomas's hospital, wished to perform an operation; and he turned his attention to the surgery boy, who had a bad leg, and said to him, one day, "Abraham, I should like to cut off your leg." "Indeed!" said Abraham, "I should not like it." "Oh," said the dresser, "it will never be of any use to you in its present state, and therefore you had better be without it. I will take a lodging for you; I will give you some money, and you shall be well attended." The boy's scruples were overcome; he took the money, and went to the lodging; all was fixed, and the operator began; but finding a great discharge of blood, he cried out to his assistant, "Screw the tourniquet tighter." He obeyed, but in doing so the screw broke: at this unforeseen accident, the dresser lost all presence of mind; he jumped about the room, then ran to the sufferer, and endeavoured to stop the effusion of blood by compressing the wound with his hand, but in vain; his sleeve became filled with blood, and poor Abraham would have died in a very short time, had not a pupil accidentally called, who had

An operation.

the presence of mind to apply the key of the door to the femoral artery, by compressing which he stopped the bleeding, and thus gained time for the application of another tourniquet.

Puncturing the artery, in venesection.

Some years ago, one of the dressers of Guy's Hospital, in bleeding a man, punctured the artery that lay under the vein (a situation in which he ought not to have bled), and before the blood could be stopped, the person lost thirty-seven ounces. One of the surgeons cut down upon the artery at the elbow and secured it. In doing this, he divided the principal veins; inflammation and mortification came on, and death soon followed.

Recapitulation.

I bring forward these examples to impress upon your minds that an imperative necessity exists for making yourselves well acquainted with anatomical science; without which you cannot conscientiously discharge your duty to society; and it is upon this that you must lay the foundation for your future advancement.

Necessity for Anatomical Science.

The parts of the body most essential to be particularly studied are, the brain, bones, arteries, veins, nerves, and joints. To each of these you must pay particular attention, and make yourselves well acquainted with its form, situation, and functions; otherwise you will only be exposed to ridicule, and perhaps worse, if, in your practice, you should be ignorant of the nature of these structures. You should know the nature of the human machine well, or how can you pretend to mend it? If you have a watch injured, you will not give it to a tinker to repair; you will get the best watchmaker you can to set it right. How, then, can it be supposed, that the finest and most perfect organization we know of, when out of order, should be consigned to the hands of unlearned persons? Mistakes of this kind do, it is true, sometimes happen, but much less often now than formerly.

When you dissect, do not attack all the parts of the body at once. The best plan is, to take the portion you are examining to your room, and keep it fresh by plunging it into alcohol. Inspect it with care, and note down your observations. By these means a head will occupy your time for five or six weeks very advantageously.

Physiology.

Physiological knowledge is of the utmost importance to the profession of surgery: this gives you a knowledge of the healthy functions, and thus enables you better to understand the nature of diseased action. This was the rock on which Hunter stood, admired by the wise, and abused by the ignorant; indefatigable in his research, he omitted no opportunity of exploring false theories, and substituting true ones founded on facts established by experiments. But it is said that he was a man of great genius: I do not think so; or, if he were, he owed it to his uncommon industry and assiduity. He was the last in the laboratory or study at night, and the first there in the morning, allowing himself very little time for repose. It was in this way he collected and arranged that Museum which will endure as long as any thing of the kind, the admiration of foreigners, as well as of our own countrymen. But we are still more indebted to him for the true principles of our science, which he displayed to us with a masterly hand. In this free country the same way is open to all who choose to take it, who prefer honourable and laborious exertion to idle habits, which insure ignorance, and, finally, disgrace.

The study of medicine necessary to the surgeon.

The study of medicine is important to the surgeon: he should be able to prescribe with certainty; should well understand the great influence of local disease on the constitution, as well as the *origin* of local disease from constitutional derangement. Without such knowledge, he knows but half his duty. On the other hand, a mere physician cannot be a good judge of surgical cases; and notwithstanding my respect for the physicians of Guy's Hospital, I would not hold my situation in that establishment, unless I had the right of prescribing for my surgical patients. I had, in one of these hospitals, a man under my care for a compound fracture, and had great hopes of saving the patient, as he was doing well; but a physician, whilst going through the ward, visited him, and ordered a cathartic, which, acting rather violently, disturbed him so much, that fatal consequences ensued. That a physician should not interfere with patients of this description is therefore evident; but I do not mean to say that one profession is

to be upheld at the expense of the other: far from it, indeed they should mutually assist in the great duty of preserving human existence.

Reading will be found extremely useful, when it is select; but I would not recommend works to young students which lay down *systems* for their guidance; such a plan of reading is bad. It is better to read the detached works on particular diseases. To the pupils generally, but more particularly to those who are allowed to pass in this metropolis but one or two seasons in attending the different hospitals, I strongly recommend punctuality in their attendance at lectures, and at the dissections and hospital practice. In St. Thomas's Hospital alone, you have an opportunity of seeing above 800 in-door, and a vast number of out-door patients, whose cases are equally useful as interesting to students. I caution pupils from speaking unguardedly before the patients; it can do no good to let them know what is intended for their cure, which it very often prevents. Some time ago, a man came into Guy's Hospital, having a disease that required an operation, and by no means a dangerous one. A pupil, when conversing with him, asked him where he came from: the man replied, "From Cornwall." "O did you?" said the pupil; "Well, I can tell you, you will never see Cornwall again." The patient became alarmed, and immediately left the hospital.

Reading.

Making improper remarks to the patient.

I recommend to you, also, the practice of taking notes, but not hasty ones, as they do more harm than service, by causing one term to be mistaken for another.

Taking notes.

I am happy to bear witness to the great improvement which has taken place, of late years, in the education of those who are coming forward in the various classes of medical pupils: this I consider a most essential advantage, as it tends, more than any other circumstance, to raise the character of the profession to its proper station. To the Company of Apothecaries, society is much indebted, as to them we owe the act which makes a certain course of education indispensable to medical students. In the metropolis, surgeons, of course, are highly respected, but not equally so in the country, for

Improvement in the course of education.

there the practitioner is obliged to inspect the preparation of his medicines, and, necessarily, must be often in his shop. But general education, so essential to our profession in particular, is making rapid and desirable advances, whilst ignorance flies fast before it.

Attention and perseverance to study.

I particularly request the young pupils, whose friends have at great expense prepared them for an honourable and lucrative profession, not to lose their precious time in idle and vain amusements; and while they have those opportunities which our hospitals afford, to keep their attention steadily fixed on the various branches of science which are essential to a knowledge of surgery, and not suffer themselves to be led away from the true path to eminence by the idle and unthinking; for, I ask them, how they can, on their return home, look their friends in the face, if they have neglected their duties? But, on the other hand, should they conduct themselves with good sense, and apply with diligence to their studies, they will receive their just reward.

Motives to study.

I have probably known ten thousand members of the faculty in the course of my professional life, to whose partiality I attribute my successful progress, more than to any merit of my own; and I should be wanting in gratitude, if I did not acknowledge it. I have observed that well-directed assiduity will surmount all difficulties: you should not be deterred in your efforts, even by poverty, for it is a great stimulus to exertion, and to regularity of life; all, however, will not be equally studious, for some will be fluttering in the boxes of another theatre, or come here only to interrupt their more steady fellow-students; but I will not suffer it as long as I have the honour of lecturing in this establishment: no man shall interrupt another with impunity. Perhaps some who are fashionably dressed may think proper to look down with a feeling of contempt upon the students whose attire is plain and more modest; but should such a feeling exist, I would advise such persons to pause a while, and consider what it is that makes one man superior to another in this profession. When they commence their career of public life, the plain, industrious, intelligent young man goes slowly but steadily in the right track of his profession, and rises to respect-

The contrast.

ability, perhaps even to a high rank; on the other hand, the fashionable lounger, who neglects to improve himself, finds his want of knowledge and his bad habits equally retard him: instead of rising, he sinks lower; his friends disappear, and at last he falls into obscurity, reduced to a pitiable state, blaming and abusing his more fortunate rivals. In conclusion, let me say, that if any of you wish to ask my advice or assistance in any way, I shall be most happy if you will call on me whenever you think proper. I do not say this from ostentation, but I always wish to show the junior members of the profession, that I do not forget the friendship I have experienced from their fathers.

LECTURE I.

IRRITATION.

Importance of the subject.

THIS being one of the most important topics in surgery, requires to be attentively studied, and its effects carefully watched, before any one can practise in his profession with credit to himself or advantage to others.

Doctrine of irritation.

The doctrine of irritation teaches the immediate and remote effects of injuries; in what manner nature restores them on the one hand; and, on the other, the mode in which apparently trifling accidents prove ultimately destructive.

Irritation is either local or general, and its effects are communicated from one part to another, through the medium of the nervous system, so that the heart, brain, and stomach, almost immediately after an injury has been sustained, even in the remotest parts of the body, will have their functions more or less disturbed in proportion to the extent of the injury and importance of the part injured.

Natural stimuli support the actions of the body.

All the actions of the body are excited and sustained by internal and external impressions, which are called stimulants: the blood, for instance, being the stimulus to the blood-vessels; the bile, to the

intestines; and caloric, in a certain degree, a stimulus to the whole system. Between all the different parts of the human frame, there exist intimate relations, which correspond with each other, and carry on a reciprocal intercourse of action. The beautiful harmony produced by these concurrent phenomena is called sympathy. Thus impressions not only produce effects on the part to which they are directly applied; but, in consequence of the freedom of communication between the nervous system, parts of the body situated at a distance from those in which the original mischief exists become affected by it: the real nature of sympathy is yet unknown, but we are acquainted with many of its effects. Thus numerous examples of sympathetic actions may be adduced; the communication which exists between the uterus and breasts is a striking instance of it. Sneezing is a sympathetic action between the nose, velum palati, and the abdominal muscles; coughing, also breathing, and the expulsion of the fæces, are a few among the numerous examples which might be enumerated.

Sympathy.

Natural sympathy.

But sympathetic action is also the result of injury and disease, becoming the cause of restoration on the one hand, or of destruction on the other; and this state of the body I call irritation. Irritation, gentlemen, may be defined to be an altered action, excited in the system by an unnatural impression. Thus sympathetic pain is experienced in the knee and foot from diseased hip, and at the extremity of the penis, when there is stone in the bladder. The passage of an urinary calculus through the ureter occasions retraction of the testicles and pain in the thigh; disease of the prostate, causes pain on the inside of one or both thighs; disease of the liver occasions pain in the shoulder; diseased testicle, pain in the loins; irritation of the intestines, an itching of the nose.

Diseased sympathy.

Definition.

These sympathetic effects, which we have just been describing, do not consist of morbid actions in the parts thus affected, but of disordered sensations. But morbid actions are also, sometimes, excited in parts near to, or at a distance from, those originally affected. Inflammation of the testicle is frequently the consequence of irritation in the urethra; and swellings of the breast, of a morbid action

Irritation produces diseased actions.

of the uterus: but there is no organ so much affected by irritation, or sympathetic influence, as the stomach. For instance, if a blow is received on the head, causing injury to the brain, vomiting is one of the first and most constant symptoms, being imparted to the stomach through the eighth pair of nerves, and by this we are led to detect the injury. Vomiting is produced when the testicles are injured, or intestines burst, wounded, or strangulated, and from a gall-stone passing the biliary duct; indeed, an obtuse pain in any part of the body will occasion sickness.

The course of irritation.

The consequences of irritation are so numerous and important, gentlemen, that I shall relate to you the medium of its communication. Irritation is generally communicated through the medium of the nerves, of which there are two grand divisions in the body. The first composed of the brain, spinal marrow and their nerves, which naturally convey sensation and volition; the second consisting of the grand sympathetic nerve, the centre of which is behind the stomach, in the semilunar ganglion and solar plexus. The modes of sympathetic communication are various. In some instances, the course of irritation is from the irritated part to the sentient extremity of the nerve, as the pain experienced in the knee and foot from a disease of the hip. In other cases, the course of sympathy is from the affected part to the origin of the nerve, as in pain in the loins consequent on diseased testicles. Irritation on the nerves of the grand sympathetic is communicated to the stomach, probably through the medium of the semilunar ganglion, and all injuries to the stomach are attended with serious effects. I could relate to you several instances in which injury to this organ had proved fatal. A man walking through Fleet-street, one day, happened to quarrel with a woman, when another came up, and gave him a blow in the region of the stomach, which caused almost instantaneous death. On dissection, no cause could be found to account for his sudden death. A man belonging to the India House, was attempting to lift a weight, when another came up, and jocosely said, "Here, stand on one side, and let an abler man attempt it;" and at the same instant gave him a slight blow on the stomach, when

the poor fellow dropped down and expired. His body, upon being opened, showed no marks of violence.

Local or general.

Irritation is either local or constitutional.

Local.

Sometimes it is local, affecting only particular parts; at others, attacking the whole system. A decayed tooth will produce an abscess, and the matter will escape by forming an opening through the cheek. This ulcer will be very difficult to heal if the tooth remain; but extract it, and the disease will quickly disappear, the cause of irritation being removed. Many cases of this kind have fallen under my observation, and I will relate a few by way of illustration.

Case.

Two persons came to me from the same place, without knowing each other's situation or intention; each of them had an abscess near the alveolar processes; which, on examination, I found extensive, producing an external opening. The disease had been of long standing, in both cases; I directed a diseased tooth near the ulcer, to be drawn, and the patients quickly recovered.

Case.

A lady in Essex, had for a long period been afflicted with a fungoid granulation, which protruded through an ulcerous opening in the cheek, and which had resisted the use of every means. Upon stating one day that a tooth near the part, was occasionally painful, she was recommended to get it drawn; the tooth was extracted, and the fungus quickly disappeared.

Case.

A gentleman of my acquaintance had, for many years, been exceedingly annoyed by an ulcer on the chin; every attempt to heal it having proved ineffectual, it was considered incurable. At length, one of the teeth opposite the wound becoming painful, it was extracted, when, to the delight and astonishment of the patient, his malady disappeared.

Case.

Mr. Toulmin, of Hackney, attended a lady, on account of her suffering severely from a diseased tooth; and she appeared also to be affected with hemiplegia. Mr. Toulmin extracted the tooth by the lady's desire, and in a short time the paralytic affection entirely subsided.

These cases are mentioned, to show the importance of endeavour-

ing to ascertain the *causes* of diseased sympathetic actions, as the removal of those defects will depend on the cure of their causes. If the causes be undiscovered, the effects are likely to continue in spite of every means that you may employ.

Constitutional symptoms.

The constitutional or general effects of irritation are frequently produced by the most trivial local cause. A person, on having a bougie passed into the urethra for the first time, feels faint, becomes sick, looks pale, and, unless you prevent it, will fall on the ground. On placing him in the recumbent posture, with his head a little lower than his body, and as soon as the blood freely enters the brain, all his functions are restored; but constitutional irritation frequently comes on in the evening, which, however, soon ceases. From the irritation of the urethra you see, gentlemen, that the stomach is influenced, the actions of the heart are suspended, and the powers of the mind gone. The symptoms of constitutional irritation following injuries are best exemplified in compound fractures. In these cases, the irritation runs very high, and the heart, brain, and stomach are much affected. A person receives an injury to the leg, producing compound fracture of one or both bones; constitutional irritation commences generally in twenty-four hours; the patient complains of pain in his loins, extending up the spinal cord, and pain in the head. He then becomes restless, and his countenance anxious; the tongue at first is dry, and covered with a whitish fur; but, as the symptoms increase, it becomes yellow, and lastly coated with a thick brown fur. There is loss of appetite, the stomach becomes irritable, and nausea and vomiting supervene. The secretions are diminished, and the stools are white. As the severity of the complaint increases, the pulse becomes quick, hard, irregular, and alternately intermittent. The respiration is hurried, intellect deranged; all impressions on the senses are painful; subsultus tendinum, hiccough, vomiting, and tension of the abdomen come on; the patient sinks into a low muttering delirium, and soon expires. Thus, in constitutional irritation, whether from injury or disease, every part of the system is affected by it; and this effect appears to be produced in the follow-

Rationale.

ing manner. When any part of the body receives an injury, the nerves convey to all the important organs of the body, spinal marrow, heart, stomach, &c., an impression of that injury. Nature immediately commences the restorative process, by stopping all the customary secretions; the various outlets being thus closed, the blood collects in large quantities in the heart and great blood-vessels, which propel the blood with increased force to the wounded part; this gives rise to some form of inflammation, the one best suited to accomplish the desired effect. Here is an illustration of the manner in which nature contends for cure; during the battle, she occasionally requires to have her ardour checked, or calls for support in proportion to her want of power; we must watch her proceedings with an eagle eye, and be exceedingly cautious in all our proceedings; for if we should open the various sluices of the body, and restore the secretions too soon, we may, by abstracting blood from the injured part, prevent the restorative process; or by increasing the excitement, disturb nature's operations.

Idiosyncrasies.

The degree of constitutional irritation, resulting from injury, depends on, several causes, First, on the importance of the part injured. Secondly, the extent and nature of the injury. Thirdly, the state of the constitution, age, and previous habits of the patient. Thus we see that constitutional irritation is very different in some persons to what it is in others; so that a wound, which in one man would be attended by the most dangerous consequences, might not, in another, disturb the functions of any important organ; this greatly depends on the state of the system at the time of the injury; his mode of living, and the climate in which he resides; excessive irritation frequently follows an operation on very young subjects, but rarely those performed on very old persons. In infancy, the irri-

Infancy and old age.

tability is excessive, and the system is easily excited to destruction: after the period of two years the irritability is considerable, but the powers of restoration are great; in old age, irritability is much diminished, but the powers of restoration are much less; thus, many gentlemen present would probably in autumn overcome a dis-

Season.

ease, that in the spring would overcome them; that is, if they have

been paying proper attention to their professional studies, by devoting their time to anatomical pursuits.

The following cases are important, and place in a strong light the dreadful constitutional effects which occasionally result from very slight local causes.

A man who had lived intemperately, was bled by the late Mr. Saunders on a Tuesday; on Thursday (having indulged in the interim in the pleasures of the table) the wound in the arm was inflamed; on the Saturday the inflammation had considerably increased; on the Sunday gangrene commenced; and on the Monday, I was asked to see him. I found him with the delirium, hiccough, and subsultus tendinum; and on the following day he died. On dissection, the skin, to a great extent round the wound, was found mortified; the cellular membrane had suppurated to a large extent, but the vein which had been opened was not inflamed. Case.

Dr. Ludlow, of Calne, whilst shooting, pricked his hand with a thorn in getting over a hedge; the part soon became inflamed, and though he procured the best surgical assistance, yet he died of tetanus within a week after the accident. Case.

Another remarkable case was that of a brewer's servant, who, in removing some casks on a Saturday, had a small splinter of wood forced under the thumb nail; at the moment he did not regard it, but in the same night he awoke in dreadful pain, and requested his wife to get up and make a poultice; this he applied, but it did not afford him any relief. On Sunday he became worse; Tuesday the pain had extended up the arm, and his hand was considerably swollen. On Thursday I was requested to see him, and on examination, found that matter was formed in the hand; I made an opening with a lancet near the part where the splinter had entered, when a large quantity of pus was discharged. The man appeared greatly relieved, and I thought he would do well; but upon hearing a noise as I was about to quit the room, I looked round: he had, by a convulsive effort, raised himself in bed, but immediately fell back and expired. Case.

An instance of a totally different nature from those just men- Case.

tioned, which shows that a great degree of injury may be incurred, and the person yet do well, occurred in another brewer's man who was run over by a dray. There was compound fracture of the elbow joint, extensive laceration of the integuments, and a large wound communicating with the joint. The man was admitted into Guy's Hospital; an operation was proposed, but the patient would not consent. The wound was therefore dressed, and in a short time it completely healed, without any unfavourable symptom shewing itself.

Irritation modified by age and temperament.

Irritation is greatest in children, and least in aged persons; the former are very much affected by operations, whilst the latter are very slightly so. Children under two years of age, upon having stones removed from their bladders, will be frequently carried off by convulsions; therefore, if you can possibly avoid it, never perform the operation on a very young child, at all events not under two years of age.

Thus, an injury which in one person would be attended with the most dangerous effects, will in another produce little constitutional derangement; and the same person may at one period suffer but little from a wound, which at another may give rise to fatal consequences. It is on this account that punctured wounds inflicted in

Wounds in the dissecting room.

the dissecting room, often produce such distressing effects; though it may, in some instances, arise from the absorption of morbid matter, which usually produces the most aggravated form of constitutional irritation; it is therefore impossible that you can be too careful of the instruments you use in dissecting and opening bodies, as carelessness on this point has caused the loss of many a valuable life.

LECTURE II.

TREATMENT OF IRRITATION.

The treatment of irritation being much the same as that required in inflammation, I shall now give but a short description of it.

When constitutional irritation arises from a local cause, the remedies must be chiefly directed to the removal of that cause, or to lessen its effects on the constitution; but, on the contrary, when local disease is either promoted or aggravated by constitutional derangement, then your remedy must be directed to the disorder of the system; and as that improves, so will the local affections disappear.

Case

A short time since, a case of compound fracture was brought into Guy's Hospital. For the first five days there was no alteration; after a time, however, the man's constitution suffered very considerably; a probe was passed into the wound, and a loose portion of bone was found pressing against the tibialis anticus; the part was dilated by a scalpel; the detached bone extracted; the constitution began to recover its former vigour, the patient's health very rapidly improved, and he is now discharged cured.

Case

A case of simple fracture of the superior portion of the tibia was admitted into St. Thomas's Hospital, which was followed by violent irritation of the whole system. The whole limb became inflamed, and matter formed at the seat of the fracture. After a short time it was thought proper to amputate the limb, when on examining it afterwards, small pieces of bone were found, which kept up the irritation. The patient soon recovered from the operation.

Constitutional.

Constitutional irritation must not be too suddenly subdued nor destroyed, as a certain degree of irritation shows that nature is endeavouring to accomplish the restorative process; keep it within bounds, carefully watch its progress, and, if necessary, check its violence, but do not entirely destroy it.

Means of allaying irritation.

There are two means of reducing irritation.

First, by restoring to the different organs their various secretions, by which the outlets become opened, and fever lessened. A man who has his skin hot and dry, and his body altogether hot, will feel well and be relieved, if you can produce on the surface a free perspiration. To produce the secretions from the intestinal canal, you must give aperients; but when the irritation is very severe indeed, you must not limit your medicine to any particular part, but endeavour to restore all the secretions. This will be best accomplished

by administering mercurials to act upon the liver, saline medicines upon the intestines and kidneys, and antimonials on the skin.

The *second* method of relieving irritation is to allay the excitement of the nervous system; this may be done by giving opium and antimony combined, or calomel, antimony, and opium, to act on the skin and liver as well as the nervous system. The dose for an adult is two grains of calomel, two of antimonial powder, and one grain of opium. To this you may add saline medicines, if you like, as they are given as much to assist the medical man as his patient! It must not be considered, however, that such medicines are entirely useless: the liquor ammoniæ acetatis with tinctura opii is a good medicine. The alkalies, judiciously given, lessen the irritability of some organs, as the bladder, when in an irritable state.

In cases of irritation, bleeding must be resorted to with care, for if it be carried to a great extent, the powers of the constitution will be unequal to the reparation of the injury.

Case. A man was brought into Guy's Hospital with concussion of the brain; the dresser who admitted him was a great admirer of venesection, and bled the patient three times a-day; in ten days he died. Upon examining the head after death, a very slight laceration of the brain was found, but no signs of any attempt at restoration. The continued abstraction of blood had robbed nature of her restorative powers. In compound fractures it is likewise extremely dangerous to bleed largely.

Where there is chronic irritation, no medicine will be found equal to the Plummer's pill, five grains night and morning; it increases the secretions of the liver, intestines, kidneys, and skin. If the blue pill be given, or calomel, it should be followed by an aperient in the morning, else its action will be confined to the liver, but not in proportion on the other secretions. To attempt to cure such diseases suddenly, or by violent and active means, must ever be improper: a chronic treatment is required, and by slow degrees only can you restore the body to a healthy state. Let me repeat, all the secretions must be restored, as this is the grand principle in the cure of disease.

The influence of the mind on some of the functions of the body is well known, and requires the greatest care on the part of the medical attendant. It is the surgeon's duty to tranquillize the patient, to beget cheerfulness, and impart confidence of recovery. Therefore it is your duty to support hope, to preserve tranquillity, and to inspire cheerfulness, even when you are still doubtful of the issue. Influence of the mind.

INFLAMMATION.

Inflammation is the means by which local injuries are repaired, and it may be therefore considered as the restorative principle. There are four signs that commonly attend it, *viz.*, redness, pain, increased heat, and swelling. Restorative principle.

First. *Redness.* This arises from an increase of the red particles of blood in the part, and may be distinctly seen when the inflammation is superficial, as in inflammation of the conjunctiva of the eye; and that it is the result of a dilated state of the vessels, is readily ascertained by injecting parts, in which the vessels are naturally of small dimensions; as for example, by the injecting an inflamed peritoneum, pleura, or tendon, which is a part naturally possessing but little vascularity. Redness.

Secondly. *Increased Sensibility*, which is owing to distension of the nerves by the greater quantity of blood determined to them. Parts naturally little sensible are quite the reverse when in a state of inflammation. I was called a short time since to a case where it was requisite to saw off a small piece of the tibia. During the operation I opened a cavity in which was a small piece of bone embedded in granulations; the latter were extremely sensitive: extract of belladonna was applied, which gave instant ease. Bones, though nearly destitute of sensation in their healthy state, are sometimes extremely sensitive when inflamed. Not only is the sensibility of a part increased by inflammation, but its irritability is exceedingly augmented by inflammation. If an hydrocele be injected when inflamed, it suppurates instead of adhering; and if amputation be performed through an inflamed part, the stump scarcely ever unites by the adhesive process, but passes into a Sensibility.

suppurative, and sometimes a sloughing state. Therefore, an intelligent surgeon generally avoids cutting into an inflamed part, from the great pain which it inflicts, and from the restorative process being difficult, on account of the great irritability of the inflamed surfaces.

Heat.

Thirdly. *Increased Heat.* Mr. Hunter denied that this existed. He made an incision two inches deep into the gluteal muscles of an ass, and into the wound he introduced a tin canula, one and a half inch long, so that there was half an inch of wound below the canula; he then passed a plug of wood through the canula, to the bottom of the wound, and confined it there, in order to prevent an union of the muscles. This was on a Wednesday. Immediately after the wound was made, a thermometer was introduced into it, and the mercury rose to 100°, exactly as another did at the same time which had been passed into the vagina. On the next morning the plug was taken out, and the ball of the thermometer introduced to the bottom of the wound; the mercury rose to 100°; the plug was then again returned and secured as before. In the evening the experiment was repeated with the same result. On Friday morning the thermometer, when introduced, rose to 99° only; and in the evening it rose to 101°. On Saturday morning, when introduced again, the mercury reached 99°; in the evening 100°. Mr. Hunter also introduced a thermometer into the opening made during the operation for hydrocele, and it rose to 101°; after twenty-four hours it was no more than 100°. Though no increase of heat is manifested in internal inflammation, yet, when it occurs on the surface of the body, an alteration sometimes of several degrees takes place; as on the inside of the thigh, where a blister was applied, the thermometer rose to 90°, while on the inside of the opposite thigh it only reached 83°.

Swelling.

Fourthly. *Swelling.* This is owing in part to an increased determination of blood to the part, and also depends on effusion of the fibrin of the blood, which, in coagulating, deposits serum in the surrounding cellular tissue.

Terminations of Inflammation.

Inflammation has four termininations.

First. *Adhesion.* This arises from the fibrin of the blood being effused into the cellular membrane, by which the parts become glued together. It had been supposed that it was albumen which was poured out in inflammation; but in examining this subject with care, it is found that the character of the effused substance, in all respects, resembles the fibrin of the blood, and by this substance are the edges of the divided parts reunited. Adhesion.

Secondly. *Suppuration*, or *secretion of pus.* This is composed of particles nearly similar to those of the blood, only differing in colour, swimming in a fluid resembling serum, and coagulating, as serum does, when exposed to the influence of heat. Suppuration.

Thirdly. *Absorption* or *ulceration.* This arises from an increased action of the absorbents, produced by pressure united with inflammation, by which the parts are partially absorbed. Ulceration.

Fourthly. *Gangrene*, which consists in the destruction of the life of an inflamed part. The arteries, enfeebled by excessive action, are deprived of their vitality, the blood coagulates in them, and gangrene is produced. Gangrene.

These are the local effects; the constitutional ones are similar to those of irritation, which I mentioned to you in the last lecture.

Inflammation produces different results in different parts. When seated in the skin, it usually becomes extensive, because the surface is unbroken. Its colour is very florid; it separates the cuticle in the form of vesications, which usually contain serum, but also in some cases fibrin; a serous effusion is also produced by it into the subjacent cellular tissue. In some instances it is preceded by fever, in others followed by it. In the cellular membrane, inflammation produces an effusion which obliterates or fills its cells; if it proceed, it occasions suppuration, and produces an abscess, the contents of which are frequently discharged by the process of ulceration. In debilitated irritable constitutions inflammation destroys the cellular tissue and produces carbuncle, which is a sloughy abscess in the cellular tissue. When chronic, it occasions tumours of various kinds, as the steatomatous or adipose; or, under peculiar circumstances, those of a malignant nature, as the scirrhous, fungous, &c. Inflammation of texture.

Inflammation of the fasciæ mistaken for Erysipelas.

Inflammation of fasciæ is generally extensive, from the large surfaces they present; they are often seen inflamed in compound fracture, producing redness of the skin to a considerable extent, and it is a very unfavourable sign in this accident. When matter is produced by inflammation of this texture, and is seated under it, great irritative fever succeeds until it is discharged; as, for example, in the palms of the hands, or soles of the feet.

Muscles.

When inflammation attacks muscles, it is known by the spasmodic twitchings which attend it. For instance, in a few hours after simple fracture, when the limb has been carefully adjusted, it becomes disturbed by involuntary convulsive catchings, occurring when the patient is going to sleep, or awaking from rest.

Tendons.

Tendons are not very susceptible of inflammation, but they sometimes become inflamed to a considerable extent. When this happens, for example, in the finger, the fore-arm swells, is red, and matter forms in the course of the tendon, which sloughs to its junction with the muscle: but in all to a greater extent than the surrounding soft parts. Punctured wounds of tendons are apt to produce tetanus more than wounds of other parts of the body. Matter formed under tendons burrows to a great extent, and produces violent irritation, as under the tendon of the occipito frontalis muscle, and the covering of the temporalis.

Absorbents.

Inflammation in the absorbent vessels is marked by red lines on the skin in the course of these vessels. These form hard knots, from the skin participating in the inflammation. Their glands become also inflamed, and both glands and vessels occasionally suppurate. They more frequently inflame from common irritation than the absorption of poisons.

Arteries.

The arteries are rarely inflamed, excepting after wounds, or the application of ligatures. Inflammation, however, of the arteries may be very extensive, when it occurs in a person whose health is very much deranged. I have known instances where it extended even to the heart. I was present when Mr. Cline opened the body of a man, who had a ligature put on the femoral artery near the groin, and who died at the second week from the operation. The internal surface of the artery was inflamed, as was also that of the

external and common iliacs, and the aorta was of a florid red internally, as far as the valves of the heart.

Veins which are inflamed from wounds, become like hard and broad cords, and extremely tender to the touch; and if it occur from bleeding, it extends from the orifice to the axilla. I have seen several patients die from this cause; and on examination, the inner coats of the arteries have been generally found adhering. I have seen suppuration of a vein, and I once saw an abscess in the longitudinal sinus of the dura mater, of which we have a beautiful specimen in the anatomical collection in St. Thomas's Hospital. When inflammation of the veins is produced by the application of ligatures on them, it will be found to be greater below the ligature than above it. Veins.

Nerves are very rarely inflamed, but when they are, the pain is excessive, and there is a tingling sensation in the parts to which the nerve is distributed. Wounds of nerves, though extremely painful at the moment, are followed by little irritation. Nerves.

The wife of a medical gentleman was obliged to have the posterior tibial nerve divided, for a painful tumour on the nerve, which I did in the presence of Mr. White, surgeon to the Westminster Hospital; although the operation was dreadfully painful, and the pain extended through the brain, spinal marrow, and the nerves proceeding from it, yet it did not affect the nerves of the great sympathetic, directly or indirectly. I have also had occasion twice to remove portions of the sciatic nerve, when but little constitutional irritation followed. Severe pain takes place sometimes in the course of the nerves, but whether it be from inflammation or not, I have not been able to ascertain by dissection. When the pain is excessive, it is called tic douloureux. Case.

Ligaments, like tendons, are not very prone to inflammation in healthy constitutions; but the synovial membrane which lines them is highly so, and the inflammation has a tendency to go on to the suppurative process. In scrofulous persons, the synovial surface becomes inflamed, and the ligament covering it thickened, so as to produce great enlargement of the joints. Ligaments.

Cartilage. Cartilage in joints ulcerates from inflammation, and often becomes entirely destroyed.

Bones. The bones, like other parts of the body, are subject to inflammation; and when fractured, it is by this process that their union is effected. Suppuration, ulceration, and mortification, or the death of the bone, also attack this structure; thus you see that, like other parts of the body, it is subject to the different processes of inflammation.

Membranes. Exhalent membranes, when inflamed, are remarkably disposed to pass into the adhesive inflammation; whilst mucous membranes, on the contrary, generally go into the suppurative state. Mr. Hunter made several experiments to confirm these facts, which have been verified by later physiologists.

Healthy inflammation. Inflammation may be of the healthy or unhealthy kind. No wound can be restored without the former; even the small puncture made in bleeding would inevitably destroy life, were it not for this salutary principle; a slight inflammatory action throws out upon the edges of the wound adhesive lymph, by which they become permanently united. When a ligature is put upon a large artery, unless inflammation supervened, no good effect would be produced. The first thing nature does in this case is, to form a clot of blood at that part of the vessel where it has been tied; inflammation supervenes, adhesive matter is thrown out, by which the internal coats of the artery become firmly glued together, and hemorrhage prevented.

Unhealthy. If the constitution be in an unhealthy condition, this process will not be effected; so that when the ligature comes off, the person may die of hemorrhage. Inflammation in a healthy constitution, is the VIS MEDICATRIX NATURÆ, established for the purpose of restoration; but the inflammation, without any obvious cause, is generally of the unhealthy kind, and arises from irritability of the constitution, and an enfeebled state of the affected part.

Acute or Chronic. Inflammation is either acute or chronic. The first passes through its stages with rapidity, while the latter is exceedingly slow in its progress. The chronic is either the result of acute inflammation, or is owing to a peculiar state of the constitution; as heat, which

occurs in persons who have lived intemperately, or in those who have been exposed to excessive and laborious exertion, or who are the victims of anxiety and disappointment.

Acute Inflammation.—One of the best examples of acute inflammation is seen in the breast after delivery. The adhesive stage is marked by hardness and pain; the suppurative, by irritative fever, fluctuation and throbbing, or pulsation; ulceration usually succeeds in a short space of time, and the matter is soon discharged. Acute inflammation.

Chronic Inflammation.—A good example of acute inflammation, terminating in chronic, is observable in ophthalmia. When consulted in cases of this description, during the acute stage of inflammation, you must bleed both locally and generally. This may be done either by opening a vein in the arm, by the application of leeches to the temples and palpebræ, or by opening the temporal artery, which sometimes relieves, from its free anastomoses with the ocular arteries. You should use such applications as will soothe and allay the local irritation, and these should consist of narcotic and emollient fomentations. When by these means the acute inflammation ends, the chronic frequently begins. In the first, our object is to diminish power; in the second, it is necessary to stimulate the vessels, to contract their diameters, to lessen the quantity of blood which has accumulated in them, and thus restore them to their natural state. This is best effected by astringent and stimulating lotions, as the solutions of alum, sulphate of zinc, nitrate of silver; and as the system of depletion required during the acute stage may have produced debility, the use of tonics must not be forgotten. Chronic inflammation.

An instance of chronic inflammation succeeding the acute may be seen in gonorrhœa. During the first stages of this complaint, we are obliged to check the action of the vessels of the urethra, but afterwards to excite it by the balsam of copaiba, and slightly stimulating injections.

Inflammation is of two kinds, either common or specific. Common or specific inflammation.

The first, with its terminations, has been already described, and

is called healthy inflammation. But the second, or specific, is of a peculiar kind, and is called unhealthy. In this inflammation, the vessels have an entirely different action to what happens in the healthy state, and thus the fluids and solids they secrete, have a decidedly opposite character.

Specific.

There are two descriptions of specific inflammation: the first is produced by a peculiar condition of the constitution; and the second, by the application of a poison.

Arthritic inflammation.

Gout is an example of the first kind. If a man for a length of time yield to every injurious excess, loading his stomach with food and wine, so as to weaken the digestive powers, he probably excites in his system what is called the gouty disposition; he experiences dreadful pain in one or more of his toes, &c., and severe inflammation ensues, which frequently terminates in the secretion of a matter that speedily becomes solid, usually called chalk-stone; this name, however, is incorrect, as it has been proved by the analysis of Dr. Wollaston, to consist of uric acid and soda, consequently is now very properly named urate or lithate of soda.

Scirrhous inflammation.

The formation of scirrhus or cancer is another example of specific inflammation, arising from a peculiar state of constitution. Let us suppose that two women receive each a blow on the breast; one woman with a constitution in a healthy, vigorous state, and the other with a system predisposed to the formation of cancer; in the first individual the inflammation will be strictly healthy, going through its different stages until a cure is accomplished; in the other person, owing to a constitutional peculiarity, the same extent of injury will produce cancerous disease, a malady over which medicine has no influence, and extirpation is only an uncertain remedy. Persons afflicted with cancerous or fungous complaints, are of exceedingly anxious minds (at least nine times in ten); this anxiety occasions a sort of irritable fever, which invariably proves detrimental.

Scrofulous inflammation.

But the best example of specific inflammation is scrofula. Persons attacked by this disease have generally light hair, fair complexion, delicate appearance; when inflammation occurs, it is

slow in its progress, although easily excited; and at last, ulceration taking place, the discharge consists of curdy matter, or a thin serous fluid, not at all resembling the pus which is formed in healthy inflammations.

From poisons.

The second kind of specific inflammation is caused by the application of poisons. Thus, in gonorrhœa, the matter secreted is widely different from common healthy matter, having, in the first place, a much larger quantity of mucus mixed with it, and, secondly, when applied to a secreting surface, is capable of exciting in the part an action by which similar matter and the same effects can be produced. The matter of small-pox occasions the same result, and as far as constitutional effects are concerned, it does not seem material how large or how small a quantity of the poison is applied, the result in each case depending upon the state of the constitution.

Irritable inflammation.

There is another kind of inflammation which I would call the *irritable:* in this disorder the nerves are much more affected than the blood-vessels. You are called probably to attend a person, who tells you that he feels in a particular part, as the hand or arm, a most agonizing pain; and if inexperienced in these matters, you will be inclined to doubt the correctness of your patient's statement, and the more so as you can discover no alteration in the appearance of the part. It may not be amiss to mention here what happened to me some time ago. I was requested to see a lady having this complaint in her foot: I tried by every possible means to remove it, but in vain. When unsuccessful, I invariably recommend the sufferer to some one else. This lady consulted two other very eminent surgeons, but their efforts, in like manner, were unable to afford relief; and finding that she got worse in town, she went into the country for change of air, where, without any medical means being employed, she entirely got rid of her troublesome companion. I saw this lady afterwards, and she described the pain that she used to feel as horrible; it was constantly at the bottom of her foot; and if she walked but a very short distance, it occasioned a confinement during four or five days.

Case.

The eyes are very subject to this torturing disorder. But no

Ophthalmic and mammary inflammation.

parts are more frequently attacked by it than the breasts of young women. It produces such a degree of tenderness that they cannot bear the slightest pressure, and their stays consequently occasion great inconvenience—the pain extends to the shoulder, down the arm, and even to the elbow, at the same time producing constitutional irritation. To cure these pains and general derangement, such medicines must be given as will influence the secretions, but more particularly those of the uterus.

Testes.

The irritable inflammation frequently attacks the testicles, and renders them exceedingly sensitive, the slightest pressure causing very great pain. There is in these cases little or no alteration of size; if any difference, the affected one is the smallest. In three instances I have been obliged to remove testicles for this disease. The subject of one of these cases was a gentleman from South Carolina: he came to England for advice, and went the whole round of medical men, without experiencing any alleviation of his sufferings. He then desired me to remove the torturing part; this was done, and the gentleman went back to his native country quite well. I heard, that soon after his return he got married, and, am happy to add, that his lady had a child!

Bladder.

The bladder is also very commonly disordered by this irritable inflammation, and the symptoms in many respects resemble those of stone—in both cases there is pain in making water, and the urine is frequently mixed with blood. The grand difference in the two cases is this: the irritable bladder is most painful when the organ is *full;* the bladder that contains a stone, when it is *empty*. Upon dissection, the inner coat of an irritable bladder has been seen the colour of red velvet. I have known this irritable inflammation attack the rectum, and produce excessive suffering, which was relieved by large doses of soda, rhubarb, and the compound powder of ipecacuanha.

Cause of inflammation.

Inflammation sometimes arises from debility, and this state is frequently seen in the lower extremities of old persons, in whom the blood returns to the heart with difficulty. From this weakened power, the arteries are called upon for unusual exertion, and inflam-

mation of the skin succeeds, frequently attended with incrustations, a serous discharge, and sometimes with a watery secretion into the cellular tissue.

Predisposing causes.

Irritable persons are much more predisposed to inflammation than others, and when it occurs in them it is of a more dangerous nature than in those who are not irritable. Thus in fevers, when the constitution has been much weakened, the parts on which the body has been resting become inflamed, and quickly mortify. But in fractures, where the system is healthy and strong, although the patient remain many weeks in bed, no such effects are produced. Where there is great irritation, inflammation is always dangerous: and the application of a blister to the chest, for the removal of a cough after measles, frequently, in this town, destroys it by bringing on mortification. Mercury, in like manner, by rendering the body irritable, disposes it to inflammation; and it is wrong to operate on a patient immediately after a mercurial course, on account of this inflammatory tendency.

Exciting causes.

The exciting causes of inflammation are whatever produces an unnatural state of the part, calling upon nature for its reparation, which she effects by the process of inflammation, as bruises, warts, pressure, extraneous substances, &c. &c. The manner in which nature repairs these injuries will be more fully explained hereafter.

Proximate causes.

Proximate causes of Inflammation.—With regard to these there has been, and still is, much difference of opinion. Boerhaave's opinion, of an obstruction in the smaller vessels, arising from the thickness of the blood, is false—for instead of being thicker, it is absolutely thinner. Cullen's theory, of spasm in the extreme vessels, is equally erroneous. These are the results of opinion not founded upon observation. We should observe first, and think afterwards. The true proximate causes of inflammation appear to be an increase of action in the vessels of the part, and an increase in the size of the vessels themselves. These phenomena are well demonstrated by the following experiment; *viz.*, Stretch the web of a frog's foot, and place it under a good microscope, put on it the smallest drop of nitric acid, or prick a spot with a pin: you

Experiment.

will soon perceive in the vicinity of the irritated part considerable agitation, and presently a red particle of blood will make its appearance in a vessel that had previously been the receptacle of transparent serum only—each pulsation pushing it on farther and farther. This red particle distends the vessel, and is succeeded by others passing freely into the vein. All the vessels of the part then take on similar actions; and thus you create under your eye, speaking figuratively, meandering rivulets of blood. The dilatation of the vessels in inflammation is not, however, confined to the part itself, but is also observable in the larger arteries leading to the scene of irritation: thus, in persons who have died, having inflammation in a foot, the femoral artery on the affected side has been found larger than the opposite. I before explained the manner in which nature throws a quantity of blood to a part for the purpose of repairing an injury, or for the removal of irritation; I will give another illustration of this, which, if you have not seen, most probably all of you have felt. It is this: when any offending matter gets under the eyelids it produces irritation;—nature immediately sends a quantity of blood to the lachrymal gland—this blood occasions a secretion of tears, and these are directed in streams over the eye, for the purpose of washing off the offending substance.

Illustration.

[Sir Astley then stated, that he would show a beautiful specimen of fungus hæmatodes. The tumour was of very large size, and, when cut open, exhibited the usual characteristics of this malignant disease; *viz.*, cysts filled by a transparent fluid; extravasated blood in clots; some of its parts were whitish, while others were very dark, and the whole was of a spongy, elastic texture.]

LECTURE III.

TREATMENT OF INFLAMMATION.

Constitutional or Local.

THIS is either constitutional, local, or both combined. When any important organ is injured or its functions disturbed, in consequence

of the influence of the injury on the constitution, the treatment must be invariably constitutional, let the local be whatever it may; for no vital organ can be disturbed in its functions without producing general derangement, which will be, more or less, in proportion to the importance of the part wounded, and the extent of the wound. Inflammation, however, in many persons, requires constitutional treatment, whether any important part be injured or not; as, in irritable habits, where very trivial local damage will speedily affect the entire system.

Bleeding.

The most powerful means of relieving inflammation is by the abstraction of blood. Its beneficial effects principally result from producing a diminution of nervous power; and that it does accomplish this, is proved by the syncope which it occasions. Thus, often the removal of a very small quantity of blood even causes a suspension of the mental faculties, as well as of all the voluntary functions. Fainting, however, cannot be suddenly produced unless the patient be in the erect position at the time the blood is drawn; for it is the loss of this fluid by the vessels of the brain, which is the immediate cause of fainting. To prove this, when you next bleed a man until he faints, place him in the recumbent posture, and let his head be situated a little lower than his body, to facilitate the return of blood to the brain: in a very short time after being thus placed he will open his eyes, and all his faculties will resume their former abode.

Modus operandi.

The second mode by which bleeding relieves, is by lessening the quantity of blood; for when there is much fulness of the vessels, the momentum will necessarily be great, and consequently the vital fluid will be thrown with greater power, not only to the inflamed, but to every other part of the body.

The third mode by which bleeding proves serviceable, is by facilitating the re-establishment of the secreting functions.

Indication for venesection.

The indication for bleeding is a *hard* pulse. In this state of the pulse the diameter of the vessel is diminished, yet the action is exceedingly strong, and each pulsation of the artery feels like the vibration of a wire: whenever, therefore, you find this description of pulse, you will be justified in taking away blood.

Carditis and Pneumonia.

The hardest pulse that I ever met with was in a person who had inflammation of the heart; in inflammation of the lungs and of the brain the pulse is hard, but not to be compared to this. The pulse, however, is not always hard when inflammation attacks important parts. The contrary is sometimes the fact; for when the stomach or intestines is thus affected, the pulse is scarcely discoverable. Persons unacquainted with the nature of this fact, are frightened at seeing a man frequently bled, who has, for example, strangulated hernia, and will often exclaim, "Pray don't bleed him any more, see how pale he is, and his pulse is almost gone." Well, then, recollect, that in inflammations of the abdominal viscera the pulse is feeble; but inflammation of the liver, however, is an exception to this rule.

Necessary precaution for depletion.

Quickness of pulse is not in itself a sufficient proof that bleeding is requisite, but when united with hardness, no additional evidence of its necessity can be wanted; therefore, never bleed where there is a quick pulse, unless at the same time it be a hard one. The indication for a repetition of blood-letting is said to be a buffy state of the blood, but your decision must not be governed by this appearance, you must still have a hard pulse. When blood is cupped it is said to be a proof of strength, and that bleeding should be repeated; the following case, however, will show, that even a cupped state of the blood and buffiness conjoined, are not sufficient evidence to warrant a conclusion that venesection may be repeated. A man at Guy's Hospital, in the last state of scurvy, and whose blood-vessels were so weak, that a very slight pressure upon the skin produced ecchymosis, whose gums bled frequently, and whose pulse was exceedingly feeble and quick, had taken from his arm, at my request, a very small quantity of blood, by way of experiment; after standing for a few hours, it became not only buffy, but exceedingly cupped. When, therefore, you employ bleeding, it may be of importance to you to keep this experiment in your remembrance.

The quantity of blood which should be drawn at a time, in inflammation, must depend entirely on the severity of the complaint.

Quantity.

The proportion of blood, compared with the solids, which can be

drawn from an animal before it dies, is about one pound to sixteen. I ascertained this fact in the following manner: I took a small dog, weighing fourteen pounds, and opened his jugular vein; in this way eleven ounces were discharged, when the dog fainted. I then opened the carotid artery, and from this source obtained three ounces more. Thus, fourteen ounces of blood were drawn from a dog weighing fourteen pounds; so that one ounce of blood to sixteen ounces of the solids is about the correct proportion.

Mode of bleeding.

When you bleed to relieve inflammation, the blood should be abstracted as rapidly as possible; therefore, the orifice made into the vessel should be of considerable size; for, if it be allowed to run slowly, the vessels have time to accommodate themselves to the diminished volume of circulating fluid; so that the system scarcely receives any shock when blood is abstracted in this gradual manner. The grand object, indeed, is to produce fainting; to effect which, blood must be suddenly withdrawn.

Case.

You may bleed so as to produce constitutional and local effects at the same time. A patient of Mr. Foster's, in Guy's Hospital, who had a concussion of the brain, was bled in the external jugular vein; immediately after the operation, the pain of the head ceased, and the irritable fever disappeared.

Bleeding in Chronic cases.

When you have accidents brought to you which will require a long time for their recovery, you must be exceedingly careful how you take away blood from the general system, but must adopt in these cases local depletion; for if, as I have before remarked, you take away from the constitution too much of the vital fluid, nature will be unable to execute the usual processes for the restoration of the injured parts; the most disastrous consequences, in such cases, follow the indiscriminate employment of blood-letting; and there is not to be found, in the whole range of surgical practice, a greater error than this, as the following case will illustrate. A fine young man, in the very prime of life, was admitted into Guy's Hospital, with simple fracture of the humerus, with slight abrasion of the fore-arm. Some time after his admission, he appeared to labour under constitutional irritation, and local pain near the seat of injury.

Case of a patient bled to death.

To relieve these, the dresser was ordered to take some blood from the arm; which he did; but not having the fear of a *lancet* before his eyes, and forgetting that his patient was in the recumbent posture, he abstracted so large a quantity that he never rallied.

Secretions restored.

The second mode of relieving inflammation is by restoring the secretions; for whenever it occurs, at least in any violent degree, all the secretions are diminished or suppressed. The most important secretions are those of the liver, intestines, skin, and kidneys; and when these cease to perform their proper functions, irritative fever is the consequence. A deficiency of secretion in the alimentary canal is the cause of a great many of the diseases to which human beings are subject. The internal surface of the intestines is lined with glands; the tube itself, on an average, is twenty-seven feet in length, and three inches in circumference; thus there are here about a thousand inches of surface, from which, in health, continual secretion proceeds. What then must the result be of allowing such an extensive surface to remain inactive? Of course, the production and continuance of irritation and fever! To excite the intestinal canal to action, therefore, should be one of our first objects. This may be done by purgatives; and they afford relief in nearly the same manner as the abstraction of blood from the arm; for a pint of serum will frequently pass off with feculent matter, after taking a cathartic. Purgatives have likewise another good effect, independently of restoring the secretions from the intestinal tube, *viz.* that of carrying off whatever feculent matter may be lodged in the intestines; but I do not believe that much irritation is produced by the accumulation of fæces in comparison with that which takes place from a stoppage or deficiency of the secretions. I have met with several cases in which a vast quantity of fæces had collected, yet little constitutional irritation was produced; similar cases frequently come under the observation of accoucheurs. In one instance, which I met with, the pressure from the fæces was so violent that it produced ulceration into the vagina; yet the amazing quantity of feculent matter excited but little constitutional irritation. Some fluid formed a passage by the side of the

Purgatives.

condensed mass, and was daily discharged; this, in a great measure, accounts for the absence of irritative fever.

Irritative fever arising from impeded secretion.

That it is from the check to the secretions that irritative fever arises, is proved by what happens in children during dentition. They are sometimes put to bed quite well, but in the morning half of the body is paralysed from the irritation of a tooth. The secretion from the intestines stops, fever is excited, which produces a hot and dry skin; but restore these secretions, by the administration of purgatives and antimonials, and the irritative fever soon subsides, although the paralysis will sometimes continue, with little alteration, for life.

Purgatives are counter-irritants.

There is another mode in which purgatives produce a beneficial effect in inflammation, that of irritating the intestines. Blood is determined to them, and is therefore drawn from the part inflamed, upon the principle that two increased actions are with difficulty kept up in the body at the same time.

Action on the Liver.

It is of no use to act on the intestines in inflammation, without also exciting the liver; therefore, give calomel with your saline medicines, but do not give salines alone; the best plan is to give calomel at night, and a saline in the morning. An excellent aperient for adults is one grain of calomel, with four of cathartic extract; or two of blue pill, with three of cathartic extract. Castor oil may also be recommended; and, as another safe opening medicine, you may prescribe infusion of senna, with Epsom salts. In children, calomel, with rhubarb, scammony, or antimony, may be ordered as aperients; and in addition to these means, the use of injections, and the warm bath, are the best means of restoring the secretions of the digestive organs.

Anecdote.

An old Scotch physician, for whom I had a great respect, and whom I frequently met in the city, used to say to me, as we were about to enter our patient's room together, "Weel, Mister Cooper, we ha' only twa things to keep in mind, and they'll serve us for here and hereafter; one is auways to ha' the fear o' the Lord before our e'en, that 'll do for hereafter; and the t' other is to keep our boo'els auways open, and that 'll do for here."

Mode of preserving health.

The methods by which I preserve my own health are temperance, early rising, and sponging the body every morning with cold water immediately after getting out of bed, a practice which I have adopted for thirty years; and though I go from the hot theatre into the squares of the hospital, in the severest winter nights, with merely silk stockings on my legs, yet I scarcely ever have a cold. Should it happen that I feel indisposed, my never-failing remedy is one grain of calomel combined with four of cathartic extract, which I take at night; with a basin of hot tea, about two hours before I rise the following morning, in order to excite a free perspiration, and my indisposition soon subsides.

Perspiration.

The next secretion we should restore, for relieving irritation and inflammation, is that of the skin; for it rarely happens, that a hard pulse continues with a free secretion from the surface of the body.

The best mode of producing perspiration is, by giving the antimonial powder with diluents, or Dover's powder; as this powder, however, is apt to increase costiveness, the antimonials are the best, and these should be combined with mercurials.

The other secretion, namely, that of the kidneys, may be restored, by giving diluents, squills, or acetate of potash.

Now, gentlemen, be assured it is not by restoring this or that secretion, which will relieve extensive inflammation; for it cannot be effected but by the complete restoration of them all.

There are some cases of inflammation where bleeding will not afford relief; this more frequently happens in inflammation of the testicles, than in any other part; for these affections, you must administer Dover's powder, combined with calomel.

Nausea.

There is another mode of subduing inflammation, namely, provoking in the stomach a constant nausea, by giving a solution of emetic tartar. I have seen this plan successfully practised on children in croup; calomel should be also occasionally administered.

Case.

In inflammation of old people, you must bleed with great caution. I was requested to see an elderly lady in the country, having inflamed lungs; I ordered her to be bled—the bleeding was repeated, when her legs began to swell; I therefore prescribed the digitalis

and the spir. æth. nitrici; it reduced the pulse, caused the absorption of the effused fluid in the legs, and she rapidly recovered. This medicine reduced the inflammation, and at the same time increased power.

The means, therefore, which are employed to lessen or remove inflammation, are those which restore the secretions, by opening the extremities of the arteries; and thus the heart is prevented from propelling a quantity of blood with violence to any particular part of the body. Summary.

TREATMENT OF CHRONIC INFLAMMATION.

The remedies employed in this affection must have a slow and gradual action on the secretions, you cannot take this disease by storm; and, if your medicines are attended by violent actions, you will do harm instead of good. The principle on which this disease depends, is the same as in acute inflammation, *viz.* the arrest of the secretions. Chronic inflammation is frequently produced through the influence of the mind: thus, long continued grief will completely stop the secretion of bile; again, loss of appetite, from a deficient secretion of gastric juice, is often occasioned by anxiety of mind; and even an ulcerated state of the stomach has been produced by a long continuance of the same cause. But let what will cause the stoppage of the secretion, some enlargement will be the result; as swelling of the liver, of the testicles, or of the joints; the formation of common tumours, as the fatty, or those of a specific kind, as the fungous. Treatment of chronic inflammation.

In diseases of a chronic kind, give calomel and opium; and I cannot point out to you a better example of their good effects than is observable in chronic inflammation of the iris. A person comes into the hospital with iritis; he has a zone of red vessels round the cornea, on the sclerotic coat, and there are red or yellow spots on the iris; if the complaint has been violent, the spots are red, from their having become vascular. You give this patient five grains of calomel, and one grain of opium, twice a day for a fortnight, and

he generally gets well. Yet this disease was formerly considered incurable. If the patient be a female, or of a delicate constitution, then two or three grains of calomel will be found sufficient; and when the mouth becomes decidedly affected, you will perceive an alteration in the appearance of the iris, when you should lessen your dose; a profuse salivation is not necessary, and, if long continued, would aggravate rather than relieve the local disease.

The most common medicine, and probably as a general one, the best that is administered in chronic inflammation, is Plummer's pill; it acts at one and the same time on the secretions of the liver, intestines, and skin; and if you can succeed in restoring these, the disease, if recent, will soon disappear: the absorbent vessels are roused into a state of increased activity, and the effects of the chronic inflammation are removed.

Another remedy.

Another excellent medicine for the cure of chronic complaints, is the oxymuriate of mercury, combined with the compound decoction of sarsaparilla. In the hospitals we merely give it dissolved in rectified spirits of wine; about one-eighth of a grain, in half a pint of the decoction, to be taken in the course of a day; one-half in the morning, and the other in the evening; continue it as long as you think necessary, taking care to watch its effects on the gums; always keeping in mind, that mercury given to excess will tend to increase, rather than destroy, constitutional irritation. As sarsaparilla seems to possess the power of lessening irritability, we frequently give it with mercury, in the way I have just mentioned; it is a medicine which has often a most extraordinary effect on opacities of the cornea, and may be prescribed, in even very bad cases, with the greatest prospect of success.

Case.

A girl from Sheerness, was in Guy's Hospital some time since, in whom the opacity was so great, that she was nearly blind; quite so in one eye: the usual remedies employed in similar cases were tried, without obtaining the least benefit; she was then recommended the compound decoction of sarsaparilla, with the oxymuriate of mercury, and in a short time she recovered her sight.

Chronic inflammation in children.

The best alterative for the removal of chronic disorders in chil-

dren, is one grain of the hydrarg. cum cretâ, and two or three grains of powdered rhubarb, mixed together, and given night and morning: this compound is exceedingly mild, and will have a particularly benign influence on the liver and intestines. One grain of oxymuriate of mercury, dissolved in an ounce of tincture of bark, and from ten to fifteen drops, according to the age of the child, being given twice a day, will likewise be found a very valuable medicine. It is said, that oxymuriate is decomposed by the bark; but, whether it be so or not, it is attended with so many good effects, that I shall continue to prescribe it; and especially in those cases where there is enlargement of the mesenteric glands. Calomel and rhubarb, the hydr. cum cretâ, and soda, will also be found medicines of much power in the chronic diseases of children.

Powder for infants.

Lastly, as it is not advisable to give these little creatures mercury, if it can be avoided, a medicine, composed of two grains of rhubarb, and five grains of the carbonate of iron, given two or three times a-day, will often render its employment unnecessary: this medicine acts as an aperient and powerful tonic.

The nature of inflammation I hope you all now thoroughly understand; recollect that the vessels of the part are in a dilated state, and the surrounding ones have an increased action.

I shall next speak of the

LOCAL TREATMENT OF INFLAMMATION.

Local treatment of inflammation.

Much has been said about the application of cold in these affections. People have been arguing about words rather than ideas, but it really is not worth while to attend to such fastidious, nonsensical objections as have been started against this remedy. Though cold is not a positive agent, yet it is capable of affording great relief in inflammation; first, by lessening the size of the vessels; secondly, by lessening action, which it effects by diminishing nervous irritability. If cold be applied to the system generally, it has the power of lessening the frequency of the pulse in an extraordinary degree. I have tried this upon myself. I went out of my house

Effects of cold

one evening into the garden, when warm, my pulse being 86; at the expiration of an hour it was 76; at the end of two hours, it was reduced to 65; and had not only lessened in quickness, but also in fulness. Cold will produce torpor, and even death.

Anecdote. A curious instance of this kind occurred near Halifax, in Nova Scotia: Dr. Scott had been dining a little way in the country with some friends, and they were on their return at night, when one of the party separated from the rest, saying to a companion, that he would frighten some of them by-and-by. However, they reached Halifax without seeing any thing more of him. At this the party became alarmed for his safety, and returned for the purpose of finding him. He was discovered behind a hillock of snow, in an erect position, but quite dead.

Anecdote. Another curious instance of this kind is related in Cook's Voyages, when some of the officers and crew of one of the ships were landing at Terra del Fuego. Dr. Solander, who was of the party, particularly cautioned them not to go to sleep; and said that it was exceedingly dangerous to do so in cold situations. It happened, however, that the Doctor was himself the first who became drowsy; it was with the greatest difficulty that his companions could keep him in motion; and it was only by the utmost perseverance that they succeeded in getting him back to the ship alive.

Effect of cold. When cold is applied to an inflamed part, it lessens its nervous energy, and robs it of its heat; but cold must be severe indeed, if it bring the *internal* parts of the body below a temperature of 98°. In this country, in the winter, many of the *external* parts of the body vary in temperature from 20° to 30°; thus a thermometer applied to the toes when they are cold, will be found to indicate 20° of heat less than it would, if applied to the calf of the leg. Cold, applied in excess, destroys life, by extracting heat, without which the vital actions cannot be supported.

Case. On the living body you may apply cold to a part until it actually becomes frozen. Mr. Cline and Mr. Sharp were once attending a patient who had strangulated hernia; to reduce which they applied ice enclosed in linen cloths, and this they continued for thirty-six

hours: now as the ice dissolved, the water formed by it ran down upon the man's groin, and the inner side of his thigh, and the parts whereon this stream passed, became completely frozen; proper applications restored them to life; but inflammation and slight mortification succeeded: the hernia, however, was reduced, and the man eventually did well. In similar cases, I advise you to apply ice in a bladder; and take care that you do not continue it too long.

Snow applied to frozen parts.

It frequently happens in this country, during severe winters, that the lobes of the ears and tips of the noses of those who are much exposed to the weather will become frozen: they may be restored to life by rubbing them with snow.

Goulard water.

One of the best lotions that can be applied to an inflamed part is composed of one ounce of rectified spirits of wine, and five ounces of water. Goulard water is also much extolled for reducing inflammation, and lessening pain; but when too long applied, or too strong, it has been known to destroy nervous irritability in too great a degree. Mr. Foster, of Guy's, saw a person in whom the upper eye-lid became completely paralysed from its improper application.

In applying the spirit-of-wine lotion, let your cloths be thin, so that the spirit may combine with the heat of the part, and carry it off in the form of vapour; in other words evaporation is produced, and it is in that way its good effects are produced.

Ice.

I do not recommend the application of ice to parts while in a state of inflammation; it irritates, and is apt to produce gangrene.

Experiment.

Some years since, when I was making a series of physiological experiments, I wished to ascertain what effects would be produced upon the pulse by the sudden application of severe cold, for which purpose I plunged my arm to the shoulder into snow; at the time of the immersion my pulse was 80, but immediately rose to 120; this result was contrary to all that I had ever been taught on the subject—the pulse sometimes did not rise so high as 120, not being more than 110, and was hard and wiry. The immersion in so great a degree of cold caused great pain, and consequently was a source of irritation. This experiment led me into an examination of the

Effects of the cold bath.

effects of the application of the cold bath; I found that when a person in health took a cold bath, who was unaccustomed to do so, that it produced irritation; but on the contrary, when a person in a state of irritation, or febrile heat, went into a cold bath, it tranquillized the nervous action, and exerted a beneficial influence.

At one time, I had injured my health by being too much in the dissecting-room, and was in the habit of discharging from my stomach a good deal of blood; a considerable degree of sympathetic fever was the consequence; in this condition I went into the country, for the benefit of a pure atmosphere, and there had frequent opportunities of noticing the influence of cold upon an irritable pulse, in my own person. Of an evening, when in the house, my pulse would be at 120, but upon going out into the cold air, it sunk in a very short time to 100, and by a long continuance in the cold, it became still less frequent. Thus, where there is great irritability of the nervous system, and where the heart is sending its blood through the different channels with accelerated motion, cold will prove invigorating, by destroying the first of these affections, and reducing the latter to the natural standard.

In a word, therefore, cold relieves inflammation when locally applied—by abstracting heat—by lessening the diameter of the blood-vessels—and by diminishing the action of the part, through lessening its nervous irritability.

Heat and moisture.

The next mode of relieving inflammation is by the application of heat and moisture; this looks like contradiction, but it is not so. It would be a contradiction to apply heat alone, and its application would certainly do harm; but the reverse is the result, when united with moisture; for the two produce relaxation, open the pores, give rise to perspiration, thereby removing congestion, and occasioning all the beneficial effects that would arise from the application of leeches. The sedative effects of heat and moisture are well exemplified by what happens when a person takes a warm bath; a man, for instance, with a pulse at 75, goes into water heated to 100 degrees; his pulse soon rises to 100, presently he perspires freely, his pulse becomes less frequent, yet soft; great relaxation follows,

and if he were not removed, he would absolutely die, so extensive is the exhaustion that it occasions. Here, then, is direct proof of what heat and moisture can do, when they are applied generally; and, when used locally, their action on the part is precisely the same.

Fomentations are ordered precisely with the same view, *viz.* to restore the secretions of the part, by which the tension of the vessels is removed, and the pain much abated. Fomentations occasionally are medicated, being composed of camomile flowers, poppy-heads, &c., but I do not consider that these possess any advantage over mere water, at least where the surface of the skin is unbroken. Fomentations.

Poultices are likewise used upon the same principle; the kind of poultice is of little consequence, provided, as in the preceding case, the skin be entire. Poultices.

The next method of relieving inflammation is by the application of leeches, which relieve upon the same principle as poultices and fomentations, *viz.* by abstracting from the part a portion of its fluids, and consequently lessening the pain and tension: after the leeches drop off, the bleeding must be encouraged; this may be done by bathing the part with warm water, and wiping it frequently with a warm sponge. Leeches.

To some persons, and in some situations, however, the application of leeches is attended with very great inconvenience; as occasionally, for example, in inflammation of the testicles. We do not find this an inconvenience in the hospitals; but frequently, in private practice, we see persons in whom it is of the greatest consequence that a bleeding from these parts should be concealed. Now, as there is much mess, trouble, and consequent exposure, from an application of leeches, what we do in such cases is this: we request the person to stand before us, and, with a lancet, puncture some of the small veins on the front of the scrotum; in this manner, and with a little warm water, you abstract any portion of blood you wish; and what is of very great consequence, you stop it when you please; for, by placing the patient in a recumbent posture, and by applying some cold water to the punctures, the Where Leeches are inconvenient.

blood will immediately cease to flow. In this way, then, you may take blood from the scrotum, when the testicles are inflamed, with very little trouble, and without any exposure. In deep seated inflammation, blood should also be taken by cupping.

[The learned Lecturer here said, at the same time putting his hand upon one of the recently amputated stumps lying upon the table, that he had a few more remarks to make, but these would be on another subject: *viz.*—the occasional retraction of the skin of a stump, after amputation.]

Case. A surgeon, at Worthing, took off a boy's arm, pretty near the shoulder-joint; the stump healed kindly, and all was thought to be doing well: some months after, however, he complained of pain, and the skin retracted to such an extent, that the bone projected through it at least an inch; in this state, he came to town, and upon examining the part near the arm-pit, I put my finger upon a small tumour; this occasioned the boy to jump as though he had been electrified; I then performed the operation of amputation at the shoulder-joint, and upon examination, it was found that the tumour which had been touched before the operation, and produced the electric shock, was a large ganglion of nerves, and it had given rise to the excessive irritability of the stump, and the retraction of the skin.

Case. Previously to the above case, a boy was sent to me, with a stump similar to the one I have just described, but in the leg; the ends of the bones were cut off, and the boy left the hospital apparently well; but soon after the arm case from Worthing had been operated upon, and the nature of the disease ascertained, this boy again returned, having his stump in a painful, irritable state, and the skin evidently retracted. Knowing now the cause of the mischief, I cut down upon, and took out the end of the posterior tibial nerve: the bad symptoms consequently disappeared, and the lad eventually recovered.

Case of irritable nerve. Going round the hospital the other day, I met with another case resembling the above, but, in point of irritability, much worse. At the particular request of the woman, I amputated—the nerves ap-

peared to be enlarged, and had formed a ganglion partially resting on the extremity of the bone; this had produced such a degree of irritation, that no part of the stump could be touched without exciting a kind of electric shock; in fact, the woman appeared very much to resemble a sensitive plant.

How the nerves become longer than the bones in these cases, does not admit of easy explanation.

LECTURE VI.

COUNTER-IRRITATION IN INFLAMMATION.

Local treatment of chronic inflammation.

In the acute, as has already been explained to you, our object is to diminish vascular action; but in the chronic we endeavour to increase it. Thus, in long-continued discharges arising from relaxation, we employ stimulating lotions, for the purpose of restoring to the vessels their healthy power of contraction. Again, in sluggish, indolent ulcers, it is absolutely necessary to excite action; for which purpose we employ washes, either composed of calomel and lime water, or the hydr. oxymur, and lime water; the cupri sulphas is also an admirable remedy in these indolent sores. Gonorrhœa, as I have already shown to you, gives us an excellent illustration of the difference between acute inflammation and chronic, and the principles upon which your opposite treatment must be founded to insure a successful result. At first you diminish strength and action, and then stimulate, for the purpose of restoring them.

Mode of applying stimulating lotions.

Whenever you apply stimulating lotions to indolent ulcers, you should always cover the parts with oiled silk; to prevent evaporation, by which cold would be produced, and the design with which it was applied frustrated. Your object here is to obtain heat and action; as oiled silk obstructs evaporation, it very materially contributes to create these: and, as the perspiration as well as the vapour from lotions condenses upon the inner surface of the oiled silk, it of course succeeds in keeping the part moist; and this is a

very great advantage, as it enables you to remove your applications without disturbing the new skin. Now, where this covering is not used, the linen over the wound becomes dry, adheres to the newly-formed skin, and consequently, when you take away one, the other must come with it: in this manner the restorative efforts of nature for twenty-four hours will often be defeated in a single minute.

The next method of treatment which we shall mention is that of counter-irritation.

Counter irritation.

The power of this remedy is very great, and its advantages numerous; but the chief benefit that results from its employment, arises from its drawing off the blood from the neighbouring inflamed parts, whereby it checks the course of disease in important organs: thus, a blister at the nape of the neck, if early applied, will arrest an inflammation of the brain; a blister at the pit of the stomach will frequently overcome an inflammation of that viscus; a stimulating irritating lotion applied to the scrotum will often cure an inflammation of the testicle. But counter-irritation, carried to excess, will do harm; you must, therefore, be particularly cautious as to the manner in which you use it. In parts that have no immediate connexion, it is really astonishing to observe its effects. In inflammation of the lungs, a blister applied upon the chest (parts between which there is no direct communication) will soon stop the disease, and be to the patient the principal cause of recovery. Blisters, likewise, applied to the front of the body, as on the abdomen, are extremely useful for the removal of inflammations of the liver, intestines, &c.

Blisters.

Blisters are more generally used by surgeons for exciting counter-irritation than any other application. Issues and setons are also occasionally adopted. I again caution you against exciting such a degree of irritation as would affect the whole system: if you were to allow this to happen, you would aggravate the original disease; it must therefore be limited, and kept within proper bounds. Sometimes, after the blister has been removed, it may be deemed prudent to keep the wound open; this you can accomplish by removing the loose cuticle, and by dressing the sore with savine ointment.

Another mode of producing counter-irritation is by the application of tartarized antimony made into an ointment. This is a very excellent method, and is now very generally adopted. You must be careful, however, on what surfaces you apply it, if you intend to excite irritation in a great degree, as it is apt, permanently, to disfigure the skin. I saw a young lady who had used it on the arm for a chronic inflammation of the elbow joint. She was offended with her medical attendants for having recommended its employment, as it left a scar near the elbow which has since obliged her to wear long sleeves. Such a defect you would not like to see in your sister or friend; therefore, it is nothing more than right that you should endeavour to obviate its occurrence; and this you may always do by proper attention. Tartarized antimony.

The next circumstance to be attended to in the treatment of inflammation is position. Medical men do not consider the human body as an hydraulic machine; nor indeed is it so; but still the fluids of the body are, in some measure, governed by the laws of gravity. Look at the operation that I spoke of in the last lecture, for relieving inflammation of the testicle. If you puncture the veins in front of the scrotum, and if the patient be in the erect position, blood will freely flow; but put him in a recumbent position, the stream will immediately cease; though, when the body is thus placed, the power of the heart is greater than when in the erect position. Posture.

If, during the ensuing winter, I should be called to any of you having inflammation in the hand, arising from punctures inflicted while dissecting, I should immediately direct you to get an inclined plane made, upon which I should order you to rest your hand as long as the inflammation was at all violent. Punctures; to be placed on an inclined plane.

It is equally necessary to attend to position in inflammation of the leg. I must give you an example; I was sent for, to see a gentleman farmer in the neighbourhood of Rayleigh, in Essex, who for a long time had been subject to a very severe inflammation in both his legs; they were exceedingly red and very much swollen, in a state threatening gangrene; the constitutional irritation was very Position in inflammation of the leg.

Case. great, and the tongue covered with a brown fur. I found him with his legs in a tub of water; I took out one of them, and it smoked excessively; I saw there was no time to be lost, had him immediately placed upon a sofa, and contrived to rest his legs upon the end of the sofa; consequently they were raised considerably higher than, his body; the vessels soon began to unload themselves, and the skin, in a short time, was evidently less red than when taken out of the water. I then applied flannels wrung out of warm water; these soon produced a very considerable perspiration, by which the cellular membrane became unloaded, the swelling much less, and the pain materially abated. He gradually recovered, and in six weeks was enabled to ride a considerable distance to market.

The completest tyro in surgery ought to know, that it would be folly to attempt to cure extensive inflammation in a limb, if it were allowed to continue in a depending position.

Rest. The next circumstance to be attended to in the treatment of inflammation is rest; the necessity of which must be well known to you, as all of you must have observed that exercise increases the action of the heart, and consequently, must be injurious in inflammation. To obtain rest for an inflamed joint is one of our grand principles in the treatment, and no good can be done without it: it is curious to observe how nature herself directs this; for where a joint is diseased, the muscles which act upon that joint have lost their power: thus, if a man has an inflammation of the wrist, and you put your hand into his and desire him to squeeze it, you find that he cannot do so, or that the attempt is exceedingly feeble. In inflammations of the joints of the lower extremities, the muscles of the part in like manner lose their vigour.

Indurations. Indurations frequently remain after inflammation has entirely ceased; these are to be got rid of by diminishing the circulation of the part, and producing absorption by the following methods:—

Pressure. Pressure has the power of exciting the action of the absorbents in an extraordinary degree; and you may produce it either by the use of rollers or strapping.

Electricity, too, is attended with similar effects; it acts strongly on the absorbent system. Electricity.

Mercury, likewise, does the same; and, speaking generally, more decidedly so than either of the other remedies I have mentioned. Mercury.

When a man dies in our foul wards, for example, in a state of salivation, we find that the alveolar processes which contained the teeth have been in a great measure absorbed.

Friction has, of late years, got into great repute, for the cure of indurated and stiffened joints, occasioned by inflammation; it was first recommended by the late Mr. Grosvenor, of Oxford, a man of strong mind, and who possessed a great share of common sense. This remedy was his hobby; and, like all other hobbies, it occasionally carried its rider into the mire; for Mr. Grosvenor sometimes would recommend friction before the acute inflammation had terminated, consequently it was productive of mischief rather than benefit; in many instances, however, where judiciously employed, the most beneficial results have been obtained. Friction.

A gentleman in the neighbourhood of Nottingham, when shooting, received a severe injury to his knee; after the violence of the first inflammatory symptoms had terminated, there remained considerable swelling, stiffness, and induration; for these he was attended by Mr. Attenborough, an eminent surgeon, of Nottingham; as the gentleman did not get better, Mr. Attenborough sent him to town, and here he for some time continued under my care, and that of a physician; still the joint remained in the same state, and the means used were inadequate to afford relief. I advised him to go to Oxford, and consult Mr. Grosvenor. This he did: and as soon as Mr. Grosvenor saw him, and heard that his limb had been kept quiet, he told him to walk to the bottom of Christ Church Meadow, and then return and dine, which he really did. Friction was used in this case with the greatest success, for, within six weeks after he went to Oxford, he called upon me in town, quite recovered, and thanked me for recommending him to Mr. Grosvenor. Case of friction.

Mode employed.

Friction accelerates circulation and absorption; and the way in which Mr. Grosvenor recommended it to be done was, by applying both hands to the joints, at the same time alternately moving them up and down.

Case.

The late Mr. Hey, of Leeds, a man whose mind was free from every paltry prejudice, most eminent in his profession, and ever anxious for truth, had a son who met with a serious injury to his ankle-joint; after trying all he could to relieve it, he sent him to Mr. Grosvenor; and under his care, by the judicious application of friction, the actions of the joint were completely restored.

In cases of violence done to the joints, when the inflammation has been subdued, which it will be in a month or six weeks, friction and motion are very useful: but in chronic diseases of joints, many months of rest will often be required, before inflammation has sufficiently subsided to allow of friction and motion being safely used to prevent anchylosis.

LECTURE VII.

ADHESIVE INFLAMMATION.

For a knowledge of this process we are indebted to that bright luminary of our profession, the late Mr. John Hunter, a man who was abused, reviled, and laughed at, when living, by the very persons who, now that they cannot any longer injure him, are ever loading his name with every species of commendation and praise.

Effects of inflammation on the blood.

Adhesive inflammation is the process by which divided parts become united.

Inflammation has a disposition to separate the blood into more parts than usually occur when drawn from a person in health. In health, it merely separates into serum and red particles; but, when in a state of inflammation, if, after being drawn, it be allowed to remain undisturbed, it will separate into serum, red particles, and fibrin. The red particles, together with some fibrin, will be found at the bottom of the vessel; the fibrin immediately on the top of

the red particles, forming what is called the buff of the blood; and the serum will occupy the surrounding space. The fibrin, having lost the red particles, contracts with great firmness, and when taken out, almost resembles a piece of leather. It has been said, that the adhesive matter is albumen; but it has been proved not to be so. Dr. Bostock, who was for several years at Guy's Hospital, took great pains to investigate its nature, and published several papers on the subject, in the *Medico-Chirurgical Transactions*: he named it fibrin. Mr. Hunter called it coagulable lymph; this certainly was not a good term to be applied to such a substance, for lymph is expressive of, and relates to, water; whereas fibrin is not only a solid, but an exceedingly firm one.

Effect on the membranes.

Some surfaces of the body are serous, while others are mucous. The cellular membrane is one of the former, and usually exhales a fluid somewhat resembling serum, but containing much less albumen. This membrane is very liable to the adhesive inflammation. The vessels that usually secrete the fluid just mentioned, when the part is inflamed, pour out fibrin, which, becoming coagulated, produces the hardness which we usually find in inflamed parts.

On the peritoneum.

The peritoneum, a membrane which doubly encloses the intestines, is a serous surface, often affected by the adhesive inflammation, which occasions the two surfaces of this membrane to be firmly glued together.

On the pleura.

But the part of all others the most subject to this kind of inflammation is the pleura, and we scarcely ever open a body without finding upon its surface many unnatural adhesions.

On the pericardium and dura mater.

The heart, in like manner, is often glued to the pericardium, so that the space usually found between the two portions of membrane is obliterated; and in the membranes of the brain we frequently meet with partial adhesions between the dura mater and tunica arachnoides.

Wise provision of nature.

Thus, then, it will be seen that the serous membranes readily take on the adhesive inflammation, by which they become permanently attached to each other, or to the adjacent parts; this is a most beautiful and wise provision of nature, for if the membranes

of cavities, such as the pleura and peritoneum, instead of the adhesive, were to receive and support the suppurative inflammation, effusion and death would be the inevitable consequences. For example, matter would be often formed in the cavity of the pleura, and empyema would generally destroy.

Effects on the urethra.

The mucous membranes, as the urethra, for example, are affected by the suppurative inflammation. This is another of nature's benevolent and wise ordinances; for, had they been subject to the adhesive, the outlets of our bodies would have closed, and life destroyed. Sometimes where inflammation of a mucous membrane is exceedingly violent, it passes into the adhesive inflammation, glues the parts together, and, unless relieved by an operation, would end in the destruction of life. I can relate to you an example of this: there was brought to me from Exeter 'Change a kangaroo for dissection. His bed of straw had caught fire, but it was very soon extinguished; and the proprietor, knowing that he had not been severely burned, was at a loss to account for his death. Upon examination, his bladder was filled with urine, which was retained in consequence of the closure of the urethra by the adhesive inflammation; the penis having been severely injured by the fire, the inflammation which followed was violent, and passed at once into the adhesive form. Thus you may perceive that common gonorrhœa would destroy life, if it were not so arranged by nature that mucous membranes are more readily influenced by the suppurative than by adhesive inflammation.

Trachea.

When inflammation attacks the air-tube, it usually happens, that the mucus, which it secretes, becomes purulent; but in very violent inflammation, adhesive matter is effused, and produces the disease which is called croup. If the larynx be the seat of this disease, it frequently destroys life; but when the inflammation is seated in one of the bronchiæ, the adhesive matter is coughed up, in an arborescent form, and the patient recovers.

APPEARANCES UNDER ADHESIVE INFLAMMATION.

Nature of adhesive matter.

When an incision is made into a part affected with adhesive inflam-

mation—into the cellular membrane, for instance—a quantity of serum is found effused round the part, and in the part itself a yellow and semi-transparent substance, having the appearance of jelly, though widely different from it in composition. The best opportunity that you can have of witnessing the adhesive inflammation is on the skin under the irritation of a blister; the blister produces the same effects as those produced in the operation for hydrocele. Let a blister be applied for twenty-four hours, till the cuticle is raised: then make an incision into the vesicles, and a quantity of serum will escape. Here, perhaps, your observation may terminate; but examine the surface, and you will find on it a yellow substance, which will exist in a greater or less degree, according to the length of time the blister has been applied, also on its severity, and on the irritability of the skin; but, generally speaking, under the application of a blister, adhesive matter is thrown out as under adhesive inflammation.

Time required for the production of adhesion.

For those who are anxious to know the time required before the adhesive inflammation commences, it may be proper to state, that it is different according to the structure of the part and nature of the constitution. In the cavity of the abdomen, the intestines will be glued together in nineteen hours after the adhesive inflammation has begun. Now I mention nineteen hours particularly, because I have seen it produced after that time in cases of gun-shot wounds. It may be in the recollection of some of you, that a Mr. Blight was shot by a man called Patch, in the neighbourhood of Deptford: the ball traversed the abdomen. I was called to this case, and Mr. Blight died in nineteen hours after he had received the injury. Here I had an opportunity of seeing what I have just mentioned; the intestines were glued to each other, and to the peritoneum; the peritoneal surface had quantities of adhesive matter on it, and was firmly united to the surrounding intestines. On the surface of wounds, the process of adhesion takes place rapidly; for, if a piece of lint be applied to a newly-made wound, in twelve hours it will be glued to its surface; in a dog, the adhesive process commences in six hours.

Adhesive matter, when effused on a thin membrane, coagulates into a net-work, assuming the character of cellular membrane.

Organization of adhesive matter.

When adhesive matter has been formed, blood-vessels soon enter it, and within a short time it becomes organized; the vasa vasorum are elongated by the force of the circulation: they enter the newly-formed substance, and send throughout it minute ramifications. On cutting into adhesive matter within twenty-four hours after it has been deposited, small bloody spots may be seen, which mark the future situation of the vessels which nourish it; but it is not till ten days after it has been formed that adhesive matter becomes completely organized; for you will find, that a fine injection would not enter adhesive matter sooner than the tenth or eleventh day after its formation. When vessels elongate, they have not the character of arteries; in general, they take a serpentine or tortuous course.

Hunter's opinion.

Some thought, at one time, and I believe Mr. Hunter was one of this opinion, that the vessels originated in the newly-formed substance; but they are formed by the elongation of the vasa vasorum of the surrounding arteries, which become dilated, lengthened, and serpentine: and the degree of vascularity will be in proportion to that of the part subjected to the adhesive inflammation. In tendons, for instance, it will be much less than in muscles.

Use of the adhesive inflammation.

This process is of the greatest possible consequence in surgery. It ought, therefore, to command much of your attention; and it will be unfortunate for you if you do not understand it. Without this process no operation could be attended with success; its absence, even after bleeding, would destroy life. Bear this principle in mind, then, gentlemen—always endeavour to effect union by adhesion. You have seen, during this present winter, a man admitted into Guy's Hospital, with a compound fracture, which was rendered simple by applying lint dipped in blood, and, in a fortnight, all danger from the accident was dissipated.

In compound fractures.

Suppose you were called to a compound fracture, what would you do? Endeavour, certainly, by bringing the parts together, to

make it a simple one. Within these few days you have had an opportunity of witnessing the fatal consequences of hemorrhage in a case of compound fracture; if the adhesive process had taken place, hemorrhage would have been prevented, constitutional irritation kept off, and recovery, in all probability, rendered sure.

In operations.

It is the same in formidable operations; the Cæsarean operation, which consists in making an incision in the course of the linea alba, for the purpose of extracting a fœtus from the womb, is not dangerous, if the adhesive process takes place; now and then, from hemorrhage and exhaustion, it proves serious; but in most cases, the danger is slight, if union by adhesion be procured. To exemplify this by the operation for cataract: in this operation a wound is made in the eye—more than half of the cornea is cut; if the adhesive process take place within twelve hours, the flaps begin to adhere, and in twenty-four they are consolidated. Suppose, on the contrary, they do not adhere—violent inflammation supervenes, and the result is destruction to the eye of the patient; the success of the operation depends then, in this instance, on the adhesive process. In a person who had been in ill health, the inflammation might be too weak, and in another case it might be too strong; suppuration would be the consequence in both instances; the same effect results in the two cases, though produced by very different causes. Again, in the operation for strangulated hernia, an opening is made into the hernial sac, which communicates with the cavity of the abdomen; and, if the parts are not afterwards united by the adhesive process, the patient dies.

Aneurism.

In the operation for aneurism, it is adhesive inflammation which saves life; a ligature is applied to the artery, a coagulum of blood forms, the adhesive process commences, fibrin is poured out, and the internal coats of the artery are glued together; but for this, when the ligature gave way, hemorrhage would ensue.

Hydrocele.

In the operation for the radical cure of hydrocele, we have a beautiful opportunity of witnessing the effects of adhesive inflammation. After the water has been evacuated, a stimulating injection being thrown into the cavity excites upon its sides an irritation;

inflammation is set up, adhesive matter thrown out, the internal surface of the cavity generally becomes permanently united, and thus a radical cure is effected. If an incision be required to be made into the tunica vaginalis, whilst it is suffering from the adhesive inflammation, its cavity is found filled with a substance which has the appearance of jelly.

Example. The treatment of a stump after amputation will best illustrate this subject. In amputating a limb, your object is first to preserve sufficient integuments, and not muscles, for if muscular fibres are preserved with the integuments, they will contract, and retraction of the skin covering the stump will be the result. When the limb has been removed, you will apply ligatures to the bleeding vessels: now I would not advise you to tie every small vessel; ligatures on the principal vessels are quite sufficient, and the fewer applied the better, for though it is desirable to prevent disturbance of the limb afterwards, yet, by waiting a short time after the operation, the smaller arteries will generally stop.

Ligatures. The ligatures themselves should be small, and consist of fine silk, for nothing is so bad in operations as the application of coarse ligatures, excepting perhaps in cases where ossification of the arteries has taken place, when it would be justifiable; with this exception only, it is the worst possible surgery to apply thick ligatures to arteries; and if a surgeon were to do it, he would understand nothing of his profession; the thinner the ligatures are, then, the better.

Difference of ligatures. Now there are two reasons why thin ligatures are preferable—1st, because they are less liable to escape; 2dly, they divide the internal coats of the arteries more effectually: when you use a very fine ligature, the internal coats will be completely divided, and the external will remain entire. My friend Dr. Jones has published an excellent work on the natural means by which arteries unite in cases where ligatures are applied; and first he states the fact of the internal coats of the artery being divided by the application of fine ligatures. Thick ligatures also prevent the wounds from healing so rapidly as thin ones. After the vessels have been secured, the

sponge should be applied, and all coagula of blood removed, as this is very essential to the union of the part; blood is not the means but the prevention of union in such cases, for unless it be taken away, the adhesive inflammation will not go on. There is one instance in which blood favours the process of adhesion, and that is in the application of a ligature on an artery; with this exception only, the opinion of blood favouring the process of adhesion is to be banished from your minds, for there are but two modes by which union can be effected, *viz.* by adhesion, and by granulation; therefore remove all clots of blood, which will only act as extraneous bodies and keep up irritation. You are to cut off one end of the ligature close to the vessel, and let the other hang out of the wound: it has been recommended to cut off both ends of the ligature close to the vessel; this plan has, however, been already given up.

Effect of ligatures.

This was determined by Mr. Hunter, in the first operation he performed for aneurism on the trunk of the artery above the tumour, instead of on the aneurism itself; for in that instance he cut the ligature close to the knot, and copious suppuration afterwards took place. Ligatures can only be removed from the vessels by suppuration or absorption (in the latter case they must be first dissolved and then removed by the absorbents;) and conceiving that if a ligature, composed of a substance easily soluble, were applied to a vessel, and cut close to the knot, it might be dissolved, and then absorbed, I applied a catgut one to the femoral artery of an old man, whom I operated on for popliteal aneurism, and cut it close to the vessel; this case turned out well, for adhesion followed and suppuration did not ensue.

Although successful here, I have tried it in several cases since, and have failed in all, suppuration always coming on afterwards. I applied a silk ligature to the carotid of a dog on one side, and a catgut one to the carotid on the opposite side: upon killing the dog some days afterwards, I found the second ligature (catgut) buried in a cyst, and that the first advanced by the process of ulceration to the side of the larynx. Experiment and observation show, then, that it is better to cut one end of the ligature off, and

to leave the other hanging from the mouth of the wound, to be removed when the ulcerative process is completed, which is from ten to fourteen days. Dr. Veitch, I believe, first advised the removal of half the ligature.

In amputation. After amputation, having disposed your ligatures in a line with each other, and leaving them to hang out at the most depending part of the wound, you will, if the limb be removed above the elbow or knee, apply a bandage, to prevent retraction of the muscles and extensive suppuration. I have seldom succeeded with my stumps above the knee when I have not used a roller; it is better to apply a roller in such cases, for the muscles will then be glued together, and form one consolidated mass. Having applied a roller, and brought the integuments together, I merely put three strips of adhesive plaster over the wound, and one round the stump, to keep the ends of the plaster in their place. It is curious to see the difference between the mode of dressing stumps now, and that

Old practice. adopted a few years ago; the old practice, was, after the adhesive plaster had been applied, to put some lint, then plaster again, after that tow, and, lastly, over the whole, a cap of flannel. If a surgeon were to do this now, he would be laughed out of the operating theatre, and very deservedly too, because he would prevent the success of the adhesive process by unduly heating the limb.

All that is necessary to do, is to apply three strips of adhesive plaster over the wound, and one circular piece; if the weather be hot, to apply the spirit of wine and water lotion, and if it be cool to keep the limb quiet. The object is to keep down the inflammation to the adhesive stage: if it goes beyond this, suppuration will be the result.

Dressing the stump. The last circumstance necessary to mention, is the impropriety of dressing the stump too early; a person anxious to see whether a union has taken place, removes the plasters in two or three days: he who does this overlooks the object in view, and must be shocked, when he looks at the stump, to see, that by the early removal of the plasters, he has destroyed all that nature had done. All you ought to do is, in four days after the operation, to remove one strip

of plaster, for the purpose of letting out any matter which might have collected. In six or eight days after the operation, it will be proper to dress the stump; but to do it before would be absurd.

The treatment which is applicable to stumps is proper also for common wounds.

Formation of cysts.

The adhesive process is useful in the formation of cysts. Balls encysted have been known to remain in the body for many years. Morgagni, if I recollect aright, mentions a case where a ball lodged in a cyst in the lungs for a considerable space of time. If the ball be not encysted, it travels, and absorption of the parts through which it passes takes place. A few days ago, a gentleman called on me, who had formerly received a wound above the zygomatic arch, from a ball; he now had a swelling on the side of his face. I asked him whether he thought it contained the ball; to which he replied, no: upon cutting on it, however, I found it was the ball by which he had been wounded some years before. It had travelled beneath the zygoma to the middle of the cheek, on the surface of the parotid gland, from whence I removed it. Perhaps it was assisted in its course by the action of the temporal muscle. I saw a boy, who had then been attending a target at which some volunteers had been firing: he thought himself safe at a distance of thirteen yards; he was mistaken, however, for one of them shot him in the collar-bone. Some months after, he came to Guy's Hospital, and I removed the ball from about the middle of the upper arm. Thus the ball, by its weight and pressure, had occasioned suppuration and ulceration, which had enabled it to travel to the situation from whence I extracted it.

Use of adhesive inflammation.

Another very important use of adhesive inflammation is that of its dividing cavities into distinct parts, by which means it fixes a boundary to the suppurative process; thus it will divide the cavity of the abdomen into two, by throwing out adhesive matter on the surface of the colon, by which it becomes glued to the peritoneum. In abscesses, a cyst is formed by the adhesive process round the matter, which prevents its escape into the surrounding cellular tissue.

In joints.

The advantage of adhesive inflammation is admirably shown in wounds of the joints. Immediately on the knee joint being opened, the synovia escapes, the person feels faint, looks pale, and the constitution appears to have received a severe shock. The wound endangers the loss of the limb and the patient's life, if bad treatment be adopted. If a poultice be applied to such a wound, or fomentations used, a suppurative inflammation will take place on the synovial surfaces; the cartilages become absorbed, and the bones ulcerated; a profuse discharge ensues, the constitution becomes extremely irritated; chills, succeeded by burning heat and profuse perspirations, frequently follow each other, and a person, just before in good health, is precipitated into a state of extreme debility. Sometimes the joint, after weeks, or even months have elapsed, gradually heals by granulation, with its motion either entirely gone or greatly impeded.

By sutures.

If, on the contrary, the practitioner brings the edges of the wound immediately together, and attempts union by the first intention, the patient generally escapes from local or constitutional irritation. The edges of the wound should be brought together by a fine suture—a plan, to which some surgeons object; but when the wound is direct into the joint, it affords additional security to the patient, as the escape of the synovia has a constant tendency to prevent adhesion, and to separate the plaster. The suture should penetrate the skin, the ligament being carefully avoided. A piece of lint wetted in the patient's blood is to be put over the wound, and over this strips of adhesive plaster. Linen cloths are to be laid over these, and kept constantly wet with the liq. plumb. acet., and spirit vini; a splint is to be placed behind the joint, to secure perfect rest. In cases where the constitution is debilitated, the adhesive inflammation is sometimes so deficient, that immense abscesses are formed from their not being bounded by adhesion; and I recollect having seen in a poor hypochondriac the back nearly covered by an abscess to which adhesion had not formed bounds.

Hare lip.

In the operation for hare-lip, it is by the adhesive inflammation the wound becomes united, and the deformity removed.

The effusion of adhesive matter, by unloading the vessels of the part, has the effect of reducing the inflammation, so that the process generally terminates as soon as this effect is produced, and this has led to the application of this principle for the reparation or restoration of some portions which have been destroyed by disease, or designedly mutilated. In the East Indies, where it is the practice of many of the chiefs to cut off the noses of many of their prisoners, an operation is frequently, and in most cases, successfully, performed, to make a new nose. Many curious cases of this kind are on record.

LECTURE VIII.

ON SUPPURATION.

SUPPURATION is the formation of purulent matter from the secreting orifices of the blood-vessels, which matter is named pus. Definition.

It is formed in cavities produced in the body by a process of absorption, as in abscesses; it is found also as a secreted fluid on the surfaces of membranes, or upon granulating surfaces.

The formation of matter is often attended with severe constitutional irritation; there are rigors succeeded by heat. When, therefore, you see a person who has had severe inflammation, and you wish to know if suppuration has taken place, you ask him if he has had a cold shivering; for this is generally the forerunner of the purulent secretion. If the inflammation be extensive, or seated in any vital organ, the constitutional disturbance will be very great, and the shivering, which indicates the formation of matter, will be very severe, and followed by a powerful re-action. Whilst the rigor continues, the blood collects about the larger vessels in the neighbourhood of the heart, and in the heart itself; at length this organ becomes stimulated to action, and sends the blood with considerable force to all parts of the body, but more particularly to that part where pus is about to be secreted. A rigor, therefore, is Constitutional symptoms of suppuration.

merely a constitutional effort towards accomplishing the object that nature has in view. When pus is easily produced, as upon mucous surfaces, there is no rigor whatever.

Local symptoms of suppuration.

When there is an attempt to produce matter, there is an unusual sensation of uneasiness in the part, together with a blush on the skin, easily recognized, by those acquainted with the subject, as a sure indication that pus either has, or is about to be formed. In the adhesive inflammation, the pain is an acute thrilling one; but here it is more dull, and is likewise pulsatory or throbbing. As this continues, the tumour becomes soft in the middle, but remains hard at the sides; the centre of the swelling points, as it is termed; and, upon pressing the part at this period, fluctuation will be evident.

The next thing to be observed, is an effusion of serum beneath the cuticle, which separates it from the cutis; it becomes gradually distended, and then bursts, leaving the cutis exposed. Ulceration sometimes takes place on the surface of the skin, whilst the same process is going on internally, so as to facilitate the discharge of the matter; generally speaking, however, the ulcerative process is continued entirely from within.

Time required.

These are the common appearances produced by the process of suppurative inflammation. Pus is generally formed in from seven to fourteen days; but the time required for this process will very much depend on the constitution of the patient, and the structure of the part in which the inflammation is seated.

Parts prone to suppuration.

Some parts more readily run into the adhesive, others into the suppurative inflammation; the pleura, pericardium, peritoneum, &c., are subject to the former; while the urethra, vagina, lachrymal duct, trachea, bronchi, nasal passages, &c., are liable to the latter: serous surfaces, therefore, are affected by the adhesive inflammation, and mucous surfaces by the suppurative. The reason why the inflammation affecting the two structures produces different results, appears to be this: the vessels of serous surfaces are too small to permit the transmission of the particles which pus contains: but when the inflammation becomes violent or long continued, then

the vessels dilate, and purulent matter is formed, even on serous surfaces. Some experiments have been made, which tend to prove that this theory is correct; for it has been found that injections which are sufficiently fine to pass freely into the vessels of mucous surfaces, will not penetrate in the slightest degree into the vessels of serous surfaces. I shall presently explain this to you more particularly.

In one of the preceding lectures, it was mentioned, that dangerous consequences sometimes arose from passing bougies in very irritable habits; the danger in these cases depends upon the formation of the adhesive inflammation, instead of the suppurative. The duct or canal leading from the inner angle of the eye, and which conveys the tears into the nose, is mucous, and, therefore, when inflamed, usually suppurates; consequently it is only obstructed for a short period; and even this obstruction can be relieved at intervals, by pressing the finger upon the skin immediately under the corner of the eye, by the side of the nose, by which means the collected matter will be forced out at the puncta situated in under the eye-lid. Should the inflammation, however, be of the adhesive kind, then an obstruction will be formed, that can only be relieved by an operation. This complaint is named fistula lachrymalis. The tears now pass over the cheek, and not into the nose, because adhesive matter has glued the sides of the tube together. The operation for the cure of this is simple, and will be explained to you hereafter.

Lachrymal duct.

The membrane covering the internal surface of the trachea is mucous; and, therefore, when inflamed, usually suppurates; but in croup, large quantities of adhesive matter are thrown out, so as very frequently to occasion death. The coagulable matter adheres so firmly, that it cannot be disengaged by the ordinary efforts of expectoration; at last, from its increase, it fills the trachea, and suffocation is of course the result. Nature has, as we before remarked, wisely ordained, that the various outlets of the body should commonly be liable to the suppurative inflammation; and if this were not the case, life would be very much shortened indeed.

Trachea.

The antrum highmorianum and the frontal sinuses also readily suppurate under inflammation.

Arteries and veins.

Arteries and veins, when inflamed, generally pass into the adhesive inflammation. It occasionally happens, however, that their inner coats suppurate: and I have more than once known persons die from the irritation thus excited.

Case.

A man in Guy's Hospital had a leg removed, for a very unhealthy ulcer. In a day or two he became delirious, and shortly after died. When examined, no particular disease in his body was found; but the suppurative process had been set up in the arteries, and this caused the fatal catastrophe. Similar events would follow the operations for aneurism, if the adhesive inflammation did not supervene, instead of the suppurative; for matter would form above the ligature, and, mixing with the blood, would destroy life. Suppurative inflammation of the veins has often been known to come on after bleeding, and occasion death. Upon dissection, in these cases, matter has been found in the heart, mixed with the blood.

Joints wounded.

Wounds made into joints are always dangerous; this has been said to arise from the admission of air. No name can be given to such a declaration but ignorant nonsense; for air has no power whatever of producing inflammation in these cavities, and he who says otherwise, knows nothing about it; the synovial membrane lining joints is a mucous membrane, and, therefore, quickly passes into the suppurative inflammation, which circumstance renders an injury done to these parts exceedingly difficult to cure; besides, the internal surfaces of joints are much more extensive than you would imagine: you would be astonished, if if you saw the internal surface of the knee-joint spread out on this table. Joints are also composed of materials having in themselves very little restorative power, being formed of ligament, cartilage, and bone, parts that soon inflame, suppurate, and become absorbed. Whenever, therefore, you are called to accidents of joints, and where openings have been made into them, these you should endeavour to close as speedily as possible. Likewise, when you have to remove from these cavities extraneous bodies, you should

draw the skin forcibly on one side, and then cut through it down upon the substance. If the operation be performed in this manner, the skin being left to itself will return to its natural situation; consequently the cut in the integuments and that in the capsular ligament will not be opposite each other, and union by the first intention will be much more likely to ensue.

Wounds of the thecæ.

In the treatment of wounds of the thecæ as much caution is necessary as in those of the joints—their structure, in fact, nearly resembles the capsular ligament and synovial membrane: an injury here, causes, in a very short time, great pain and inflammation, and much constitutional irritation and fever. If matter form, it becomes deposited, or locked up, as it were, in a tendinous bag; and so great is the irritation which it sometimes occasions, that it has been known to destroy life in sixty hours.

Case.

A young gentleman from the West Indies, of great professional merit, of the name of Alcock, informed me one Monday night, after a surgical lecture, that he had, in the course of that day, punctured the theca in some part of his hand—as he was living at the time in the house of the late Dr. Haighton, I advised him to show it to the Doctor (who was an exceedingly clever man); he did so;—on the following day he suffered greatly from constitutional irritation, and on the Wednesday morning died: his system was certainly a very irritable one, and that accounts, in a great measure, for so speedy a dissolution. When, therefore, you suspect matter to have formed in these parts, let the quantity be ever so small, you ought to discharge it. It is surrounded by a structure through which, without assistance, it cannot pass; therefore nature requires your assistance. At the commencement of inflammation in these injuries, your treatment should be prompt—apply leeches and lotions, and give your patient calomel and opium—these measures, judiciously used, will often check the progress of the disease, and in a short time completely remove it.

Formation of pus.

Formerly it was the opinion that matter was produced by a dissolution of the solids; but this opinion is now exploded, for we have numerous facts to prove that it is not true; in the urethra, for

For example, in diseases of the bones of the nose, the smell is more offensive to my olfactory nerves than any thing I know in nature.

Pus of a poisonous nature.

When matter of a poisonous kind, the result of a specific inflammation, is applied to the surface of the body, it irritates, occasions inflammation and suppuration, and this newly-formed matter is of exactly the same description as that which produced it; at least the poisonous quality is retained undiminished in virulence. This is illustrated by the discharge of gonorrhœa, chancre, small-pox,&c. To enumerate all the instances would fatigue you.

But these instances must be considered as additional arguments in favour of pus being a secretion.

Suppuration is not without its advantages; in two points of view it is very important.

Utility of pus.

First. By forming a covering to granulating surfaces, thereby preventing the granulations from becoming dry through the influence of the air; for, if they were not kept moist they could not push forward. Secondly. The suppurative process is the means resorted to by nature for effecting the escape of extraneous bodies: thus a ball, by its pressure, gives rise to suppuration, and ultimately is discharged, excepting in such cases as we have before described, where it remains encased by adhesive matter. Another advantage possessed by pus, will lead to the healing of a sore without any adventitious aid. Thus we see in other animals, sores encrusted with the solid matter of pus left by evaporation: under this is fluid pus contained, and when the encrustation is removed, healthy granulations appear. In sores obstinately resisting different applications, I have seen them thus encrusted when left without applications of any kind, and heal gradually without further attention.

Some wounds are very troublesome, and, do what we will, we cannot get them to heal. Now and then it happens, if you discontinue your dressings to such sores, and let their surfaces remain exposed to the air, incrustations or scabs will form; under these, pus will be secreted, which, by keeping the granulations constantly

moist, will often cause ulcers of this description to heal, when all artificial attempts have been completely unsuccessful.

When the constitution has been long accustomed to a discharge from an ulcer, some caution is requisite when healing it: nature appears to produce a quantity of blood equal to the discharge which those sores have supported, and to continue to do so after it has ceased, for, if done too suddenly, hectic or apoplectic symptoms are very apt to supervene. This may be prevented by great attention to the secretions, by giving frequently calomel at night, and an aperient in the morning: or by taking away occasionally some blood, when the above symptoms supervene. Ancient surgeons observed these; to obviate which they were in the habit of making issues in other parts of the body at the time of healing old sores. Quantities of matter, constantly discharging for a considerable period, inevitably act on the constitution as sources of depletion; and which, if suddenly discontinued, we may reasonably imagine would produce the symptoms before stated. There is no necessity, however, for issues to prevent them, as purgative medicines will answer much better, and speedily carry from the system, by a natural channel, any increase of its fluids. Mr. Wilson, formerly a lecturer on anatomy in this town, in his younger days was for a long while annoyed by a spitting of blood, which threatened him with an attack of pulmonary consumption; at length an ulcer formed upon his arm, and shortly after the bleeding from the lungs ceased. The sore was an exceedingly obstinate one, and resisted for a great length of time all attempts that were made to close it; at last, however, it was accomplished, upon which the bleeding from the lungs once more returned.

Caution in stopping long continued discharges.

A long-continued discharge from the ear has, upon being too suddenly checked, produced oppression of the brain.

Suppuration is best promoted by the application of heat and moisture; but we shall treat of this subject more particularly when we describe abscesses.

LECTURE IX.

ON ULCERATION.

Definition.

ULCERATION is the absorption of any constituent part of the body. I have already endeavoured to explain to you, that under the increased action of the vessels which accompanies inflammation, an increased deposit takes place from the arteries; also, that this deposit is according to the stage of the inflammation, and the part which the inflammation attacks; that the inflammation is either adhesive or suppurative, and that it ends in the one state in the immediate production of the process of adhesion, and in the other in the effusion of a quantity of purulent matter from the extremities of the vessels.

Effects of inflammation on the blood-vessels.

Effects on the absorbents.

But inflammation has not only an influence on the arteries; it has also an effect on the absorbent vessels, which are thrown into a state of inordinate action, whenever any considerable quantity of blood is thrown upon them. There is a natural balance between the action of the arteries and the absorbent vessels. In a state of health, and at the adult period of life, the portion of matter deposited by the arteries, and the portion taken into the system by the absorbent vessels, are, as nearly as possible, balanced. In youth a greater quantity is poured out by the arteries than the absorbents remove; but in age a smaller quantity is deposited than absorption is taking away. You find, therefore, that the balance is destroyed in a different manner at different periods of life; but when a considerable and inordinate absorption takes place of some part of the body, that absorption is denominated ulceration.

Ancient hypothesis.

It was formerly thought, that it was necessary to the ulcerative process, that matter should be formed; but this is not the case, as ulceration often occurs without being accompanied by any purulent secretion. The formation of matter, therefore, is not necessary to the process of ulceration. The great cause of ulceration is *inflammation united with pressure*. If the inflammation be considerable,

and the pressure but slight, ulceration will be produced; and if the pressure be very considerable, and the inflammation but slight, still there will be ulceration. As a proof, both that pressure is the cause of ulceration, and that ulceration is not necessarily accompanied with the formation of matter, I will give you the example of aneurism. Here is a specimen on the table of a large aneurism of the aorta, just above the heart, into which you may pass your hand in the hole produced by the ulceration of part of the ribs and sternum; those parts having been absorbed by the pressure of the aneurismal sac, producing an increased action of the absorbent vessels. Here the pressure is exceedingly great; but the degree of inflammation is very slight. In the same manner we see an aneurism of the aorta on the fore part of the spine, producing absorption of the vertebræ, by the pressure of the aneurismal bag, though no matter is effused, the ulceration being produced by the pressure arising from slight inflammation, unaccompanied by any secretion of matter. From these facts, we are led to conclude, that the formation of matter is not necessary to the ulcerative process; and that it only happens on exposed surfaces of the body, where it is necessary for the protection of sores, by covering the granulations.

Causes of ulceration.

Pressure.

Example by pressure.

The constitutional symptoms of ulceration are slight. In general, a degree of fever attends it, but it is very slight. The pulse is under 100, and at the same time small; we do not find any considerable excitement of the constitution, and the fever is rather of the hectic or chronic kind, than sudden or violent in its attack. It continues sometimes for several days. The pain attending ulceration is not very considerable; if you ask the patient, he will tell you that it is of a gnawing kind, as if there were insects about the part. We may conclude, therefore, that the *irritation attending ulceration is but slight, and the pain not considerable.* With respect to the appearance of the ulcerated part, it looks as if it were worm-eaten; the surface is rough, and very irregular.

Symptoms of ulceration.

Sometimes a very considerable portion of the body is removed by ulceration. Here is an example of an ulcerated tibia on the table. See to what an extent ulceration has removed not only the cancel-

Extent of ulceration.

lated structure of the bone, but the shell in which that structure is contained. Here is another example, in which a great part of the tibia has been removed; the ulceration has extended six or seven inches, so that little more than the fibula of the leg remains: such is the power of the absorbent vessels, of feeding, as it were, upon themselves.

Rapidity of its process.

The ulcerative process is sometimes extremely rapid in its progress: as much will be destroyed in the course of a few hours, as will require weeks and months to repair. In proportion to the extent of surface destroyed, will be the difficulty with which that surface is closed. Something will depend, also, on the form of the ulceration, and the kind of surface exposed: but the general rule is, that the difficulty of the reparative process is proportional to the extent of surface destroyed.

Laws of ulceration.

It is a curious law, with respect to the ulcerative process, that it has a tendency to the nearest external surface of the body. This is a law which is attended with the most salutary effects; for, if it were otherwise, the body would very frequently be destroyed by the ulcerative process. In consequence of this tendency, matter formed at a depth in the body, finds its way through the integuments, instead of proceeding through the more important parts. Many examples may be given of this law. One of the most remarkable is this:—Matter forms not unfrequently behind the sternum close to the pleura and pericardium, which membranes are extremely thin, not so thick as paper. From the proximity of these membranes, it might be expected, that the matter would generally open into the pleura, and, by discharging itself into the cavity of the chest, destroy life. Instead of this, however, the pleura undergoes no other alteration than that of becoming thick; and while it is acquiring this addition of substance, the process of absorption is going on in the inner part of the sternum, an aperture is formed through it, and the matter makes its way through the bone and integuments, rather than through the pleura and pericardium. The same circumstance takes place with respect to the peritoneum. If matter be formed in the abdominal muscles, the peritoneum is very

rarely absorbed to admit the matter into the cavity of the abdomen; but the matter makes its way through the integuments, and finds an outlet on the surface of the body.

Ulceration of the liver.

So in an abscess of the liver, the matter is discharged, not through the skin, which is a more remote surface, but into the cavity of the intestines, whence it is carried off by stool, or discharged into the stomach, from which it is thrown up by vomiting. These effects are produced in the following manner: the surface of the abscess becoming united with a portion of intestine, or stomach, by the adhesive process, the ulcerative action commences, by which a communication is formed between these surfaces, and the matter is discharged in the manner before mentioned, without danger, or at least with little danger, to life.

Ulceration of the bones.

The same thing takes place in absorption of the bones. Thus, in ulceration of the tibia, the matter breaks through the skin, or that surface which is only covered by skin and periosteum. This is a law in part depending on the less vitality and greater irritability of those parts which are nearest the surface of the body. The external parts of the body are the most weakly with respect to circulation, and most readily absorbed. I do not mean to say that they are weakly with respect to quantity of blood, for they possess a considerable share of vascularity; but they are weakly with respect to the living powers. The external parts of the body are more irritable, and more subject to vicissitudes of action from corresponding changes of temperature than other parts of the body. They have less strength of circulation, and, consequently, give way to ulceration more readily than those parts which are more deeply seated, and possess a greater strength of circulation. Another reason is, that the adhesive process goes on glueing the more internal parts, while the external, which are thin and weak, become united to these parts, and in this way form a considerable solid. An instance of this is found in the adhesion of the pleura to a lung, so as to form one structure. It may be considered, then, as a law of the animal economy, that the ulcerative process has a disposition towards the nearest external surface of the body.

Parts newly formed prone to ulceration.

Those parts of the body which are newly formed, are more liable to be absorbed than those which have long existed. A part covered by a cicatrix proceeds rapidly to ulceration, because it is more weakly constituted than those parts which have existed longer. The irritability of a part is proportional to its weakness; and the parts which are weak and irritable, fall most readily into the ulcerative process. To take a familiar illustration—when a child labours under symptoms of constitutional derangement in cutting a tooth, why do you lance its gums? You cut the gums, not for the purpose of making an immediate passage for the tooth, and procuring immediate relief to the child; but because, when the gum by the adhesive process heals upon the divided part, a cicatrix is produced by this little operation, which is very readily absorbed; and the result is, that when the tooth rises, the child cuts it with much less pain and irritation than it would otherwise have done. If a man have inflammation in his leg, and this falls near a place where ulceration previously existed, the scar produced by the old ulcer gives way much more readily than the original skin. I have observed that, if a patient under gonorrhœa, has had an abscess in the urethra, which will now and then happen in consequence of suppuration of the lacunæ, or if from the same cause he has had an abscess in the scrotum, or on the side of the penis, if he should get a second gonorrhœa, he will be sure to be attacked with a similar abscess. Proceed with as much care as you may—guard against inflammation with all possible caution—and yet, if he has abscess in the first gonorrhœa, it will infallibly return in the same part, if he get a second.

Example.

Lord Anson's voyage.

One of the most remarkable instances of the readiness with which the process of absorption attacks newly-formed parts, may be seen in *Lord Anson's Voyage round the World*—a work which, I doubt not, is generally known to you. It is a most able and entertaining publication; and if any student has not read it, I can strongly recommend it to his perusal: for, while professional knowledge should undoubtedly be the first object of your pursuit, general literature should not be neglected, and is so far from being incompatible with that primary object, that it cannot fail to enlarge your

views, and give efficacy to your professional researches. So intimate is the connexion between every object of useful and scientific inquiry, that there is hardly one branch of knowledge which does not in some measure throw light and illustration upon another. The circumstance which I am about to mention, may illustrate this remark. Lord Anson's book is one of the most valuable works which has appeared on nautical subjects; nor is it without its use as illustrative of a principle in surgery. Lord Anson's expedition to the Pacific Ocean was undertaken with a view of destroying the power of Spain in the New World. As he was obliged to sail sooner than he expected, many of the crew which he took out were invalids, some having cicatrices, and others having previously had fractured bones. In his passage round Cape Horn, he encountered very severe weather; many ships were obliged to return; some were lost, and the crews of those which succeeded in getting at last to the Isle of Juan Fernandez, suffered great hardships. In doubling Cape Horn, the crew suffered severely from attacks of the scurvy; and it was remarked by the clergyman, who was an observing man, though he knew nothing of our profession, that the men who had had ulcers before were invariably attacked with ulceration in the same parts; and that if their bones had been formerly fractured, they became disunited. When the men obtained fresh vegetables, &c. on shore, they recovered their health; their bones united, and their sores healed. There cannot be a better example than this, to show the readiness with which newly-formed parts ulcerate, when compared with the original organs of the body.

This does not surprise us, because we know that scurvy produces the ulcerative process, attacking the gums, causing profuse bleeding, &c.; that the ulcerative process has a stronger disposition towards parts newly formed, and that in this case, therefore, it appeared in parts where ulcers had formerly healed, and in disunited limbs where callus had previously formed.

Extremities prone to ulceration.

The parts more remote from the heart ulcerate more readily than those in the vicinity of the heart. This circumstance led me to say, that when the vital action is feeble, and the power of the cir-

culation diminished, we find a greater disposition to the ulcerative process than otherwise. Thus, for one ulcer in the arm, we find twenty in the lower extremities; and you cannot but have observed, in going round the wards, the great number of sore legs, those opprobia of our hospitals.

Slightly organized parts ulcerate slowly.

In those parts which are endued with little vital power, ulceration takes place very readily; while in those to which the quantity of blood sent is very small, ulceration takes place with difficulty. This is the case with tendons. Tendinous parts possess very little blood; very few arteries or absorbent vessels are distributed to them. Hence the process of absorption goes on with great difficulty, and tendons will slough to a great extent rather than become absorbed. This circumstance must influence our practice. In abscess under the fascia, an incision should be made as soon as possible through the covering, to liberate the confined matter. So in abscess of the finger, when the constitution suffers, because the theca will not give way to the process of ulceration, and the nervous system becomes irritated by the pressure of confined matter, an early incision should be made to liberate the matter, and give relief to the constitution. The same practice should be pursued in abscess of the palm of the hand.

Case.

A gentleman who had formerly received a wound above the zygomatic arch from a ball, called on me, having a swelling on the side of his face. I asked him whether he thought the ball was there? to which he replied, No. Upon cutting down on it, I found that it was the ball by which he had been wounded some years before. It had travelled beneath the zygoma to the middle of the cheek, on the surface of the parotid gland, from whence I removed it; perhaps it was assisted in its course by the action of the temporal muscles.

Use of ulceration.

The ulcerative process is useful to the animal economy, in removing extraneous bodies from the system. Thus, a ball lodged in the body, and a ligature round an artery, are disengaged by the process of ulceration. It is useful also in the exfoliation of portions of bone, in separating parts which would otherwise remain in the

body, perhaps for the remainder of life. In three or four months a considerable portion of exfoliated bone will be separated by the ulcerative process. You will find a case of popliteal aneurism in the other hospital, where the leg has sloughed a little below the calf. Almost the whole of the leg has separated, except the tibia and fibula. A very small portion still remains to separate. By my advice, nothing has been done to the living solids, and the process of nature is left to take its course. You will soon see that the bones themselves will separate by the process of exfoliation, and thus nature will herself perform the operation of amputation without loss of blood, or any danger to life.

ON ABSCESSES.

I shall now proceed to the consideration of abscesses.

Definition. An abscess is a collection of matter in a cyst, produced by inflammation, without loss of substance. What happens in the formation of abscess is as follows:—First, there is an inflammation of the adhesive kind in the cellular tissue, by which the different cells of the cellular membrane become filled with adhesive matter. A slight ulcerative process takes place, the inflammation still proceeding, and a little cavity is formed by the ulcerative process, a space being left for the effusion of pus, the result of the second stage of inflammation. A drop of matter is secreted into the cavity, and as soon as it is poured out, the pressure on the side occasions an increase of the ulcerative process, which adds to the cavity previously formed. More matter is then produced, and the surrounding solids having a tendency to the ulcerative process, it is accumulated, so as to lead to absorption of the neighbouring parts. In the formation of abscess, the matter does not produce absorption of all the parts around equally, but it excavates chiefly on the side towards the skin, and very little in the opposite direction; a circumstance which led to the reflection, that matter had no power of eroding, as was formerly supposed, when it was thought that matter acted chemically on the solids like an acid, or caustic alkali.

Formation of abscess.

Abscesses are dangerous according to the following circumstances :—

Danger of abscesses.

First, from their size. It is not, however, the quantity of matter produced which renders them dangerous, but the difficulty which nature has in repairing the devastation made by excavation of the solids, from the pressure of the matter.

An abscess may discharge a great quantity of matter, and the constitution may have been scarcely affected by it; but very soon after it is opened, the constitution begins to suffer. It is not, therefore, the quantity of matter, but the process of restoration after the evacuation of the matter, which affects the constitution. The largest abscesses which occur in the body are those of the liver. Patients will sometimes recover from abscesses of this part, in which immense quantities of matter have formed. I remember one of enormous magnitude, from which the patient recovered.

Case.

Dr. Saunders, the lecturer on medicine at Guy's, asked me to see a woman who had a large abscess in the side. I made an opening into it with a lancet, and it discharged a surprising quantity of matter, as much as would fill two-thirds of a wash-hand basin. I have heard, indeed, of much larger quantities of matter having been discharged. After pressing out the matter, I passed a roller tightly round the abdomen, and brought the parts together, with a view of producing the adhesive process, which now and then occurs. I did not see the patient again, but some days after I met Dr. Saunders, who asked me how I thought the patient was going on. I told him I imagined he asked me, because he thought me very sanguine; and he replied, that I should be gratified to learn, that the woman was doing extremely well. In fact, the orifice had closed; no more matter was discharged, and the patient got well without any bad symptoms. I have mentioned this case, because it may guide your practice when you are operating upon large abscesses, and show you the propriety of endeavouring to procure the adhesive process, by bringing the sides of the abscess together. Very large abscesses sometimes terminate favourably, but in a great number of cases they destroy life.

The next circumstance which renders abscesses dangerous, is their number. Thus, the greater number of little abscesses on the surface of the body, in small pox, frequently destroy life. Here nature performs the suppurative process; the pustules die away, and the cuticle is separated from the surface of the body; but nature has not the power, in many cases, of repairing the destruction of the cutis; the exposure of the nerves of the skin occasions great constitutional irritation, and the patient dies, as if destroyed by a burn or a scald. From their number.

Abscesses are also dangerous, from their being situated in vitally important parts, such as the brain, heart, or lungs; or when they are not seated in parts of vital importance, from their pressure on essential organs. From their situation.

A woman was admitted into this hospital for a complaint in the throat, occasioned by swallowing a pointed bone. All she complained of, at first, was a soreness in the throat; but she was shortly after seized with difficulty of breathing, which increased greatly, and she died. On examination after death, I found, upon making an incision into the pharynx, that between it and the fore-part of the vertebræ, a large abscess had formed, which, by pressing the pharynx forward on the epiglottis and glottis, occasioned difficulty of breathing, and in the end destruction of life. Shortly after this, Dr. Babington came to this hospital with a friend of his, who was labouring under a great difficulty of breathing. He requested me to examine his throat; having put my finger on the back of the pharynx, and felt fluctuation there, I told him that this was a case of which I had seen an instance, where the patient had died from a collection of matter formed in the same situation. I immediately procured a seton needle, and including it in a canula, like a trocar, I put it down into the pharynx, let out a considerable quantity of matter, and the patient was relieved. Here was a case, which, but for this operation, would probably have terminated fatally, by the pressure of the matter on vitally important parts. In the same manner, abscesses in the perineum, or between the prostate gland and the rectum, will, by their pressure on the urethra, Case.

occasion irritation of that part, and sometimes complete retention of urine. Thus, we find, that abscesses, though situated in parts not of themselves vitally important, sometimes become dangerous by their pressure on more important parts.

Recapitulation.

The danger attending the formation of abscesses, arises from their size, number, and seat, or from their pressure on important parts: there is also another danger, if abscesses occur between the bones and periosteum. Whenever bones form the boundary of abscesses, such abscesses are tedious in their cure, and, in many cases, dangerous. Thus, it is in psoas abscess: in this disease the matter begins to collect on the fore-part of the vertebræ, and proceeds through the psoas muscle, till it reaches the groin, where it makes its appearance just below Poupart's ligament; and from examination of these cases after death, the vertebræ are found ulcerated. It is not my intention now to enter into the consideration of psoas, or lumbar abscesses, as they will be treated of on another occasion; but I just mention the complaint, to show the danger of abscesses between the bones and their coverings; and that the reason is, the union between the soft parts and bone is with difficulty produced, and the process of restoration extremely tedious.

LECTURE X.

ACUTE AND CHRONIC ABSCESS.

At the conclusion of our last lecture, gentlemen, we stated that the danger attending the formation of abscesses arose from their size, number, and pressure on important parts; and lastly, that when they formed in important parts themselves, they generally proved destructive to life.

Now abscesses are either acute or chronic.

Acute abscess.

The common course an acute abscess takes is three weeks. The

adhesive inflammation first begins; this is succeeded by the suppurative: and, lastly, the ulcerative process comes on; and it is generally three weeks from its commencement before matter is discharged.

Chronic abscess.

But chronic abscesses are slower in their march; take, for instance, the psoas abscess, to which we have alluded; it is often six months before matter makes its appearance in that complaint. If a person comes to you with a psoas abscess, and you ask how long he has had pains in his loins, he will tell you for four, five, or six months past; seldom less than four, and generally for the space of six months. There are varieties in the irritability of different constitutions, but if you see a man with swelling in the groin, which, when he coughs, rebounds under your hand, and has a fluctuating feel, and who has had for four or five months pains in his loins, you will say that it is psoas abscess; so these are the criteria by which you are to know it. Chronic abscesses sometimes occur in the female breast.

Case.

A lady was sent to me from Sussex some years ago, to have her breast removed: knowing the surgeon who had recommended this person to me to be an intelligent man, I did not attentively examine the breast, but said to the lady, I will call on you soon, and perform the operation. I fixed the day, and was about to perform the operation, the patient being seated in a chair before me; when I said to the gentleman (Mr. Edwards) who was assisting me, I think that I feel a sense of fluctuation here, at least, I will not proceed to remove the breast, till I have ascertained whether it be matter. I took a lancet, and made an opening into it, and out gushed a quantity of matter. Thus, a chronic abscess had existed in this part for a considerable time. Very lately, while going round Guy's Hospital, one of the young gentlemen, or I believe, Mr. Key, brought me a woman who had a chronic tumour of the breast. On examining it, I perceived a slight fluctuation, and stated, that most probably it contained matter, but was told, in reply to this observation, that it had existed for four or five months; I said, however, it did not signify—asked for a lancet—made a puncture

into it, which let out a quantity of matter; and went away smiling. I merely mention to you these cases, to put you on your guard: for I have seen breasts removed, which were only chronic abscesses; and thus, from an ignorance of this circumstance, you might put your patient to a cruel operation, where a small incision would have done.

Treatment of acute abscesses.

In the treatment of acute abscesses, the best medicine you can give is the liquor ammoniæ acetatis, sulphate of magnesia, and opium; six oz. of the first, one oz. of the second, and a drachm of the tincture of opium, of which the dose is three or four table-spoonfuls three times a-day. By this medicine you lessen irritation, and expedite the suppurative and ulcerative processes: no medicine that I have observed, under such circumstances, gives so much relief. The sulphate of magnesia prevents any costiveness from the opium, and the opium tranquillizes the nervous system, and lessens pain. The local treatment consists in the application of fomentations and poultices: and why, you may ask, use both these remedies? To promote heat and moisture: a less quantity of blood is sent to the part, and a relaxation of the vessels takes place; this expedites the suppurative process, and that being done, the ulcerative process takes place with more ease. The kind of poultice to be applied to the part is of little importance; linseed-meal and water, bread and water, &c. No stimulating action would do; the object is to preserve the heat and moisture of the part, and to prevent evaporation: let the part be enveloped in oil-silk, for, by its assistance, the heat of a part is preserved, and evaporation prevented. It is desirable in the suppurative process to prevent evaporation; oil-silk is what is generally used then in private practice; it is clean, agreeable to the patient, and most conducive to his comfort.

Mode of opening abscesses.

Before proceeding to the consideration of chronic abscesses, I will say a few words on the opening of abscesses. If an acute abscess seems disposed to go through its different stages without any interruption, the best practice is to leave it undisturbed. Acute abscesses, beginning under aponeurotic fasciæ, ought to be opened as early as possible; the earlier the better. The moment one drop

of matter may be felt to fluctuate, it is advisable to make a free opening, both as it regards the constitution and the part. Whenever the matter can be felt close to bone, it will be right to open it, excepting in cases where it may occur from severe courses of mercury, between the cranium and pericranium. Mercury will inflame the periosteum (and the pericranium is a part of the periosteum) to a greater degree than the venereal disease itself; and in those cases where a fluid exists between the pericranium and bone, unattended with any blush, do not open it; it will be removed by purging, and giving bountifully the decoction of sarsaparilla. But when matter is formed, and there is a blush, it will not be absorbed; an opening must be made, exfoliation will often take place; but when there is no blush, beware of opening the tumour.

Treatment of chronic abscesses.

Now, gentlemen, the treatment of chronic abscesses will be very different from those of the acute kind. In the last case, you wish to diminish the state of excitement in the constitution; and in the former you do all you can to give it additional powers, by allowing generous diet, and giving the patient ammonia and bark; the ammonia is the medicine on which the principal reliance is to be placed. You know that of late, bark has not been much used; but people are apt to run into extremes—bark assists the suppurative process; generous diet must be allowed, in order to increase the action of the parts, by giving tone to the constitution. Stimulant poultices should be applied to the part, and the best I know is the muriate of soda (common salt) and water, a meat-spoonful of the salt to a pint of water, and the poultice should be wetted with this; yeast and oatmeal, vinegar and flour, each of these expedite the process of suppuration. In indolent cases, it is customary to employ stimulant plasters, and the best I know is the empl. galb. comp.; it is stimulating, and consequently excites the action of the part. The emplast. ammon. cum hydrarg., and the emplast. thuris comp. are also used; they, however, are more tranquillizing, and, in general, excite slight perspiration over the part, similar in its operation to the soap cerate, which is also of use.

Opening of chronic abscesses under the fascia lata.

These, then, gentlemen, are the remedies, local and constitu-

tional, to be used in chronic abscesses : but it remains now to be considered how to treat chronic abscesses, when it becomes necessary to open them: I shall now proceed to tell you. Suppose you are called to a case where there is a collection of matter under the fascia lata of the thigh (the largest in the body), extending, as it often does, from just above the knee to the trochanter major? what would you do? Open it certainly; make an incision half an inch in length, and squeeze out all the matter you can. Having done this, apply a roller, making the turns all over the thigh, with the exception of the opening; the result of this is, in many instances, that adhesive inflammation is excited, and thus the sides of the cavities are often readily united; always take care, in the application of the pressure, to leave the mouth of the wound uncovered. The same directions are to be attended to in collections of matter, when met with under the tendinous expansion which covers the muscles of the leg and fore-arm; the object is to endeavour to produce the adhesive inflammation, just as in the case of abscess in the liver, that I stated to you on the last evening; from which the matter was evacuated by the puncture of a lancet; and afterwards by means of pressure, the adhesive inflammation, took place, and the recovery of the patient was the consequence. This, then, is to be your practice, to endeavour to procure a union of the sides of the cavities by the adhesive process.

Prevention of scars.

Another reason for the early discharge of matter is the prevention of scars, particularly in exposed parts of the body. This may appear to you of little consequence, but I tell you it is not so: scars, from abscesses in the neck of females, excite in the minds of most of our sex a reluctance to associate with them; and thus many a fine young girl may, from these blotches and scars, be doomed to perpetual celibacy. No part of the practice of surgery has been so bad as the manner in which wounds on the neck have been treated. I have seen on one side of the neck large scars from old wounds that had been badly managed; whilst, on the other side, where the treatment had been more skilful, scarcely any vestige of a wound was to be seen. I have, from very early in life

(and subsequent experience has proved to me its use), been exceedingly careful in the management of these cases. Aperients, with calomel and rhubarb, should be given; evaporating lotions should be used. You must be strict as to diet and regimen; for though the patient be debilitated, he must be made still weaker. The best mode to adopt in these cases, is to open the tumours before the skin is much affected, and before a blush has appeared, and scars will in general be prevented. It is desirable in opening the tumours, to use a very fine knife, for two reasons:—1. A small opening is made; 2. It does not alarm the person. The knife I always use, is the one contained in the eye-case, for cutting up the cataract, the blade one-eighth of an inch wide, and it appears to the patient as a needle. When you press the sides of the wound, take care to squeeze out all the solid flakes of matter to be met with in scrofulous tumours. If this be not attended to, they will at last slough; but if, on the contrary, you carefully avoid leaving any of that unorganized substance, adhesion will take place, and the wound heal up. Every thing in these cases depends on getting rid of the solid matter. Bread poultices, wetted with a sulphate of zinc lotion and spirits of wine, may be used afterwards.

Case.

Whilst living in Broad-street, in the city, a lady came to me with a tumour in the side of the neck. I perceived on the opposite side several scars; I said "Will you allow me to try if I can prevent a scar here?" She answered, it was for that purpose she had consulted me. Warm poultices had been used on the previous occasions, with which I would have nothing to do in this, and she got well with scarcely a pimple to be seen. It is of the highest importance, then, to endeavour to prevent those appearances, which, on the exposed parts of the body, produce such painful feelings. In the higher orders of life, particularly, a child with scars and blotches on its neck would be secluded from society.

Opening scrofulous abscesses.

Now, gentlemen, there is a point of great importance to be attended to, *viz.* the direction in which you make the opening: always make it transversely, and not in the axis of the neck; for when the wound heals, it will scarcely be seen among the creases

or folds of the neck. One more observation on this subject: let me entreat you not to open these tumours when they have a blush on them like the hue of a grape; the veins are in a dilated state, and if you open the tumour, you will bring discredit on yourself. If the edges of the wound should not unite in any part, a little injection of sulphate of zinc or copper may be used.

There are two other points connected with this subject, which I will mention to you, and then I shall have done.

Causes of hectic fever.

1. The causes of hectic fever. You are all aware that a continued fever, *i. e.* rigors followed by heat, and a sweating stage, attend the formation of matter: these rigors take place once or twice in twenty-four hours, according to the irritability of the part and constitution; and had it been asked, thirty or forty years ago, on what it depended, it would have been said, absorption of matter into the constitution. Some of the old surgeons used to put sponge to the mouth of wounds, to absorb the matter, and prevent its being carried into the constitution; but, gentlemen, it appears to have no power on the constitution. There is no doubt, certainly, that the inoculation of putrid matter will, as we often see, sometimes prove fatal. The proofs that the absorption of common matter into the constitution does not produce fever, are—1. It is not during the formation of matter that the fever comes on; for never till after the abscesses have broken is the patient attacked with it. Certainly, the formation of matter will be attended with a slight fever, but not of the hectic kind: the tongue will be clean, the pulse very little affected, and the person very slightly deranged; but after an opening is made into the part, constitutional irritation sometimes comes on, and life is then endangered.

2dly. The degree of hectic fever is not at all proportionate to the size of the surface on which the matter is formed. Look, for instance, at a large wound on the leg: the person will be going about with it, and feel little or no inconvenience; whilst a sore on the lungs of the size of a crown produces hectic fever of the most violent kind. On one part, it is very considerable; on another, it is very slight.

3dly. Hectic fever comes on when no matter has formed. A woman, who had her leg amputated, came into the hospital for a pain in the knee on the same side; the symptoms of constitutional irritation were so severe, that in consequence Mr. Chandler held a consultation. The knee-joint was a little enlarged, and violent pain in the part, with great constitutional disturbance existed. Amputation was now performed above the joint, and after the operation I had an opportunity of examining the limb. There was no formation of matter in the knee; in the condyles, however, of the thigh-bone the ulcerative process had commenced, and the hectic fever was the effect, in this case, not of a disease of the knee-joint, but of the cancellated structure of the thigh-bone. In those cases also where matter has been absorbed, no hectic fever has come on. Some years ago, my old friend, Mr. Cline, thought that psoas abscesses might be cured by causing the absorption of the matter, and he tried the effect of digitalis on a boy of sixteen years old, who had a psoas abscess; the size of the tumour diminished, the skin became flaccid; but as soon as the digitalis was left off, the matter returned again, and during the trial of the medicines, the pulse was lessened, and the boy a little weakened—symptoms which, as you well know, are produced by digitalis. But during this time, no hectic fever came on; therefore, the belief of the absorption of matter being the cause of hectic fever is unfounded; for it is only the result of a constitutional effort to repair an injury, or to cure a disease. Case.

The last circumstance that I shall mention, is the influence which the admission of air into cavities has in producing local irritation. Now, from what I stated concerning the absorption of matter into the constitution, I think you will have agreed with me: whether you have or not I do not care; it is my duty to state to you my opinion—you must think for yourselves; only do not rest contented with thinking; make observations and experiments; for without them your thinking will be of no use. The circumstance, however, about the admission of air into abscesses, when they are opened, not producing local irritation, will be less readily understood. Influence of air when admitted into abscesses.

When an opening is made into an abscess, very little irritation supervenes till the third day; I say the third day, because it is not till then that constitutional disturbance takes place. If asked whether air has any influence in producing local irritation, you may answer, yes; but I say that it is not the case. Old surgeons, in their opinion on this subject, maintained that it was the admission of air which produced the local irritation attending the opening of abscesses, and endeavoured to cure hydrocele by inflating it after the evacuation of the water. But what was the consequence? when the air became absorbed, the adhesive inflammation did not take place, and the hydrocele returned.

Experiment.

Again, experiments have been made on animals: air has been blown into the cellular membrane of a dog; nothing but a temporary stiffness from the distention of the skin takes place, and when the air is absorbed, the crackling goes off without the adhesive inflammation. Dr. Haighton made an ingenious experiment some years ago; he inflated the abdomen of a dog from an opening in the tunica vaginalis; and this mode of doing it evinced his knowledge; for in the dog, and many other animals, there is communication with the abdomen from under the tunica vaginalis. The dog was let loose; he was stiff for a few days, but when the air was absorbed he became quite well.

Device of the Norwich butcher.

I know a curious circumstance which took place at the depôt at Norwich; it was at the time when persons were drawn to serve in the army. A man, unwilling to become a soldier, came to the surgeon, and said that he had a large rupture, which disabled him; he showed it, and the surgeon sent him away. This man had made a puncture in the scrotum, and inflated it with a brass blow-pipe; the man himself mentioned it to a surgeon at Yarmouth as a joke.

Cause of irritation.

What takes place when air is admitted into the cavity of the chest? An air-cell gives way, the wind goes into the cellular tissue, the face and body become bloated up, but is afterwards removed by absorption, without producing any inflammation; thus a person who holds that the admission of air into cavities produces the

irritation attending the opening of abscesses, takes a narrow and partial view of the case; for the cause of the irritation is as follows: if a wound be made into any cavity of the body, be it an abscess or a natural cavity, soon after the vessels of the part are divided, inflammation arises to heal the wound, whether it be exposed to the air or not. If it heal by adhesion, the influence is slight, and directly terminates; but if the adhesive inflammation be insufficient or imperfect, then a suppurative inflammation follows, and granulations arise, which process produces violent influence both upon the part and constitution. Therefore, the cause is, the division of the blood-vessels, and not the presence of air; and its degree depends upon the ease or difficulty with which the injury is repaired.

[After the lecture, the stomach of a dog which had died of hydrophobia was exhibited to the class. The œsophagus was inflamed, and the internal surface itself very red; there were also deposits of coagulated blood between the mucous and muscular coats, an appearance which, Sir Astley said, had always been observed in dogs that had died of this complaint. The animal had unfortunately bitten four persons, who were under medical treatment.]

LECTURE XI.

ON GRANULATION.

Two modes of union.

I HAVE endeavoured to describe to you the first mode in which the union of wounds, and the mode of filling up cavities is effected, namely, by the process of adhesion. I shall now proceed to consider the other mode of union between divided parts of the body, namely, *Granulation;* thus the two processes which nature institutes for the purpose of filling up the cavities of the body for the cure of wounds are adhesion and granulation.

Definition.

If you are asked for a definition of the term granulation, you will

say that a granulation is a newly-formed part, generally red in colour, and having the power of secreting pus.

Its formation.

The mode in which granulation is produced is as follows:—and you will find it very similar to adhesion, but differing from that process in one respect.

Process of nature in uniting divided parts.

When an abscess has been opened, or when a wound has been produced, if the abscess be not immediately closed, or if the edges of the wound have not been brought together, inflammation is excited, and this inflammation occasions an effusion of the fibrin of the blood upon the surface of the wound. This fibrin is poured out in a layer which covers the surface of the wound. The layer of fibrin soon becomes vascular, for blood-vessels, which are elongations of the vasa vasorum of the divided vessels, are forced by the action of the heart into the fibrin which has been deposited, and this layer consequently becomes vascular. The difference between the mode of union by adhesion and by granulation, is, that in the latter the vessels shoot to the surface of the layer which has been thrown out, terminating by open mouths on the surface of the newly-formed substance, and secreting pus, at the same time that a layer of lymph, or fibrin, as it is more correctly termed, is effused. The fibrin which is poured out, besides this purulent secretion from the vessels, forms a second layer, into which the vessels shoot as before. The vessels supporting the first layer are the means of supporting the second layer, where the vessels terminate as before, by open mouths on the surface of the substance effused. In this manner layer after layer is formed until the cavity becomes filled.

Character of granulations.

The characters by which granulations are distinguished are these; their surfaces are uneven; they are generally red in colour, and they secrete matter. I know not whether you have followed me or not, but this process may be easily explained. Suppose we open an abscess; the result is, that adhesive inflammation is produced in the internal surface of the cavity. A layer of adhesive matter is in this way thrown out, and if the sides of the abscess are brought together by passing a roller round it, we may often prevent the future formation of matter, as I have before had occasion to explain to you.

But if the union by adhesion does not take place, then granulations are formed in the following manner:—When fibrin is poured out, the vessels shoot up to its surface, permeate the newly-formed substance, and terminate by open mouths on the surface of the layer. This layer becomes the means of filling up a portion of the cavity; it is soon succeeded by another; the vessels become elongated, effuse matter on the surface, and shoot up as before, to the second layer of fibrin. In this manner one layer after another is formed, until the cavity of the wound is entirely filled. Granulations formed.

The vessels shooting into granulations are very numerous; they are principally arteries. If you inject an ulcer of the leg, the great degree of vascularity in the granulating surfaces is accounted for by the number of vessels divided into radiated branches, which we see entering the granulations, and producing the arborescent appearance which is observed in them. In examining the structure of granulations, they appear to become vascular in the following manner:—An artery enters at the base of the granulation, and is then divided into radiated branches; from these vessels pus is secreted, and an incrustation is formed, producing a layer of adhesive matter on the surface of the granulations. Their vascularity.

This is a little difficult to conceive; it is a circumstance which, I believe, has never been observed, and which I learned in the following manner: I took a portion of injected ulcer from the arm, and threw it into alcohol, in order to observe its vascularity. After it was thrown into the alcohol it was so opaque on the surface that no blood-vessels could be seen. It is the fibrous matter, therefore, covering the surface of the granulations which receives the blood-vessels. In this view a granulation may be considered as a gland, and the surface of an ulcer merely as a glandular surface. Now a gland is a part of the body in which a secretion from the extremities of the arteries takes place, and the blood which is not employed in the secretion is returned to the heart, by means of the veins which accompany the arteries. So in granulations, the arteries throw a quantity of blood near the surface of the wound, and there secrete pus. There is a vein accompanying each artery, and the Experiment.

fluid conveyed by the vessels is partly converted into pus on the surface of the ulcer, and partly returned back to the heart.

Their powers of absorption.

Granulations are not good absorbent surfaces in ulcers recently formed; but if the ulcers have existed for any length of time, the absorbent vessels readily take into the system any substance which may be applied to them. In this way we frequently see persons salivated by the use of injections of the oxymuriate of mercury. It is not an uncommon practice to inject a solution of a grain or two grains of oxymuriate of mercury into sinuses, for the purpose of stimulating the vessels. If the sinus has existed for a considerable time, the oxymuriate of mercury is frequently absorbed, and the mouth becomes affected in the same manner as if the mercury had been absorbed into the system by rubbing it into the skin, or taking it into the stomach. This proves that old granulating surfaces have the power of taking in, by absorption, a fluid of this description.

Lotio nigra.

I have known what is commonly called the black wash, which is composed of the liquor calcis and the submuriate of mercury, when applied to the surface of ulcers, produce an effect upon the mouths of persons who are easily affected by mercury. I believe that the wash of the liquor calcis and calomel often produces good effects in the cure of sores, by the mercurial action which it excites in the system, and not merely by its local effects on the sore to which it is applied. Ulcers are, however, frequently the means of producing baneful effects upon the constitution, by the readiness with which they absorb any substances which are applied to them.

Liquor arsenicalis.

Thus, arsenic applied to the surfaces of sores is very frequently absorbed into the system; and on this account, arsenic is to be regarded as a very dangerous external remedy. With respect to the use of arsenic as an internal remedy, it ought never to be employed without extreme caution, and unless the patient is watched from day to day.

Case of death from arsenic.

I remember a case in the other hospital, of a patient who was brought in with a fungus of the eye, and who was under the care of Mr. Lucas, a man of great skill in his profession, and the father

of the present surgeon of that name. Mr. Lucas ordered a solution of arsenic to be applied to the part. After it had been used for three days, the man complained of pain in the stomach, but this was not supposed to arise from the use of the solution. The application was continued; the pain in the stomach became excessive; convulsive tremors of the muscles succeeded, and the patient died. I was quite sure that he died from the influence of arsenic in the system; and upon examination of the body after death, I found the stomach inflamed, and exhibiting the peculiar appearance which is produced by arsenic, and not by poisons generally. I believe, therefore, that this person died from the application of the arsenical solution.

Quacks.

Quacks are in the habit of destroying tumours of the breast by the use of arsenic. Women are sometimes, though very rarely, foolish; and they will undergo any torture which is not inflicted by a knife, rather than submit to an operation that would not give them a tenth part of the pain which they suffer from such applications. They go to a person who tells them of the number of cures he has performed by means of a specific used for the purpose of destroying scirrhous affections; and, indeed, these quacks very frequently destroy the scirrhous part, and the patient too. Mr. Pollard, a surgeon, told me, the other day, of a person in town, who applied an arsenical preparation for a scirrhous affection of the breast, in consequence of which the patient died in less than a week.

Case.

I had myself occasion lately to perform an operation for a scirrhous breast, to which arsenic had been applied. I asked the woman which gave her most pain, the application of the arsenical preparation or the operation. She replied, that the pain of the operation was not so great as that of the application, and that the arsenic had been applied ten or eleven times. The consequence of these applications is, that they become absorbed into the system, and produce derangement of the stomach, the intestinal canal, and the nervous system, and sometimes cause paralysis.

Anecdote of a notorious quack near the Kent Road.

While I am on this subject, I will mention a case to you which

occurred in this town, and which I should have scarcely believed, if it had not come within my own knowledge, that of Sir William Blizard, and other surgeons. A person in this metropolis happened to have *bow* shins. It was a part of his duties to teach ladies to draw and paint, and in the prosecution of this branch of his profession, he found his *bow* shins, as he himself declared to me, a very great evil. He felt that his merits were less fairly appreciated, and his instructions less kindly received, by reason of the convexity of his shins; he was persuaded, in short, that his *bow* shins stood between him and his preferment. Under this impression, he went to a very noted person in this town, and showing him his bone, said to him, "Pray, Sir, do you think you can make my legs straight?" "Sir;" said the doctor, "I think I can: if you will take a lodging in my neighbourhood, I think I can scrape down your shins, and make them as straight as any man's." A lodging was taken; the father of the patient assisted in the operation, and all three of them—the father, the son, and the doctor—took a turn in scraping down the convex shins.

A great deal of rasping was required; an incision of very considerable extent was made in the skin, the integument was turned aside, and an instrument which was at that time contained in the surgeon's case, called a rougee, was employed to scrape the shin-bone. When the doctor was tired of rasping, the father took a spell, and the patient, in his turn, relieved his father. At last the shell of the bone became so thin, that the doctor said they must proceed no further with that leg. The other leg was then rasped in a similar manner, and thus large wounds were produced in both of the shin-bones. The surfaces granulated very kindly, and little exfoliation of the bones took place; but, unluckily, the granulations *would* form bone, so that up jumped the bones of the shin again. The doctor, however, was not to be defeated, and accordingly put a layer of arsenic over the whole surface. It was in consequence of the effects of this application that I saw the patient. The arsenic was absorbed into the system, and he became paralytic in his arms and

lower extremities. A great number of exfoliations took place in his legs; and he showed me a large box, in which the exfoliated portions of bone were contained. I recommended him to go into the country, and he went to Bath, where he staid for some time, and got rid of his paralysis. This case made a good deal of noise in town; and there were some surgeons who expressed a strong wish to prosecute the doctor. I recommended them, however, not to take any steps until I had seen the patient himself: and when he next came to me, I asked him whether he thought his legs improved, and whether he would again undergo the same operation, at a similar hazard of his life, to have his legs made a little straighter? He replied that he would; and under these circumstances I was of opinion that, as the young man was content, it was a folly to think of prosecuting the doctor. The patient, in this case, appeared to be as great a fool as the doctor whom he consulted, and deserved to be punished for his folly. I have no wish to injure individuals; and I shall not, therefore, mention the name of the operator. Some time has elapsed since the case occurred, and the transaction is now almost buried in oblivion. One of the parties is since dead; not the person, however, who underwent the operation, for he still lives, and is proud of his improved legs; and the doctor lives also, and is well known to most of you, at least by name.

Application of opium.

Opium, when applied to the surfaces of sores, is very readily absorbed into the system. I believe that it is often a very useful application to the surfaces of sores. I mentioned, on another occasion, a case in which a tetanic affection was produced in a child, whose leg had been amputated by Mr. Lucas, the present surgeon of Guy's, and where the application of opium to the stump gave more immediate relief than I ever remember to have witnessed. It relieved the spasms, and, as I believe, saved the child. If opium, applied to the surface of sores, be absorbed into the system, it produces excessive costiveness, extreme pain in the head, and torpor of the system, which is only to be removed by the frequent administration of active purgatives. The effects on the constitution,

when absorbed from the surface of sores, are very much the same as when it is introduced into the stomach.*

Sensibility of granulations.

Granulations possess nerves as well as arteries, veins, and absorbent vessels. Granulations are sometimes extremely sensitive; but this is far from being the case in all granulations. We shudder at seeing a person handle a sore roughly, supposing that it must give the patient extreme pain. Granulations which spring from parts endued with great sensibility, such as muscles, are indeed extremely sensitive; but many granulations, such, for instance, as arise from bones, have no sensibility whatever. If ulceration be produced to a considerable extent in an exposed bone of the head, a probe may be put into it, while the patient is quite insensible of your touching his head. If you do this in the granulations arising from bones, and ask the patient whether you have touched him, he will say, "No;" but if you apply the probe to the edge, or near the edge of the wound, he will feel it. Granulations, therefore, springing from bone in an uninflamed state of the bone, are not sensitive.

Except in bones.

Cancelli of bones sensible.

Granulations, however, which spring from the cancellated structure of the bone, are, sometimes, extremely sensitive. I have, at present, a patient who had a compound fracture of the leg: the fracture was attended with abscess, and a small exfoliation of the bone took place. In this case, when a probe was put down into the cavity, the granulations from the cancellated structure of the bone were extremely sensitive. When the inflammation passes away, the sensibility of the part is diminished. The same thing happens with respect to granulations springing from tendons, (as the tendo achillis, for instance,) which are entirely insensible. So

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* A woman applied to me with a boy, about ten years of age, having Tinea Capitis; she requested some active preparation which I did not think proper to trust her with. On the same day she obtained some tobacco liquor, with which she freely washed the child's head: not many hours afterwards I was sent for, when I found the boy in a state of syncope, pulseless, congestion of the brain, in short, dying. I employed local depletion and diffusive stimuli, but he sunk eight hours after the first application of the tobacco liquor.—L.

granulations arising from fasciæ, and the aponeuroses of muscles are endued with little sensibility. In general, therefore, although granulations springing from parts of great sensibility are sometimes exquisitely sensitive, those arising from parts in a great degree insensible, or entirely so, as tendons, are not sensitive; a circumstance which you cannot at any time go round a large hospital without having an opportunity of witnessing.

Granulations readily unite.

Granulations are very readily united to each other. The mode in which union is effected, is, by bringing the edges of the two granulating surfaces together, so as to produce the adhesive process. The surface of the granulations will be covered by adhesive matter, and you have only to apply the two surfaces to each other to produce an union. The knowledge of this principle is very often useful in the practice of surgery. A man has a considerable portion of the scalp raised from the skull, and the pericranium throws out granulations, whilst the raised portion of scalp is also granulating. Instead of waiting for the tedious process of the union of both surfaces, by granulations filling the cavity, you have only to place one portion of the granulations upon the other, bind them well down with adhesive plaster, and they will be sure to inosculate. In this manner, a surface, which it would otherwise have taken a long time to close, will be healed in a few days.

Advantage of strapping.

The cavity of the scrotum, after removal of the testicles, is often covered with a great number of granulations, by bringing the surfaces of which together with adhesive plaster, a wound, which would otherwise require weeks in healing, will be healed in a very short time.

Baynton's principle.

It was upon this principle, namely, that of bringing together the granulating surfaces, that Mr. Baynton proceeded with so much success in the treatment of ulcers; so that our hospitals are now much less filled than they formerly were with those opprobria of our art.

The next subject to which I shall direct your attention is the closing of sores by cicatrization.

Cicatrization.

The formation of the new skin with which a sore is covered over,

is called cicatrization, which is produced in the following manner:— The vessels at the edge of the skin form granulations, and these granulations unite with the granulations of the surface of the sore. The granulations produced from the edge proceed towards the centre, and those on the edge inosculate with those on the surface of the sore, and are united by the adhesive process. The vessels become elongated from the edge of the sore, and proceed in radii from the circumference to the centre. Day after day, an addition is thus made to the cicatrix, until at last the vessels reach the centre from every part of the circumference; when the process of cicatrization is completed.

It may be said by some persons, that this is not the only mode which Nature takes for the formation of new skin, for that it often happens that the process of cicatrization commences from the centre of the sore. If these persons mean to say that insulated portions of the skin are sometimes seen in the centre of a sore, having no communication with its edges, there can be no doubt of the fact.

But how does this happen? It is not that the centre of the sore has the power of forming new skin, but the new skin in the centre is produced in consequence of the whole of the skin not having been ulcerated away, and granulations arising from the part of the skin which was left. This only happens in irregularly formed sores, where the healing process is gone on to the centre, and then the sore has broken out in the circumference. If granulations arise from any portion of skin in the centre, these granulations produce new skin, and an insulated portion of skin is produced, forming a part of the cicatrix, which is not afterwards ulcerated away.

Appearance of a newly formed cicatrix.

When a cicatrix is formed, in the first instance it is extremely vascular; but when it has existed for any length of time, the blood-vessels become contracted, and it is whiter than the original skin. Hence the white appearance of the cicatrices after small-pox; for, although they are more vascular than the original skin, when first formed, in a little time they lose this vascularity, and are endued with less living power than the surrounding parts.

The readiness with which the surface of a sore is covered in by cicatrization, depends very much on its form. A sore of a circular form requires a very considerable time before it will heal; whereas a sore of much greater length, but of less diameter, will heal more quickly. You may always pronounce, therefore, that a round sore will be longer in healing than a longitudinal one, *cætaris paribus*, as for example, in the same patient, where the constitution is the same. The reason is, that the vessels have to elongate much less from the edge to the centre in a longitudinal than in a circular sore. The form, therefore, has an influence on the readiness with which cicatrization takes places. Importance of form.

Sores are very often difficult to heal, from their situation. Thus, if a sore be situated at the back of the leg, there will often be great difficulty in healing it. Indeed, such a sore can only be healed by raising the heel, and so loosening the skin, in order to give it a power of being drawn in, to form a new cicatrix. By this means the vessels are more readily elongated, and continually draw the skin nearer the centre of the sore. It appears, then, that the form and situation of the sore have a very considerable influence on the healing power.* After the cicatrization of an extensive sore, more especially if it has been produced by a burn, the new formed skin contracts, occasioning great deformity; and if near a joint, further mischief ensues from its motions being impeded. Situation.

Here is a model in plaster, on the table, representing the case of a patient who had been severely burnt, and in which extensive deformity had supervened on the cicatrization of the wounds. The chin had become united to the breast, the arms to the sides, and the upper arm to the fore arm. Contraction of cicatrices.

Now, in looking at a case like this, some of you might be induced to exclaim, How abominably inattentive must the medical man have been who had the care of this patient, for all these consequences might have been prevented? If you said this, your

* For this reason, ulcers situated over tendons, or about the ankle, will, for a long time, resist every means of healing them, on account of the granulations being disturbed by the slightest motion of the parts in contact.—L.

censure would be culpable; you have no right to say so; for it is a case that may happen to any of you. Deformities of this kind generally arise after the process of healing is completed; they are the effects of the contraction of the cicatrices, and not of the contraction of the skin at the time of the accident. Here the skin is contracted so as to pull down the chin, and evert the lip, so that the saliva runs over the surface of the breast, and is constantly excoriating it. All these results proceed, not from the production of the new skin, but from the contraction of the cicatrices after the production. I say this from having seen, among many other cases of the kind, the case of a child who was a short time since admitted into Guy's. In consequence of the contraction of the cicatrices, the upper arm adhered to the fore-arm, and the thumb was drawn back so as to be immovably joined to the upper arm.*

Case. I will mention another case of this kind. Some time ago, a young gentleman, who was playing with fireworks, happened to be slightly burnt in the forehead. His father, who was a very intelligent man, showed considerable anxiety, and expressed his apprehensions at the time, that some horrible deformity would arise from this accident; for he had witnessed instances in which the eyebrows

* It would be tantamount to sacrilege in me to detract from those opinions of Sir Astley, founded as they are on the most extensive practice, with a mind peculiarly bent on prying into the secrets of nature; neither is it the vanity of obtruding an isolated hypothesis on the profession, but a sincere desire to benefit suffering humanity, and in some degree to redeem the healing art from such an opprobrium.

That such contractions do take place I am well convinced of; but if the healing process were not accelerated by *astringents* and *escharotics*, and instead of which, warm and moist poultices applied for a length of time, especially where there is a loss of muscular substance, no contraction would take place.

I could enumerate a number of cases in support of this mode of treatment, but the brief space of a note will only permit me to state one.

Case.—A young gentleman, while lecturing on heat at the Southwark Literary Society, had his hand severely burnt in several places with phosphorus, owing to the high temperature of the room, and being in the vicinity of a large fire. Mr. Pilcher, Lecturer on Anatomy at the Webb Street School, and several other medical gentlemen present, rendered him every

had been drawn up, so that the patient had no power of closing his eyes, from a similar cause. Granulations, however, very soon arose on the surface of the forehead; the sore healed kindly, and the father was delighted to see what he supposed to be the favourable termination of the case. Some time after this, however, I saw this gentleman, and, upon inquiring after the child, he told me that he was very well, but that a horrible deformity had ensued from the accident: the eye-brows were drawn up, the eye-lids elevated, and the forehead was quite wrinkled. This took place a few weeks after the healing of the sore, in consequence of the contraction of the cicatrix; and unfortunately this was a deformity incapable of being remedied by any means which art could suggest. I have never seen a case like that represented in the plaster bust on the table, where the chin is united to the breast, which was capable of being cured. You may, by putting a knife behind the bridle, and dividing it, separate the chin, to a considerable extent, from the breast; but whatever force you may use for keeping the head back, the contraction will ultimately be the same. There are some parts of the body, however, in which deformities of this kind may be removed; as in cases in which the thigh is united to the abdomen, where the bridle may be divided, and the joint afterwards straightened; but where the bridle is broad, as under the chin, no operation will avail.

In the formation of cicatrices the original parts may all be Parts reproduced.

assistance. Warm poultices were applied until the sloughs came away, then *astringents* and *escharotics*. The granulations proceeded very favourably on every part, except on the ball of the thumb, which evidently evinced a disposition to contract in the direction of the *Opponens Policis*, by forming a rigid cord, which I immediately divided: I re-applied the warm poultices and continued them for about three months; a cicatrix formed, and although there is manifestly a loss of substance, yet no contraction has taken place, and it is now two years ago.

Rationale. Why does nature approximate those distant parts, so contrary to her original design? Because she is propelled by a hurried process of cicatrization to form an unnatural union, before she had time to provide a suitable substitute, which she afterwards resents.—L.

NATURAM EXPELLAS FURCÂ, TAMEN USQUE RECURRET.---Hor.

reproduced, except two. In the first place, new skin, though differing somewhat in texture and smoothness, is still a substance similar to the original skin. Skin may be defined to be a substance producing rete mucosum and cuticle. Are both produced by the newly-formed skin? Undoubtedly. The cuticle is produced very quickly, and with respect to the rete mucosum, or covering matter of the skin, a little time elapses before it is produced; but it is produced, as the following fact will show:—The new skin of a negro does not become white, as in that of Europeans, but is at first red, and after a little time turns blacker than the original skin.

Case of a negro.

I was struck with this in the other hospital, in the case of a negro, who had been a sailor in a privateer, and had received several wounds in different parts of his body. I observed that the cicatrices were every where blacker than the original skin. We may conclude, therefore, that the skin which is reproduced is true skin; that the cuticle is very quickly reproduced, and the rete mucosum after a short period. The cellular membrane is also reproduced, though it has at first the appearance of a solid fibrous mass, which requires some time before it is drawn into the reticular texture, similar to the original membrane. Tendons are very easily reproduced. If the tendo achillis be divided in an animal, it will be reproduced in about a fortnight or three weeks; but it will be somewhat larger than the original tendon. The same thing takes place in the human subject; as you may see from a specimen in our museum of a tendo achillis which had been reproduced, and which is larger than the original tendon. Every body knows that bones are reproduced; not only the shell of the bone, but the cancellated structure; not only the salt or phosphate of lime, but the cartilaginous substance in which it is deposited. Nerves are also reproduced, but there is some little doubt whether they assist at all in the restoration of sensation by anastomosis.

Experiment.

Dr. Haighton made an ingenious experiment with respect to the union of nerves. He divided the par vagum, or eighth pair of nerves, in a dog, on one side, and then let the animal live for some time; he then divided the par vagum on the opposite side, and after

suffering both nerves to unite, he then divided them at the same moment, when the animal died.

In *tic douloureux*, after the operation of dividing the nerve, even when the sensibility of the part to which the nerve was distributed is not entirely restored, and although numbness still remains in the cheek, the painful sensation usually returns. Case of tic douloureux.

An old gentleman, from Bury, in Suffolk, had undergone the operation of the division of the nerve for *tic douloureux* several times. When he came last to me, there was still a little numbness remaining in the lip, yet the pain of the *tic douloureux* was as great as ever. I divided the nerve, but the operation did not afford him the same relief as before. He came again some months after, and wished the nerve to be again divided. The pain in the part had returned to its former degree, although the numbness of the lip was much greater than before. Case.

The parts of the body which are not produced, are—first, muscles, in the case of a man who had a scar on the fore arm, which appeared to have long existed, I found that, instead of muscular fibre under it, a tendinous structure had formed. A muscle, when divided, unites by tendon, and not by muscle. Secondly, the cartilages of the ribs unite by bone, and not by cartilage. [Sir Astley exhibited to the class a specimen of cartilage of the human rib which had been divided, and in which ossific union had taken place.] This, however, will depend, in some measure, on the age of the person; for in very young subjects cartilaginous union will be produced, but in subjects more advanced in years, the cartilages of the ribs invariably unite by bone. Parts not reproduced.

LECTURE XII.

ON ULCERS.

In treating of this subject, I shall first describe the appearance of

ulcers in what may be termed their healthy state, I shall then detail the several circumstances which render their cure difficult, and proceed to point out to you the remedies which are found to be the most efficacious in practice.

Definition.

An ulcer may be defined to be a granulating surface secreting matter. When an ulcer is in a perfectly healthy state, the appearances which it exhibits are as follows:—

Appearance of an healthy ulcer.

The granulations are florid; their blood-vessels possess a considerable quantity of arterial blood, and the freedom of circulation produces this florid appearance. The granulations are equal on the surface of the sore, rising a little above the edges; for it is necessary, in order that a sore should heal kindly, that the surface of the ulcer should be a little more elevated than the surrounding skin. The surface of the sore secretes matter which has a milky appearance, or rather the appearance of cream. The edge is whitish in colour, and adapts itself to the surface. In this manner the granulations springing from the surrounding skin are very nicely adapted to the circumference of the sore, so that the granulations of the edge unite with those on the surface. When, therefore, you see the surface of an ulcer red, the granulations equal, the surface rising a little above the edge, the discharge of matter healthy, and the edge of the sore nicely adapted to the surface, you will say that this ulcer is in a healthy state. In order to produce this state of the sore, the best practice which you can generally pursue is to apply poultices and plasters.

Principles of treatment.

When you open an abscess, or when a wound is produced which cannot be healed by the adhesive process, the best application is a poultice, for the purpose of exciting the growth of granulations. This poultice must not be too warm; it should be gently stimulating, so as not to repress the growth of granulations, but to form a soft bed to which they may spring. The effect of the poultice is, by its warmth and moisture, to encourage such a degree of action as may promote the rising of the granulations. When the granulations have risen to the edge of the sore, then the practice must be altered; and the object is to adapt the granulations of the edge

to those of the surface. For this purpose, adhesive plaster or unctuous substances are employed, with a view of pressing down the granulations of the edge of the sore on those of the surface, so as to make them unite. These are the principles of treatment in the cure of ulcers. We first encourage the growth of granulations by the application of the gentle stimulus of poultices, and when the granulations have risen to the edge of the surrounding skin, we press down the granulations of the edge on those of the surface, either by the application of adhesive plasters, or of unctuous substances. The more unctuous such substances are the better; for the vessels will have a greater facility in shooting towards the centre, and the granulations embedded in this unctuous matter will more readily extend along the surface of the sore.

Impediments to the healing process.

Such are the principles of treatment applicable to ulcers in the healthy state; we shall now proceed to consider the impediments to the healing process which frequently occur, and which render a different mode of treatment necessary.

Granulations profuse.

The first circumstance which renders the cure of ulcers difficult, is the too prominent state of the granulations, producing what is vulgarly called proud flesh. In this state, the granulations rising considerably above the edge of the surrounding skin, are necessarily prevented from uniting with those of the surface. In order to prevent the continuance of this state of the sore, the common treatment is to apply dry lint to the centre of the sore, and some unctuous substance to the edges. The lint, by its pressure, prevents the growth of granulations in the centre, while the unctuous substance allows the granulations on the edge to proceed and inosculate with those on the surface of the sore. The lint should not be applied to the edge of the sore, for if it be, the granulations will be prevented from proceeding towards the centre of the sore. The nitrate of silver, and the sulphate of copper, are employed for the purpose of destroying luxuriant granulations near the edges of the sore. Here our practice is just reversed. Lint is applied to the centre of the sore, for the purpose of keeping down the granulations on the surface; whereas the caustic is applied for the

purpose of keeping down the granulations which are nearest the edge of the sore. In this way we promote the healing of the sore, forming a little circle by the caustic from day to day until we arrive at the centre.

Adhesive plaster is used with the same intention, *viz.* that of keeping down the granulations. The common adhesive plaster is, however, too stimulating for this purpose; a plaster, composed of equal parts of the emplastrum thuris compositum, and the emplastrum saponis, is a much better plaster to promote the healing of ulcers than the common adhesive plaster. This is a point deserving attention; because, if the application be of so stimulating a nature as to excite inflammation and excoriate the skin, we are often under the necessity of leaving off the adhesive plaster. It sometimes happens, that the action is so great as to oblige us to apply a sheet of lead to the surface of the sore; when this is necessary, you may apply a piece of lint covered with the ceratum cetacei, over these a piece of sheet lead, and round the whole a roller should be passed of about five yards in length. These are the various modes of treatment in this state of the sore.

Languid granulations.

The next circumstance to which we shall advert, as giving rise to difficulty in the treatment of ulcers, is a languid state of the sore, in which its action is too slight. What is the character of such a sore? You may know that a sore is in this state, by the glossy and semi-transparent appearance of the granulations; instead of the florid hue which characterizes granulations in their healthy state, a considerable portion of them is bloodless. The fact is, that the vessels near the surrounding parts have not sufficient power to throw the blood to the extremities of the granulations.

Ung. hyd. nit.

To remove this glossy appearance, and produce a healthy state of the sore, the application most commonly used is the unguentum hydrargyri nitrico-oxidi. This is a strong stimulating application, which occasions a determination of blood to the part, and produces a florid redness in the granulations, instead of the semi-transparent appearance which they assume in the languid state of the sore. It produces, however, a white appearance in the edge of the sore,

arising from the thickened state of the cuticle, which prevents the growth of the granulations on the edge. This may be corrected by the application of the unguentum hydrargyri fortius to the edge of the sore.

Lotions are frequently applied with the same view, such as the sulphate of zinc, in the proportion of two grains to one ounce of water; or the sulphate of copper, in the proportion of one grain to three ounces of water. The oxymuriate of mercury, and the liquor calcis, are also used for the same purpose. In addition to these applications, it will be necessary to bind up the sore with a roller, and to allow the patient to take a great deal of exercise; for without exercise, a healing disposition will not be produced in the sore. Lotio zinci.

It will be highly useful in these cases to employ some stimulating plaster, such as the emplastrum galbani compositum, for the adhesive plaster will not answer the purpose: the sores are languid, and the object is to increase the action in the part; this will be greatly assisted by giving the patient a nutritious diet, allowing him at the same time to take exercise, and, in fact, by doing every thing to improve the constitution. Empl. galb.

Well, the next stage of ulcers we come to, is that to be met with in patients on their admission into the hospitals. When the surgeon goes round the hospital on the first day after the taking in, he will meet with a number of persons with inflamed ulcers on their legs; and what, I ask of you, is the character of these sores? You know that there is a serous discharge from these wounds, a bloody ichor, composed of serum and the red particles of the blood—a disposition in many cases, to slough—that the surface is covered with a brown incrustation, and the skin and surrounding parts are highly inflamed. Well, then, you will find that the same treatment which is applicable to inflammation in general, will be of service in these cases, where inflammation has been kept up for a long time to a high degree. Rest must be enjoined; the patient must also keep in bed in the recumbent posture. Fomentations and poultices must be employed: fomentations will tend to produce a secretion Inflamed ulcers. Rest enjoined.

from the part; and poultices, by their soothing quality, to promote the growth of granulation; both will evacuate the matter from the wounds. Then, with these applications, the vessels begin to form, the sore assumes a better appearance, healthy secretions are thrown out, and granulations shoot up; fibrous matter is deposited, and in a little time you will have the skin covering the wound. Fomentations, poultices, rest, and the recumbent posture, must be enjoined, and the patient must be purged. The best cathartic that you can administer is calomel and compound extract of colocynth, five grains of each at bed-time, and a draught of the infusion of senna and sulphate of magnesia on the following morning. By this plan you will do more to subdue the inflammation than by any other I know. If the part in the neighbourhood be much inflamed, leeches had better be applied near the circumference of the ulcer: with this treatment, in a very few days granulations will spring up, pus will be secreted, and the surrounding edges will assume a healthy appearance. Without, however, attending to the constitutional treatment, all your local applications will be of very little avail.

Gangrenous ulcers.

Gangrenous Ulcers.—This kind of ulcer you will very frequently see in a man, who has been in poverty and distress for a long time, going up and down the streets of London, looking out for an asylum where he may rest his head; this person comes to the hospital at last, in a reduced and emaciated state. When you see a wound of this description, you will know it by the surface being perfectly free from discharge; the surrounding edges of a livid appearance, with small vesicles or blistered spots on them; and the patient suffering much from irritative fever. Seeing this state of the wound, then, you enjoin the patient the recumbent posture, which is essentially necessary to promote the separation of the dead parts.

Principle of treatment.

The principle of treatment in these cases is to produce a very slight increased action in the part. Sometimes, when the action is excessive, you must, on the contrary, soothe the part:—both will be sometimes good. When there is debility of the part, a slight

stimulus should be employed; but when there is excessive action, it is to be avoided.

The best application that I know for producing a slight stimulus and checking gangrene of the part, is the nitric acid; there is none equal to this: fifty drops of it to a quart of distilled water, will be found a most useful remedy. The acid may be increased to a drachm; this may be done or not, just as it may give pain to the part; but, generally, the average quantity is fifty drops. I have seen, in a short time after this application, a quick separation of the parts from sloughing, to which there is always a tendency; and healthy granulations spring up, being, as the chemists would call them, oxygenated; that is to say, the carbon being thrown off from the arterial blood in the vessels with which they are supplied. Here the granulations are of a beautiful florid red: this, then, is a most useful remedy. Nitric acid.

Oiled silk should be applied to the wound, so as to prevent the smell arising from the parts tainting the room; for it is always considerable when the process of sloughing is taking place, and granulations are arising; an advantage, though a slight one, compared with the others, in the use of the nitric acid, is, that the offensive smell is nearly taken away by it, the sulphuretted hydrogen is destroyed. Another very good application to sores of this kind is nitre, in the proportion of one drachm to a pint of water; this agrees very well with the sore, and has the same effect, though in a diminished degree. It appears that all the combinations of the nitric acid are good. Sulphuric acid is of use also in these cases, six drops of the acid to an ounce of water. The muriatic acid has not the same effect as the other two. If nitric acid be applied to the wound, the granulations will assume a red and healthy look: if the sulphuric be, they will have nearly the same appearance; but if the muriatic acid be put to the wound, it will be seen that it will have a comparatively slight effect on the granulations, and, therefore, it is an inferior remedy in the treatment of these wounds. Poultices made of port wine, porter, dregs of lees, yeast, a large spoonful of it to a pint of meal, may be all used. Oiled silk.

Variety of dressings.

Gentlemen, you must have recourse to a great variety of applications; for, after you have tried one, which at the beginning did good, you will, from the wound getting worse under its use, be obliged to change it for another, and so on. There is at this time a girl in the other hospital with sloughing of the pudendum; a variety of means have been used, all of which, at the outset, relieved her a little; but none continued to do her good for any length of time, and she will, most probably, in the end, fall a victim to the disease: it is upon this account that I mention to you so many remedies. The carrot-poultice is also a very good application. The constitution of the patient must be attended to, or else the local means will do very little; therefore, local applications must be aided by constitutional remedies; and what is the best medicine that you can administer?—opium and ammonia, gentlemen; twenty drops of tincture of opium, three times a-day, with ten grains of the ammonia, in an ounce and a half of camphor mixture, and a little (one drachm) of compound tincture of cardamom.

Case.

Constitutional means.

This is the medicine which will agree best with the patient. He must be well nourished, or at least he must have as much as his digestive powers will allow; port wine also must be given, and spirits must be allowed to those who have been addicted to their use. By brandy and opium I have seen these sores cured; in fact, they are our sheet-anchors in the treatment of these ulcers. But more of this in another lecture, as I shall have to speak of gangrene again.

Irritable ulcer.

The next kind of ulcer that I come to is the *Irritable Ulcer*.

This sore is extremely difficult to cure. How then are you to know it? When you find the granulations most unequal; in some parts being very high, in others very low. The discharge from the wound consists of a bloody pus. I do not know what to compare it to better (though it is not quite so good) than strawberry cream. (*A laugh.*) It is pus mixed with the red particles of blood. This sore may be known by the inequality of the granulations, the nature of the discharge, and the great pain and tenderness in the part; so that the patient, when touched in that part, is like a

sensitive plant. As you will be sure to find considerable difficulty in the treatment of these sores, I will tell you, the best application that you can make use of is one compounded of the cetaceous ointment, gray oxide of mercury, and powdered opium :—

℞ Unguent Cetacei
Hydr. Nit. ā ʒss.
Pulv. Opii ʒj. M.
Fiat unguentum.

This must be spread on lint, and applied to the part twice a-day. What are the internal remedies you ought to exhibit in these cases, gentlemen?—calomel and opium: these are the medicines on which you are to rely; a grain and a half of calomel and a grain of opium morning and evening. Nothing will be of so much service as this medicine.* It should not be carried so far as to produce ptyalism, or to affect the constitution severely; but it should be given so as to restore the secretions, and to diminish the action of the nervous system. The calomel will do the first, and the opium will lessen the nervous irritability. The treatment of inflammation has been improved of late by calomel and opium.

Iritis.

The effect of this medicine in chronic inflammation may be seen in the disease called iritis. Here calomel and opium may be exhibited; nor should a deposit of white matter, having the appearance almost of pus, into the anterior chamber of the eye, be any barrier to their use. Give five grains of calomel and a grain of opium night and morning; and in the space of a week, if the eye has not suffered a good deal, or become disorganized, this remedy will correct the inflammation. We use other aids, such as the compound decoction of the sarsaparilla. Some think it a placebo; others have

* Messrs. Reynolds, Gunton, & Co., Wholesale Druggists, in the Borough, prevailed on me to try the Naptha Barbadensis, as a dressing to indolent or intractable ulcers: and in justice to that article, I have no scruple in placing it amongst the most important therapeutic agents in such cases. My mode of applying it is thus: I spread the Naptha on thin paper, termed double crown, with which I cover the ulcer, and on a stronger paper I employ it as a strapping, on the principle of Baynton.—L.

a very high opinion of its efficacy. I do not think much of it myself in those cases; but, after the use of mercury, it diminishes the irritability of the constitution, and soon soothes the system into peace. With this view, its aid, combined with other remedies, may be of use.

Case.

So much for irritable ulcers. Before I conclude this part of the subject, however, I will mention a case which just occurs to me: I allude to that of Mr. Lucas, the surgeon of the other hospital. That gentleman, in consequence of having pricked his finger, had a very irritable sore, which obliged him to go into the country, where he remained for a considerable time. The remedy which he found most efficacious for bringing the sore into a healing state, was the application of a solution of nitric acid, very much diluted, and the compound decoction of sarsaparilla. From the latter he thought he derived considerable benefit. By these means, and by attention to his general health, he effected a cure; but his life was in considerable danger, from the irritable sore produced by this apparently trivial accident.

Sinuous ulcers.

Sinuous Ulceration.—It is necessary to explain here well what I mean. Whenever, therefore, a sore extends to any considerable depth, so that the discharge has to travel through a channel before it arrives at the surface, such an ulceration is called sinuous. There are two reasons why these ulcerations are difficult to heal: first, from matter forming at the bottom, forcing its way through the passage, and thereby disturbing the healing process, by breaking down whatever adhesions or granulations form on its sides; and, secondly, the same interruptions occur from the actions of the muscles, when these ulcerations happen in muscular parts. Thus, if the healing process has commenced in fistula in ano, when the sides of the fistula are at rest, the first time that the person has a motion, the sphincter ani, by its action, will destroy all the newly-formed adhesions and granulations; consequently, if the sphincter be divided, and the parts have rest, granulations will form, remain undisturbed, and a cure be the result: this clearly shows that the motions of the sphincter occasioned a continuance of the evil.

Sometimes in these cases, for the purpose of exciting the adhesive inflammation, injections are used. Now, which is the best? In my opinion, tinctura lyttæ: it readily produces inflammation; adhesive matter is thrown out; you take care to keep the sides of the sinus in contact; and by these means the parts will permanently coalesce. Sinuses of the rectum, however, are seldom cured without an operation; indeed, I have met with but two such cases: one was that of a gentleman who came from the north of England; he had been annoyed by a fistula on each side of the anus, one of which was operated upon by the late celebrated Mr. Hey, of Leeds. He was cured on that side by the operation; but as it was attended with great loss of blood, the patient was too much frightened to be cut again, and came to town for my advice. I examined him, and finding that there was considerable space between the anus and fistula, I advised him not to submit to the operation, and said that I would try to relieve him without it. I first injected port wine and water: this did not answer—it was not sufficiently powerful. I therefore threw in port wine alone, and succeeded in obliterating the canal. I was fortunate in this instance; for I can assure you that fistula in ano is seldom, very seldom, completely cured without an operation. When you do not succeed by injection, you may employ the caustic bougie. Still pressure will be necessary; and it is quite impossible that you can succeed without it. When the fistula is very deep, it may be divided into two; or a seton may be introduced, and kept in for a fortnight or three weeks, with a view of stimulating the parts for the purpose of filling the cavity with granulations.

Stimulants employed.

LECTURE XIII.

THE SUBJECT OF ULCERS CONTINUED.

In this evening's lecture, I shall continue the subject of ulceration. Ulcers are frequently formed for the purpose of allowing the dis-

Extraneous bodies.

charge of extraneous bodies; when such substances become lodged, therefore, in any part of the human frame, inflammation is excited —pus becomes secreted, which, pressing towards the surface, ulceration takes place, and the extraneous substance is thus afforded an opportunity of escaping.

Exfoliation.

Ulcers frequently occasion, to a very considerable extent, exfoliation of bone: here you can assist nature by applications which act chemically on the parts; apply, for this purpose, a lotion composed of muriatic acid and water, or nitric acid and water; this wash will dissolve the phosphate of lime, or earthy matter of the bone; and by removing this inanimate substance, the power of the absorbents will be increased, and a quicker separation of the diseased from the healthy parts be the consequence. The acids, however, have not so great an influence in these cases as you might be led to expect from what chemical writers have stated; still, however, you will find them to be of use, and they should therefore be employed.

Irritation of the nails.

Ulcers which occasionally form on the fingers and toes are sometimes exceedingly difficult to heal, from an irritation caused by portions of the nails. You may think this too trifling a subject to require a moment's consideration; but I can assure you the truth is far otherwise. A nail, for example, from pressure or some other cause, shoots into the skin beside it; a fungus springs up: the surgeon applies caustic and destroys it: in a short time it rises again; the caustic is repeated, and the fungus disappears; it speedily, however, returns, and will continue to do so, notwithstanding all his efforts to the contrary, unless he remove the irritating cause. Now this cause is the projecting portion of nail; as soon as that is got rid of, the fungus will cease to grow, and the ulcer immediately heal.

Treatment.

The best methods to adopt for the purpose of radically relieving these troublesome affections are as follow: pare down the nail as thin as you can without producing bleeding, then raise it a little, and introduce between it and the sore a small piece of lint; in this way the irritating cause may generally be removed. It sometimes happens, however, that the sore is so exceedingly irritable, that

even lint cannot be lodged on its surface without producing great increase of inflammation and pain: in such cases what I do is this: —with a pair of scissors I slit up the nail on that side where the disease exists, and then with a pair of forceps turn back and completely remove the divided portion. This is a very painful operation certainly, but I have known persons get well by this treatment in ten days, where the complaint had, for months, resisted every other. The applications to be used after the operation are of little importance; poultices are the best, and these will be required but for a very limited period; for the irritating cause having been removed, the fungus will soon disappear.

By blister.

The next best plan to be adopted, for curing these cases, is the application of a blister; this brings away the cuticle, and often the nail along with it. The most lenient method is the one first mentioned, *viz.* the introduction of a piece of lint. Mr. Hunter, in alluding to this disease, said that the parts were not in a state of harmony. This is very true, and a very proper expression; he also applied it to those cases where a disease in the gland producing the nail, causes the nail to turn black; such affections are not uncommon, and are often thought to be syphilitic, and I have frequently known persons salivated in consequence. This opinion, however, is perfectly erroneous. You must wash the sore with liq. calcis and calomel, and administer the pil. hydr. submur. comp. and decoct. sarsæ.

Entire removal.

Sometimes, in these causes, we are obliged to dissect out the gland that produces the nail; and though the operation is a most painful one for the patient, yet we are, for the purpose of affording permanent relief, compelled to perform it.

Whitlow.

Whitlow, what is it? Why, an exceedingly painful swelling, terminating in an abscess by the side of a nail. The principle is this: the matter forms at first under the nail, but, being unable to force its way through that horny substance, burrows under it, thus producing excessive pain and irritation. Fungous excrescences often arise in these cases, which induce the surgeon to apply caustic; this practice is worse than useless. You should, after fomenting

or poulticing the part, remove the loose portion of nail; this permits the matter to escape, and instantaneous relief is the result.

Menstrual ulcer.

The next ulcer that I shall describe is the *menstrual;* I mean by this, a sore which is once in three weeks or a month covered with blood. This complaint is connected with amenorrhœa. In going round the hospitals, you all must have observed that females will one day have their sores covered with pus, and probably on the next day covered with blood. In fact, the menstrual ulcer is of very common occurrence. You must wash these sores with liq. calcis and calomel, give to the patient the mist. ferr. c. myrrh. and pil. hydr. submur. comp., one ounce and a half of the former twice or three times a-day; and five grains of the latter every night at bed-time. These medicines will generally succeed in improving the state of the constitution, by restoring the defective secretions.

Ulcers from varicose veins.

The next ulcers that I shall describe are those which arise from *varicose veins;* and here I shall detain you for a few moments, as the subject is one of some importance. The veins in different parts of the body often become varicose, but those of the lower extremities by far the most frequently so. This condition of the vessels may arise from a variety of causes; but the more immediate one appears to be either a thickening of the valves, so that they are incapable of approximating, or a rupture of the valves: in either case the effects will be the same—the blood pressing in one uninterrupted column—the veins become distended and serpentine, and the valves widely separated from each other—their arteries, by their powerful attempts to return the blood to the part, soon excite inflammation, and ulceration quickly supervenes. What are the common effects produced here by the first desquamation of the cuticle? Why, the whole surface covering the diseased veins is formed into a crust, under which a quantity of serum is secreted.

Treatment.

The first thing to be attended to in these cases is the recumbent posture: in fact, this position is indispensable; you can do nothing without it. Lint wetted by the mercurial wash should be laid on the ulcers—oiled silk over these, and then the limb should be well and regularly bandaged, beginning at the foot. The bandage allows

the valves to recover their lost action, and consequently will be found to be highly useful. Another great benefit is derived in these cases from opening the veins; indeed, they are so distended, that they may more properly be termed lakes than rivulets. If you do not open the vessels you will find considerable difficulty in the progress of cure.

Puncture.

The best plan that you can adopt is to puncture them by means of a lancet, twice in the course of every week as long as you think they require it; let the bandage be afterwards applied, and the parts kept wet by means of evaporating lotion. No danger whatever attends the opening of these veins, and very great relief will be afforded by it. If the punctures, however, at any time should not unite, but fret into ulcers, you must apply to them the liq. calcis and calomel. It often happens that persons, who, for any length of time, have had the veins of their lower extremities in a varicose state, will find at night a great quantity of blood in their shoes; the crust before alluded to coming off is the cause of the hemorrhage. Upon being called to a patient so situated, you put him in the recumbent posture, apply a bandage, wet the part constantly, either with the spirit wash or cold water, and in all probability you will soon get rid of the disease altogether.

Pregnancy is a frequent cause of varicose veins; so also is obesity.

Mal-practice.

It was formerly the practice, when the veins were in a varicose state, to tie and divide them. This plan is still pursued by many surgeons; but it is one, gentlemen, that I have deprecated in my lectures in this theatre for the last eight or nine years; it is bad treatment, very injudicious, and fraught with great danger; therefore let me exhort you never to sanction it. I have seen this operation prove fatal in two instances in these hospitals; therefore I was induced to say that it did not succeed, and have for years spoken against it.

Case.

A gentleman of Nottingham informed me, that he had tied the vena saphena, for a varicose state of the veins of the leg in a young farmer, in other respects healthy, and the operation proved fatal. The same lamentable catastrophe occurred to a most respectable

practitioner at Brentford; and both these gentlemen told me, that they would not again perform the operation for the world. If I were to tell you all the cases in which I have known it terminate fatally, I should recount at least a dozen. Another *overwhelming* objection to the operation is, that when it does not prove fatal, its ultimate effects are perfectly nugatory. 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. When an artery is tied, the inflammation is *above* the ligature, but in a vein it is below; in this case, the vessel becomes terribly distended, the inflammation uncommonly severe, and either extensive suppuration, mortification, or death, the result.

Travers on Varix.

Mr. Travers has written an admirable essay on this subject, which well deserves your attentive perusal.

Ulcers are sometimes occurring in the cellular membrane, forming what we call *chronic carbuncles*.

Carbuncle

When the constitution is impaired, from whatever cause, it frequently happens that small swellings will form under the skin. At first they are red; then turn purple; and ultimately slough. The ulcerative process is slow in those cases. A white substance will soon be perceived at the bottom of the sore, and, as soon as this comes away, healthy granulations will rapidly form, and the wound become healed. Constitutional treatment, however, in these cases, must not be forgotten; for unless you improve the general health, the ulcers will not get well.

Treatment.

You should administer aperients, such as the infusion of senna, Epsom salts, &c., and give alteratives—the Plummer's pill will be found the best. For females, where great general debility has given rise to the formation of these sores, no medicine can equal in power the carbonate of ammonia. I shall have frequent occasion to allude to this. I generally give it in the following form;—

R. Ammon. Carb. ʒss.
Aq. Menth. Virid. ℥v ss.
Tinct. Cardam. Comp. ʒss.
M. ft. mistura. Cujus cap. coch. duæ 4ter. in die.

If any one medicine improves the nervous system when deranged, more than another, it is this. I have often prescribed it for females when in a state of extreme weakness, and its effects are truly astonishing: two table-spoonfuls of the mixture may be taken four times a-day. If the poultices have not the effect of exciting the granulating process, you may wash the sores with the liq. calcis and calomel lotion, or gently touch their surface with the nitrate of silver.

Cutaneous ulcers.

It not unfrequently happens that the skin, in various parts of the body, gets into a state of *superficial ulceration*, and without any evident cause. The best applications in these cases are the yellow wash: ungt. hydr. nit., or the ungt. zinci oxydi. The internal use of the oxymuriate of mercury will likewise be found particularly beneficial and salutary; give it in the formula mentioned to you in a previous lecture, *viz.* in conjunction with tincture of bark: a small quantity of this mixture should be taken in a little white wine, once or twice daily, according to the age and symptoms. This medicine will be found a very valuable one, when the above-mentioned ulcerations are connected with disease of the mesenteric glands.

Noli me tangere.

There is an ulcer often existing on the face, called *noli me tangere*, which name imports nothing more than that you must not touch it. This disease has never been correctly described; the truth is, that it is an ulceration of the glands or follicles of the nose, those small cavities from which you can squeeze sebaceous matter; the ulceration extending deeply, at last even the cartilages of the nose become destroyed; the plan of treatment to be pursued here is as follows, you must get prepared an ointment according to the following prescription:—

R. Arsenic Oxyd.
Sulphur Flor. āā ʒj.
Ungt. Cetacei ʒj.
M. fiat unguentum.

You must spread some of this ointment on lint, lay it on the ulcer, and leave it there for twenty-four hours; then remove it; a slough will come away: you dress the ulcer with some simple

ointment, and it will generally heal. If the ulcer is not deep, you may cure this complaint without using the arsenical preparation, by merely painting the surface of the sore with a solution of the nitrate of silver. You must be cautious, however, in your manner of using this application.

Case. A gentleman once came to me with an ulcer of the kind of which I am now speaking, and which I painted in the manner described to you with a camel-hair brush. In the course of the day, when at Lloyd's, he was asked by some friends what was the matter with his nose; for they told him it was quite black; and, in point of fact, it was so. I was not aware, at the time, that a solution of the nitrate of silver would have produced that effect; and I merely mention the circumstance, that you may be on your guard. Deep ulcers, having a malignant aspect, often remain in the faces of old persons, without producing any ill consequences, though, from their appearance, they portend the most direful effects. To such sores, the best application is the lotion, composed of liquor calcis and calomel.

Gouty habits. In gouty habits, ulcers frequently form in joints, arising from inflammation caused by a deposition of the urate of soda. Persons will come to you with many joints open from this cause. A gentleman came to me from the country, thus circumstanced. Several of his joints were quite exposed, and the cartilages of some of them absorbed. I found in each of these joints a lump of the urate of soda; therefore, when it is necessary, you increase the openings through the skin, remove the urate of soda, that being the exciting cause of the disease.

Ulcers with thickened edges. Occasionally, the thickened state of the edges of ulcers impedes the healing process. These edges must be adapted to their surfaces, and this may be done by means of the empl. galban. comp., which will remove the indurated cuticle, and stimulate the parts to action; if this, however, should not succeed, you may use the ungt. hydr. fort. or ungt. lyttæ: or you may, with a lancet, scarify the edges, and this method will often succeed when every other fails.

Ulcers with inverted edges. The edges of sores are sometimes very much *inverted;* constitutional treatment, as well as local, is necessary here. With respect to local, the application of the nitrate of silver to the edges,

and the black wash to the surface of the wound, are generally all that will be required: and the constitutional medicines I have so often mentioned to you must be regularly given until the ulcer heals.

Some sores have their edges very much *everted*, and this affection is commonly symptomatic of a cancerous diathesis; the usual methods of treatment practised in these hospitals is to poultice such ulcers; to attend particularly to the condition of the general health, until the edges have resumed a natural and healthy state. The admirable mode recommended by Mr. Baynton, should be had recourse to, which, by approximating the sides of the wound, and thus facilitating the processes of granulation and cicatrization, will more surprisingly contribute towards the completion of the object we have in view. With everted edges.

LECTURE XIV.

ON GANGRENE.

HAVING traced inflammation through its adhesive, suppurative, and ulcerative stages, I shall now proceed to consider it in its most destructive form, namely, when it exists in such excess as to produce gangrene. We find that inflammation, when it is extremely active, occasions a destruction of vital power. At other times, when there is a less degree of inflammatory action, but where the powers of the part are feeble, the life of the part will also be destroyed; so that gangrene is produced either by an excess of inflammatory action, where the powers are natural, or by a less degree of inflammatory action, where the powers of the part are feeble. Gangrene.

Gangrene may be considered as a partial death. This is its definition: the death of one part of the body, while the other parts are alive. Definition.

The symptoms of gangrene differ according to the manner in which it is produced. When gangrene is the result of high and active inflammation, the pain attending its production is exceedingly Symptoms.

severe; the inflammation is very extensive; there is usually a blush to a considerable extent; and there is generally, though not always, a considerable degree of swelling. The secretion from any sore which may exist ceases, for the skin no longer perspires. The surface of the skin becomes of a dark colour; it is said to become purple, but it is rather of a brownish tinge. The cuticle is raised, a vesication is produced, and when this breaks, it is found to contain a bloody serum. When this serum is discharged, the skin assumes the gangrenous appearance, and becomes perfectly insensible. The vesication extends to parts beyond the ulceration; thus in sores of the leg we frequently see a large portion of the skin giving way, and the gangrenous vesications extending beyond the ulcerative surface.

Constitutional symptoms.

The constitution suffers considerable derangement from gangrene; there is a high degree of irritative fever, and the pulse is often exceedingly quick. The pulse is generally said to become slow when gangrene takes place, but I have never observed this. I have indeed occasionally remarked but a few beats in a minute, because it is very frequently intermittent. Still the pulse is quick, though occasionally intermittent. It is said also to become soft, but I should not say that this is the character of the pulse in gangrene. It is quick, very small and thready, and generally irregular.

Delirium and hiccough.

Gangrene seldom occurs without delirium, and it is attended also with vomiting and hiccough. Hiccough, indeed, is the characteristic sign of gangrene, and it takes place though the gangrene may be situate in a part very distant from the stomach; as for example, in the toe. The fact is, that when gangrene arises from a diseased state of the constitution, the stomach is extremely deranged, and this derangement of the stomach is followed by a spasmodic contraction of the diaphragm, producing hiccough. This symptom does not arise from any alteration in the action of the diaphragm, but from its sympathy with the deranged state of the stomach. If you wish to correct hiccough, you may arrest it for a time by giving some slight stimulus, or even by adopting opposite means. Thus a glass of cold water will suspend it for a considerable time.

Gangrene from feeble action.

Such are the symptoms when gangrene is the result of excessive

action. But gangrene is sometimes the effect of a low degree of inflammation; as when it is produced by the application of cold. When a great degree of cold has been applied to any part for a considerable time, the part will become benumbed; that is, its nervous powers will be diminished: and when it is thus enfeebled, it will be unable to bear a very slight degree of supervening inflammation, so that gangrene will be produced, and the destruction of its life will follow. In this climate, however, destruction of the life of the part does not in general immediately follow. A person will come to the hospitals with his feet benumbed; he may have been wandering about the streets, unable to find a place of refuge; until he becomes, from this cause, incapable of walking. Great care must be taken, in these cases, not to apply heat very suddenly; even the common heat of the bed frequently occasions inflammation, which is extremely liable to proceed to gangrene, in consequence of the diminished nervous influence of the part.

I knew a gentleman of the first consequence in this country, and whose death occasioned perhaps as much regret as that of any one who has died for many years, who lost his life from an act of imprudence. He had been out shooting, and had exposed himself to severe cold; and finding his feet benumbed on his return, he immediately put them into warm water. The consequence was, that a gangrene took place, of which, notwithstanding all the care that could be taken of him, he died. In this climate it generally happens that inflammation succeeds the application of cold after an interval of two or three days. By the use of some slight means of treatment this inflammation is generally suspended, and it is by the repetition of the inflammation, rather than by its severity, that the powers of the part become at last exhausted. In colder climates than our own the part exposed to cold becomes white, and the suspended circulation is commonly restored by rubbing the part with snow. If it be not very carefully treated, however, inflammation and sloughing is apt to come on. If a part be completely frozen, inflammation frequently ensues in a short time, and, after

Case.

continuing for a few hours, is followed by a destruction of the vital power.

Process of Separation.

These are the symptoms which we observe in cases where gangrene is the result either of a high degree of inflammatory action, or of diminished power. When gangrene is produced by either of these causes, the process of separation soon commences. This process is one of the most curious operations of nature in the human body. There is nothing more extraordinary to my mind than the power which nature possesses of separating even large members without any danger from hemorrhage, or the smallest jeopardy to life. Thus we see a limb of considerable size separate without in the slightest degree endangering the life of the patient. There is an instance of this at the present time, in the other hospital, in a case of popliteal aneurism, which will afford you an opportunity of judging of this process of separation for yourselves.*

Separation of the skin.

The first appearance which we observe after the destruction of the life of any part is a white line, which nature forms for the separation of the dead from the living parts. For this white line we anxiously look, since it is the barrier which nature sets up between the dead and the living parts, and it becomes a criterion of the cessation of the gangrenous disposition. At this white line the cuticle is raised. This elevation of the cuticle is a vesication, which forms a line of circumvallation around the gangrene. When the cuticle becomes separated, as it will in two or three days, we find a chasm beneath it, produced by the absorption of the living skin in contact with the dead. The living skin is taken up by the absorbent vessels into the constitution, and in this manner the living parts are separated from the dead by a process of nature. If we were to reason *à priori* on this subject, it might be expected that the absorbent vessels would rather remove the dead portion of skin in contact with the living; but this is not the case. The absorbent vessels act on the living parts, but not on the dead: nor is the dead skin absorbed after the time when granulations have

* This man's leg separated through the calf.—L.

formed, but it becomes loose, and ceases to attach to the surrounding parts; the chasm formed by the absorbent vessels affording an opportunity for the separation.

Separation of cellular tissue.

The next part which begins to separate is the cellular tissue immediately under the skin. Gangrene proceeds to much greater extent in the cellular tissue than in the surrounding skin, because the cellular membrane is a part of weaker living powers. It is for this reason that a sloughing disposition in sores extending to the cellular membrane is so dangerous. A small chancre beginning in the pudendum of the female, and sometimes in the penis, will frequently occasion destruction of life in the part. Some persons have absurdly supposed that these sloughing sores are not chancres, because they have not the common venereal character. But how does this happen? If a chancre forms in the pudendum of an irritable female, and has a sloughing disposition, it extends into the cellular tissue, inflames to a high degree, and produces gangrene. In this manner the character of the chancre becomes destroyed. There is at this time an unfortunate female in the other hospital, who has lost a considerable portion of the external organs of generation, in consequence of a sloughing chancre. The hospitals teem with such cases: and indeed this deplorable result is always to be expected when a sloughing chancre extends into the cellular tissue, a part naturally weak, and rendered weaker in these persons from their irritability and mode of life.

Separation of muscle.

The next part which separates is muscle. Muscles separate nearly opposite the edge of the skin. Wherever the skin separates, the muscle gives way; a line of separation is formed, and the living portion of muscle is taken away from the dead. This is not the case with tendons; these, like the cellular tissue, do not separate opposite the skin, but at a considerable distance from the part at which the sloughing takes place. If a tendon is exposed in the palm of the hand, by a sloughing ulcer, it separates at the wrist, for it is incapable of resisting the inflammation, in consequence of its weak living powers, and separates therefore at the part where it joins the muscle.

Tendons.

Separation of nerves.

The nerves separate, like muscles, opposite the skin. But the most extraordinary instance of the process of separation is that which takes place with respect to the larger blood-vessels.

Separation of arteries.

What would be the result, if you were to separate with the knife the anterior and posterior tibial arteries, without placing a tourniquet on the limb? The person would die in a few minutes. Yet nature cuts through these vessels, and frequently divides the arteries I have mentioned, without a drop of blood issuing from the limb. This happens in the following manner:—the blood in the vessels of the dead part becomes coagulated; the coagulum, however, does not confine itself to the dead part, but extends to the living vessels which join it, and is, in this manner, glued to the inner side of the artery, so that the vessels are, as it were, hermetically sealed; and not a drop of blood can escape by the side of the coagulum. The same thing takes place in veins, the coagulum adhering to the inner side of the living vein, so that no blood can escape. If you amputate a limb at a considerable distance from the part at which gangrene has commenced, you will still find the vessels sealed.

First case of amputation.

The first amputation which I ever performed, was in the case of a gentleman who had a gangrenous ulcer near the head of the tibia. In this case it was necessary to amputate above the knee, as sufficient skin would not have been left if the amputation had been performed below. When I loosened the tourniquet, I was surprised to find no femoral artery. On a closer examination, I found that the inner side of the femoral artery was completely plugged up, and sealed by the coagulum, which had extended at least six inches above the place at which the gangrene had occurred; it appears, therefore, that the artery is not only sealed at the place at which nature cuts through it, but at a considerable distance above it, in order to provide against the danger which would arise from a separation of the coagulum.

Separation of bones.

Bones, at last, become separated; but this process is very slow; and it is a long time before they exfoliate, loaded as they are with phosphate of lime. Hence we are often under the necessity of taking away bones, when the process of separation is in other

respects complete. I am anxious, whenever I have an opportunity in these lectures, to refer you to cases actually existing in the hospitals; and you cannot have a better opportunity of observing the process of nature with respect to the separation of bones, than in the case of popliteal aneurism, to which I have before directed your attention. This man underwent the operation for aneurism in the other hospital. The aneurismal bag had been loaded with fluid blood for a length of time; the process of gangrene commenced at the ankle; all the soft parts were absorbed, and there is nothing now remaining but a portion of bone, which will also separate, if we permit it to do so. The saw would quicken the process, but it is unnecessary, for the bone will separate by the efforts of nature alone.

Case.

I knew a person in the county from which I came (Norfolk), whose leg entirely separated by the process of gangrene alone. In the foot this very commonly takes place; in the calf of the leg it is not common, but below the calf, it frequently occurs. I attended one of the king's messengers, some time ago, who came from Germany, with a gangrene in the foot. The foot separated at the tarsus, and the whole process went on without any surgical operation, and with nothing but the aid of the simplest applications.

Gangrene the effect of debility.

Gangrene is frequently the effect of a debilitated state of the constitution. Thus, if a man have been confined by long continued fever, the nates are apt to slough and become gangrenous in consequence of the imperfect circulation, arising from the position in which he has been forced to remain. Some fevers have a greater tendency than others to produce gangrene; as for example, scarlatina. In slight cases of scarlatina, the most horrible effects will sometimes arise from gangrene. The tonsils will slough to a great extent, parts of the Eustachian tube, and even the tympanum will separate, and large portions of bone exfoliate. The worst effects of this kind are observed in those cases of scarlatina where the fever is not the most violent.

The measles are very apt to be followed by sloughing, unless great care be taken not to irritate the skin of the chest too much.

In this town it sometimes happens, that a large blister applied to the chest of a child labouring under measles occasions a high degree of inflammation, producing gangrene, and endangering the life of the patient. In constitutions of an unfavourable kind, I have often seen the measles produce a slough forming a black aperture in the cheek of the child, through which its food was passed, and life soon destroyed. Mercury, if used to excess, often excites sloughing, from the fever and consequent debility of the constitution which it produces. Whatever, in short, weakens the constitution much, disposes it to the production of gangrene; for the body, when thus debilitated, cannot bear any excess of action.

Gangrene from cold.

When the application of cold is the cause of gangrene, the effects are produced very much in the same way. The powers of the part to which the cold is applied are diminished, and this diminution of power leads to the destruction of the part, under the first excess of action.

Effect on the tendons.

There are some parts of the body naturally constituted feebly; as for example, tendons. When inflammation attacks a tendinous structure, it runs very readily into a state of gangrene. Hence the danger of making incisions into a tendinous structure, which frequently affect the nervous system with the highest degree of irritability, and produce tetanic symptoms. It is not the injury to the nerves which produces tetanus, but the sympathy of the nerves with the injury to the tendon.

General rule.

It may be stated, as a general principle, that inflammation is the cause of gangrene; gangrene very rarely happens without inflammation; but as there are some exceptions to this general principle, I will mention them.

Gangrene not the result of inflammation.

I have seen, in a case of hydrothorax, a small spot in the legs become at once black, without any appearance of inflammation, and extend itself until it occupied a very large surface. Here the total absence of circulation, and not an increased degree of it, occasioned the destruction of life in the part. So we now and then see aneurism producing gangrene. In the case of popliteal aneurism, to which I before adverted, the gangrene is produced, not by the

bursting of the aneurismal bag, but by the pressure of the bag on the vessels, occasioning the destruction of life in the limb below.

I saw a gentleman a few months ago, who was on the point of death from the pressure of an aneurism. His foot afterwards became gangrenous. He did not die, however, for separation of the foot and part of the leg took place, and he ultimately recovered. Case.

So much for impeded circulation without inflammation, as a cause which sometimes produces gangrene. The division of a considerable blood-vessel will sometimes produce the same effect. I believe I have already mentioned in the lectures, the case of a gentleman who was stabbed in the groin by a foreigner, with a dirk or sharp knife. He was stabbed just in the femoral artery; considerable hemorrhage took place, which was stopped by a ligature on the artery; but the leg afterwards became gangrenous, and it was necessary to perform the operation of amputation. Gangrene from the division of an artery.

Since I commenced these lectures, I have seen a most melancholy instance of a gentleman in the prime of life, who died from gangrene, in consequence of an injury to the femoral artery. This gentleman was thrown out of a gig, as he was going down a hill, and the wheel of the carriage went over his thigh. When he was taken up, it was found that he had a simple fracture of the femur. Every thing which attention and skill could do for him was done; but some peculiarities were immediately observed at the time of the accident. The lower part of the leg was quite insensible; it was considerably swelled and hard. After lying in bed for a week, the patient became so restless that he wished to be removed. This was done in the gentlest possible manner. He did not, however, experience the relief which he expected from a change of position, and the swelling was in some degree increased. Case.

I was then sent for; and when I saw him, I was surprised to find that gangrene had already commenced at the knee. This was hardly to be expected from a simple fracture; for it so rarely happens that the femoral artery is injured by a fracture of the thigh-bone, that amongst all the cases of fractured femur which I have seen in the course of my life, I never yet met with an instance

in which the artery was injured. However, from the immediate insensibility of the limb at the time of the accident, from its coldness, from the swelling which accompanied it, and also from the pulsation which existed opposite to the fracture, I was led to believe that the femoral artery was torn through. The question then arose whether we should amputate or not. Upon examination, I found the limb emphysematous; the air had extended into the cellular tissue up the thigh to the abdomen, and putrefaction had already commenced. I perceived, therefore, that the patient had but a few hours to live, and that it was useless to put him to the pain of an operation.

Sectio-cadaveris.

Upon examination after death, by the medical gentlemen at Rochester, where the patient resided, it was ascertained that the femoral artery was divided. It seems extraordinary, when we contemplate the situation of the thigh-bone, that a fracture of it should not, in one case out of ten, produce a similar result. A little knowledge of anatomy, however, explains this circumstance. The artery is enclosed in a sheath, which so far protects it, and its elasticity yielding to the pressure of the bones, enables it to escape in a great majority of cases from the occurrence of this accident. The history of gangrene, as far as dissection enables us to judge of it, is this: the excessive action of the part closes the blood-vessels, and the blood contained in them becomes coagulated.

Experiment.

This is a curious circumstance, which I ascertained by an experiment made on an animal. It is a well-known fact in physiology, that if a quantity of blood be included in a living vessel between two ligatures, at the distance of two or three inches, this blood remains about three hours before it becomes coagulated. To ascertain whether, if blood were admitted into a dead vessel, from which the air was entirely excluded, it would coagulate as it would in a glass out of the body, I put a ligature on the jugular vein of an animal, and another ligature at the distance of two inches from the first; then, cutting through the end of the vein, I brought it externally to the skin, so that it hung out from the wound. Having ascertained that the blood coagulates in three hours and a quarter

in a living vessel, I took off the ligature from the dead vessel, and found that in ten minutes the blood had coagulated as firmly as it would in a vessel into which a person had been bleeding. In a dead blood-vessel, therefore, the blood becomes coagulated just as it would in a vessel out of the body. If you attempt to inject a part after gangrene, the injection will not enter the vessel. There is a specimen on the table (Sir Astley exhibited the specimen,) of a gangrenous limb, where you may perceive that the injection has entered only as far as the part at which gangrene has commenced. Such is the state of parts under gangrene. They can never be recovered, because living blood can never again circulate in them.

The subject next in order is the treatment of gangrene; but as I intend to occupy a little of your time this evening by a very curious experiment, I shall defer the consideration of that subject to the next lecture. I have something to say to you, also, gentlemen, on another subject. In the course of these lectures, I have always considered it my duty to direct your attention to what is going forward in the hospitals, and to illustrate every subject, as far as possible, by a reference to cases which are actually under your inspection.

Singular Case of Anastomosis.

A short time ago, I amputated a limb in the other hospital, in a case of aneurism, which is extremely curious, and to which I am not sure that there ever has been a parallel. Some months ago, a man underwent the operation for aneurism; the femoral artery was tied; shortly after, the pulsation disappeared, and he was soon after supposed to be cured of the aneurism, and discharged. He returned to his work; but soon after a swelling arose in the ham, without pulsation. The swelling subsided in consequence of rest: but a few weeks ago, while the man was at labour, the swelling returned with great pain, which increased during the time he was in the hospital; and, as there was no prospect of his recovering a useful limb, amputation was resorted to. In this case, I found the femoral artery, below the place to which the ligature had been applied, was conveying blood. As it was impossible that the femoral artery could be pervious, the blood must have been conveyed

by anastomosis. It does now and then happen, that a blood-vessel will arise from the artery just above the ligature, and pass into the artery immediately below the ligature; by which means the circulation is produced. There is a beautiful specimen in the collection, where the brachial artery had been tied, and the blood was conveyed by a vessel not more than three inches in length, from the part just above to the part just below the ligature. This now and then occurs after the operation for aneurism, anastomosis happening where it is not usually found, from a short vessel running from one portion of the artery to the other.

Reed's Syringe.

The other subject to which I mean to call your attention, is the experiment which I made on an animal last Friday, in the other hospital. This experiment, gentlemen, delighted me; I do not know that I have ever experienced greater pleasure in my life than I felt in going home from the hospital on that day. With respect to antidotes against the effects of poison, it is well known that they are, in a great degree useless. It is impossible, for instance, to get rid of arsenic from the stomach by any remedy that can be administered. It is doubtful whether any man ever recovered from the effects of that poison by means of an antidote. So with respect to opium; when it is taken into the stomach in such large quantities that vomiting cannot be excited, the patient cannot be relieved by the exhibition of medicine; for where is the antidote against the effects of opium?

Case.

A few weeks ago, a nurse in this hospital died in consequence of having swallowed opium. No relief was exhibited to her; but can it be said, after what we saw on Friday, that no relief *could* have been administered to her? A short time since, a patient died in the other hospital, under similar circumstances; the quantity of opium taken being so large, that vomiting could not be excited by any means which were employed.

Case.

I was myself, on one occasion, called to a young lady, who had taken two ounces of the tincture of opium. It was ten o'clock in the morning when I first saw her; she was then comatose. I tried to excite vomiting by the sulphate of copper, giving it in as large doses

as I could venture to administer; which I have sometimes known to succeed when all other means have proved ineffectual. It was, however, unavailing in this case, and I sat by this young lady from ten o'clock in the morning, until eight in the evening, watching the regular process to death, without being able to administer to her the least relief.

Its advantages.

Let me ask you then, gentlemen, whether an experiment of this kind is not in the highest degree interesting, and whether we are not infinitely indebted to the man who first suggested the means of administering relief, under such afflicting circumstances? I am happy to tell you, that the gentleman to whom we are indebted for this suggestion is now present: that he is ready to have the experiment made upon himself, and that so confident is he of the success with which it may be applied, that he would have no objection, if I could permit it, to take a large quantity of the tincture of opium, in your presence, this evening. I suggested, however, that a little coloured water would answer all the purposes of illustrating the use of the instrument. The syringe, which was brought to me the other day by a very ingenious man, Mr. Reed, of Kent, is entirely a new invention, nor do I think the merit of that individual in the least degree diminished by what I have since learned.

Its application.

The application of the syringe to the stomach, in cases of poisoning, is due to a gentleman whose name I shall presently mention. Mr. Reed's syringe is a new contrivance, which has been formed upon a principle in hydraulics, (first applied, I believe, by Mr. Bramah,) and which is capable of increasing the force of the instrument to the greatest possible degree. To give you an idea of its force: if I were to stand on a piece of wood, and the wood were surrounded by any thing which would prevent the escape of the water, the force of the syringe is capable of raising me from the ground. I do not wish to commit myself by any observations on a subject with which I do not pretend to be particularly conversant; but I believe, gentlemen, the principle is this: when a fluid contained in a vessel, having a large diameter, is

thrown into one of very small diameter, the result is, an exceedingly great accumulation of force.

Hydraulic Power.

Thus we see that piles which are driven into the beds of rivers, by the force of immense weights acting upon them, are raised by the admission of a very small quantity of water under them, upon the principles which I have just stated. Mr. Reed's syringe is formed upon this principle, and the valves are, besides, different from any which had been previously employed in similar instruments.

First applied.

With respect to the medical application of the syringe, however, for the purpose of removing poisons from the stomach, we are indebted for it to Mr. Jukes, a surgeon at Pimlico, who published an account of it in the *Medical and Physical Journal* for November, 1822, p. 285; and a further account in the same journal for June, 1823. Mr. Jukes originally employed a gum-elastic bottle to be applied to the tube; but the improvemnt of a syringe was suggested by Mr. Bush, of Frome.

LECTURE XV.

TREATMENT OF GANGRENE.

In the last lecture we defined gangrene as a partial death; we described to you the symptoms which attended it, when it was the result of high and active inflammation, and when it was the result of a low degree of heat.

To prevent Gangrene.

We shall now proceed to consider the treatment which is usually employed to prevent gangrene, and to prevent the sloughing process. You must endeavour to soothe the parts by the application of leeches, with a view of checking the excess of action. It generally happens, in cases of gangrene, that the body will not bear any considerable degree of depletion; but local depletion, by

means of leeches, may be safely resorted to. Thus, in compound fracture of the leg, for instance, gangrene may be prevented by the application of leeches, when it would not be equally safe to take blood from the arm. Soothing applications, such as poppy fomentations and poppy poultices, should be employed to subdue the excessive action which threatens the destruction of the life of the part. It will be necessary, at the same time, to attend to the constitutional treatment of the patient.

General bleeding.

In this metropolis, it is seldom safe to take blood from the arm of patients to prevent gangrene. In the country, a different practice may be pursued; and it will frequently be necessary to take away blood in erysipelas, and other cases, in which we cannot and dare not deplete in town, where the constitution of patients is broken by intemperance, or enfeebled by deteriorated air. When you take away blood, however, to prevent gangrene, do not take more than eight or ten ounces, lest the vigour of the circulation, and consequently the nervous powers of the constitution, should be too much diminished.

Constitutional Remedies.

Two or three grains of calomel should be given at night, with a view of restoring the defective secretions of the intestinal canal and the liver; and the liquor ammoniæ acetis, with a few drops of the tincture of opium, should be given several times in the day. By the calomel you restore the secretions; and by the opium you tranquillize the system, and diminish the irritability which leads to the destruction of the life of the parts. Do not begin by stimulating the constitution too much, in cases of gangrene. The effect of opium may, in some respects, be similar to that of taking a stimulus into the system, but it is by diminishing excessive action, at the same time that it increases the strength of the body, that opium becomes so valuable a medicine in these cases. The best means, therefore, of preventing grangrene, are to restore the secretions by calomel, and to diminish irritability by opium, and, in some cases, by taking away very small quantities of blood.

Benumbed, or frozen parts.

If the gangrene arise from the application of cold, the treatment must be different. In these cases, the action of the parts is feeble

from the diminution of nervous power, and it will be proper to restore it to a healthy state by stimulants of the most gentle kind. For this purpose, the best application is the camphorated spirit of wine, accompanied with gentle friction. If you are called to a patient whose feet are benumbed by the application of cold, you must sit by his bedside, pour the camphorated spirit into your hand, and rub it on his feet with the utmost possible gentleness, so that the part may not be irritated by violent friction.

When the first effects of cold are removed, it will be proper to apply poultices to the part. The poultices must be cold, for warm applications to the part are to be carefully avoided. One of the most valuable of our nobility died of gangrene from an imprudence in this respect. He was out shooting in December last, and his feet having become benumbed, he put them into warm water as soon as he returned home. The consequence was, that his toe became gangrenous; the gangrene soon extended to the other foot, and he died from its effects. When parts are frost-bitten in colder climates, you are aware that the common practice is to restore the circulation by rubbing them with snow.

So much for the prevention of gangrene.

When Gangrene has commenced.

But as soon as gangrene has commenced, it will be necessary to apply a gentle stimulus to the parts, with a view of supporting the action of the surrounding parts, which are threatened with the destruction of life. The application which I have found to be most uniformly successful in such cases, is the poultice of stale beer grounds. The stale beer grounds, which may be obtained in any public-house, should be mixed with linseed meal, and a poultice formed of them, which will produce a gentle and beneficial stimulus to the part, and prevent the gangrene from spreading to the surrounding skin. Spirituous fomentations are also of use for the same purpose. At the same time that this local treatment is employed, means must be taken to support the constitution, which is debilitated by excessive action.

Ammonia, &c.

The best mode of supporting the constitution is by the exhibition of ammonia mixed with opium. From seven to ten grains of the

carbonate of ammonia, with twenty drops, or half a drachm, of the tincture of opium, should be taken two or three times a-day, or even more frequently, as once every four hours. This plan will generally prevent the extension of gangrene. Bark was formerly extolled, as possessing great virtue in cases of gangrene; but it is doubtful whether it does not do as much harm as good. For the first two or three days the patient feels comfortable, and his health is improved by its exhibition; but, after a short time, his stomach becomes loaded and oppressed. It first makes him costive, and then purges; and, after a little time, we are obliged to suspend its use. I am much disposed to try, in these cases, the new form of this medicine, which agrees so well with the stomach; I allude to the sulphate of quinine. It is my intention to give it a full trial, in the first case of gangrene which I meet with; and I recommend you to try it yourselves in the cases of gangrene which may come under your observation. An excellent medicine used in the other hospital, is a bolus of five grains of the carbonate of ammonia, with ten grains of musk, given every four hours. I have seen this medicine produce the best effects in sloughing sores in the foul wards, and in gangrenous sores, where the gangrene was much disposed to spread. The musk has the effect of keeping up the stimulus of the ammonia, which is apt to subside after a few hours, when the ammonia is exhibited alone. A port wine poultice is an admirable application in these cases. I mentioned to you, a few days ago, the case of a girl in the other hospital, who had a gangrenous sore in the pudendum, where a great variety of applications had been tried, without any beneficial result. At last a port wine poultice was applied, and with such immediate good effects, that, though I had before despaired of her life, the last time I saw her the sore was brought into such a healthy state, that there are great hopes entertained of her recovery.

Quinine.

Ammonia and Musk.

Port-wine.

Applications of turpentine are often of use in these cases, for the purpose of stimulating the parts. After great want of circulation in any part, from the course of the blood having been arrested, sloughing sores are very apt to occur. Thus, after the operation

Turpentine.

of tying the femoral artery, if the limb be suffered to rest in the same position for a considerable time, a small gangrenous spot frequently appears. In such cases, the spirit of turpentine is the best application. Yeast is often applied with the same view. A lotion much used in the other hospital, for this purpose, is the formula which used to be called the epithema lythargyri acetatis, but now called the epithema plumbi subacetatis.

The following is the mode of preparing it:—

℞ Confect. Ros. ʒj
Mel. Rosæ. } āā
Tinct. Opii. }
Liq. Plumbi Subacet. ʒjj. M.

This is an application which accords extremely well with limbs in a state of gangrene, when the dead are separating from the living parts: it is a very useful application then in gangrene. During the sloughing process, the nitric acid is the best application that can be used: when the gangrene stops, and the line of demarcation is drawn, and the sloughing process is commencing, the nitric acid may be employed in the portion of fifty drops to a pint of water. I have seen very good effects from an application composed of vinegar and camphor mixture, about four ounces of the vinegar to twelve ounces of the camphor mixture; I have seen this of service when no other application had been used, as in the case of a gentleman at Peckham, whom I attended with Mr. A. These are the different modes of treatment for the prevention of gangrene, and the arresting of the sloughing process.

ON THE PROPRIETY OF AMPUTATION IN GANGRENE.

Propriety of amputating.

As to the propriety of amputation—there is no occasion in general for amputation in cases of gangrene when the sloughing process is going on, as you have an opportunity of seeing in the man at the other hospital, where nature has performed the operation herself, without any assistance; if the surgeon will be content to wait a short time, and the patient is disposed also, you will find that the parts will separate as well without, as with, an operation.

Now the old surgeons, who observed nature well, adopted the very same plan in their amputations as nature pursues in these cases; the skin separates the longest, the muscles next, and then the tendons, together with the bones, which are left considerably shorter than the rest, as you may observe from the specimen on the table. When bones ulcerate, the tendon soon separates, and the bones become covered in by skin and muscle; the limb, however, before me, was amputated. The cases in which you are called on to perform the operation of amputation are when the patient will not be able to sustain the shock to the constitution; then, gentlemen, if gangrene be going on in any part, or through the middle of the leg, by which the power of the constitution will be nearly destroyed, you may have recourse to an operation; but even here there will not always be occasion for it. You have an opportunity of seeing in the other hospital at present, in a case to which I have so often alluded, separation taking place above the centre of the leg; there is no necessity to amputate always under such circumstances, and you can give the patient a chance of his life, without resorting to it, if he dread the knife.

I say, gentlemen, *in constitutional gangrene* never amputate till the sloughing process has commenced, and healthy granulations are to be seen on the sore; for if an operation be performed, the parts will assume exactly the same appearance after as before it. It is curious to see how the loss of a slight quantity of blood will destroy life in these cases.

When I was a dresser at these hospitals, during my apprentice- Case.
ship, a case of sloughing opposite to the calf was brought in: Mr. Cline, my old master, on going round the wards, said to the dresser, that the projecting ends of the bone had better be removed. There were some granulations between the bones, which, in sawing them off, the dresser did not observe, and therefore cut through them; little hemorrhage ensued; no ligature was applied; yet, on the same night, the patient died. There was a case under the care of Mr. Foster, in the other hospital, on which he performed the operation of amputation; there was gangrene on one foot, a slight gangrene on the nose, and the other foot. The leg was amputated;

but the infection spread in the nose and foot, which, before the operation, were slightly gangrenous: then, gentlemen, it is proper to consider that amputation should never be performed till the constitution is in a sound state, and healthy granulations have appeared.

Gangrene from accident.

But with respect to *gangrene* from *defective action* or *accident*—When called to a person labouring under gangrene, arising from accident or pressure on some important vessel, amputation may be performed without the least hesitation.

Case.

A girl was brought to this hospital, who, in endeavouring to reach something from the chimney-piece, trod on the fender, which turned over on its edge, and she fell backwards; there was a compound dislocation of the elbow-joint, together with a wound of the brachial artery; this vessel was tied by the dresser, hemorrhage was arrested, gangrene soon afterwards appeared in the finger, when, nine days from the accident, the operation of amputation was performed above the elbow-joint, and the patient did extremely well.

Case.

A man was brought to Guy's, from Woolwich, with popliteal aneurism: the aneurism had acquired a great size; there was a gangrenous state of the limb below, so that it was thought there was no chance of saving his life by tying the artery; therefore amputation was performed. Before the operation the pulse was from 120 to 130. In the evening, after the removal of the limb, I sent Mr. Callaway, who was my apprentice at that time, to see how the patient was doing; he found that the pulse had fallen to 90; and no stump that ever came under my care turned out more favourably. Thus, instead of increasing the irritability of the constitution, the source of the irritation being removed, the health of the patient became improved.

ON GANGRENE IN OLD PERSONS.

Cause of gangrene.

We often find old persons afflicted with gangrene, from very slight causes, and particularly those who are tall. The heart

being naturally weakened by age, the circulation becomes extremely languid in the feet; hence mortification of the toes ensues.

The appearances which the part assumes are these:—at first it is red and painful; the person, thinking little of the matter, puts upon the affected part a piece of linen; in a few days the cuticle comes off, and there issues from the surface a sanious discharge; red streaks are now seen passing from different parts of the foot up the leg; and the glands in the groin often undergo considerable inflammation and enlargement; all the absorbent vessels of the foot becoming inflamed, produce universal redness of the diseased member. Soon after this the gangrene begins to extend, destroys the whole of the foot, and passes to the upper part of the leg, where it usually stops, as it seldom reaches the thigh; the constitution becomes considerably influenced; there is some degree of fever, and the cheeks are of a florid red colour. Its characters.

This gangrene will not commonly destroy life, if attention be paid to the patient. It generally arises from ossification of the arteries—not of the large vessels, but of the small. These losing their elasticity, combined with a debilitated action of the heart, give rise to the disease of which I am now speaking. The earthy matter is sometimes deposited in great quantities in the large vessels; and here *(showing a preparation)* is an example, in which the deposition of earthy substance has rendered the principal arteries of the leg, and even part of the femoral artery, impervious. Gangrene from ossific deposits.

I recollect some time ago a very intelligent surgeon telling me, that he thought a certain nobleman, whom he was at that time attending, had ossification of the arteries of the leg, and that it would some day give rise to gangrene—of which gangrene his Lordship has since died. Case.

Where ossification of the blood-vessels exists, very slight causes will give rise to gangrene. A gentleman of the city, in cutting a toe-nail, carried the knife too far, and cut the quick, as it is termed: the wound soon became gangrenous and black, and in the sequel he died. Case.

Case. I attended a gentleman, an old surgeon, who, for the purpose of getting rid of a bunnion, had (most foolishly) put a lancet into it; gangrene followed, and he died.

Case. I was lately sent for by Mr. Holt, surgeon, of Tottenham, to see a gentleman, who, when cutting a corn, had carried the incision a little too far, so as to produce bleeding: gangrene here likewise took place. Old persons must, therefore, be cautious; for life being almost exhausted very little will extinguish it.

Treatment. A poultice, composed of port wine and oatmeal, will generally be found the best *local* application: and your *internal* remedy should consist of opium combined with ammonia. You must not expect that these cases will always recover. I have known, however, a single toe, a whole set, and even the entire foot, to slough, and yet the patient do well. In these cases you must never amputate—whether there be healthy granulations or not, do not amputate; for as surely as you do, mortification of the stump will supervene.*

The next subject of which I shall speak is

CARBUNCLE.

Of this I shall have but little to say, as many of the foregoing observations are equally applicable here.

Symptoms of Carbuncle. When carbuncle is about to take place in any part, it is generally preceded by pain, and at first a swelling of considerable hardness; this is occasioned by the adhesive inflammation: the surface of the tumour then assumes a livid redness and a spongy soft feel; little ulcers now form in the skin, which, from their number, give it a sieve-like appearance, so numerous are the orifices; from these a white discharge passes—this fluid resembles flour and water mixed together: and a man who has seen much of carbuncle, knows the nature of the disease instantly upon seeing the discharge. When the little openings are all formed into one, the dead cellular membrane begins to escape, for it previously cannot do so, from the smallness of the apertures.

* The Chlorurets of Lime and Soda have been found of essential service, at least as disinfecting agents.—L.

In gangrene of the extremities there is not this mechanical obstruction to the sloughing of the dead part. And though gangrene is generally difficult to cure, yet carbuncle usually does well, except when situated on the head or neck. Though persons will recover from carbuncles of an enormous size upon the back, yet very small ones on the head or neck will often destroy life; indeed I never saw a patient who recovered from carbuncle upon the head; in these cases there is effusion between the tunica arachnoides and pia matter. The inflammation which attends fistula in ano will sometimes destroy the cellular membrane of the neighbouring parts, thereby occasioning an enormous quantity of the nates to slough, and yet the patient shall do well.

Treatment.—The peculiar treatment of carbuncle consists in making upon the surface of the swelling, at an early period of the disease, a large crucial incision, for the purpose of affording the deadened parts an opportunity of escaping; then apply the port wine poultice, and give the patient such stimulants as will tend to increase the vigour of his constitution, and here we shall again find opium and ammonia our sheet anchors. Treatment.

ON ERYSIPELAS.

Inflammation of the skin is generally extensive. Why? In consequence of the surface being unbroken. Thus, when the pleura or peritoneum is attacked by inflammation, the whole of these membranes usually become affected by it; and also when erysipelatous. Erysipelas.

Inflammation invades the skin, it is not uncommon to see it run from one part to another, till half the body is covered by it. Sometimes it is ushered in by fever, and sometimes not. Certain constitutions are sooner affected by it than others, and often its effects appear to be entirely local. But unquestionably it affects the constitution more frequently than otherwise. Its seat.

Its characteristic appearances are, a florid skin, with vesicles containing a secretion of an amber colour under the raised cuticle. Characteristic marks.

It is seldom that the skin suppurates in these cases; the cellular membrane, however, occasionally does. It is very common for erysipelatous inflammation to terminate in gangrene. You must not consider all cases of inflamed skin erysipelas. I have often seen cases treated as such, where it would have been right to deplete. The best characteristic sign is its vesicular appearance: and this constitutes a specific difference between it and common inflammation.

Frequently on the head.

The head seems to be more commonly affected by it than any other part; it often succeeds the most trifling injury of the scalp; and, like carbuncle, when it occurs in this situation, generally destroys life. I had the misfortune to lose a lady of considerable consequence from its effects, where it came on after the removal of a small encysted tumour from the forehead. It made its appearance three days after the operation, and all the exertions of Dr. Baillie, and myself, were unable to arrest its progress. Thus a trifling operation on the scalp destroyed life, in consequence of having been succeeded by erysipelatous inflammation: but I shall speak of this more particularly afterwards, for I have some doubts whether inflammations on the head, following slight wounds, be truly erysipelatous or not.

After a person has once had this disease, he is very subject to it again; and some persons appear to be predisposed to its formation.

The influence of season.

It generally makes its appearance in spring and autumn, but seldom in winter, and not very often in summer. Whatever renders the body irritable predisposes to erysipelas. In hospital practice, surgeons were formerly exceedingly afraid to operate in autumn and spring; for it has often happened that the stimulating effects of adhesive plaster have produced this disease, and have led to the death of the patient. Sometimes it is epidemic, and sometimes contagious.

Treatment.

Treatment of Erysipelas.—In this town the following plan is pursued, and which, *for London*, is undoubtedly the best:—You at first give calomel, for the purpose of restoring the secretions of the

liver and intestines: then allow a generous diet, and administer the ordinary tonics; or from what I have witnessed, I would advise you to try the sulphate of quinine; it is a most powerful tonic, excites in the stomach a genial warmth, and will often remain in that organ when bark will not.

Experiment. Dr. Marcet, now deceased, but late a physician of Guy's, endeavoured to ascertain whether the antiphlogistic or tonic mode of treatment was best for this disease; therefore he put two persons, having erysipelas, into adjoining beds; to one of whom were given tonics and a generous diet; to the other, salines and low diet; blood likewise was abstracted from the latter; they both recovered, the former rapidly, while the latter lingered in a debilitated state for a very considerable period.

Stimulant. You will find, where the erysipelas attacks the lower orders of this town, who weaken their constitutions by the excessive use of ardent spirits, that gin may be sometimes advantageously employed as a remedy, at once being the evil and its cure; the two last cases of this disease which I saw in the other hospital, prove the truth of what I am now saying: a man had erysipelas dreadfully severe; Case. his head swollen to an enormous size, and his recovery, by every person, thought impossible. It was discovered, one day, that his wife brought him some gin. He declared that he was better from having drunk it, was consequently permitted its continuance, and, to the astonishment of all, he rapidly got well.

Not six weeks after this, there was another man, similarly circumstanced, brought into the same ward; and having, from the result of the above case, formed a high opinion of gin, I directed the sister to give it here also; and really this patient recovered as speedily as the former. But it is in the debility consequent upon the first stage of the disease that this plan is to be resorted to. The local treatment of erysipelas consists in the application of camphorated spirits of wine in the first stages. When the vesications are about to break, or are broken, powder the part with starch, and if gangrene be produced, apply a port

wine poultice, or the nitrous acid, a lotion, in the proportion of drachm of the acid to a quart of water.*

LECTURE XVI.

ON INJURIES OF THE HEAD.

Brief account of the nervous system.

BEFORE I proceed to mention these, I will give you a brief account of the nervous system; a correct knowledge of which, however, can only be acquired by assiduity in the dissecting room. The nervous system is composed of the following parts, *viz.* brain (which is divided into cerebrum, cerebellum, and medulla oblongata), medulla spinalis, and two sets of nerves—one set issuing from the brain, and the other from the medulla spinalis. Beside these, there is also the grand sympathetic nerve, which may be said to form a system in itself, it communicates with most of the nerves of the brain, and with those of the spinal marrow; it forms by its branches a large ganglion, or several ganglia, called the semilunar, situated behind the stomach, and a plexus proceeds from this, which distributes branches to the greater part of the abdominal viscera.

Its distribution.

The nerves are freely distributed to every part of the human frame, and are the means by which all voluntary and involuntary motions are maintained. It is impossible that a mere description of the nervous system, in this place, however minute it might be, could make you sufficiently acquainted with its anatomy; for this can only be obtained by the most careful and attentive examination of the dead body. It is necessary, however, for you, at this moment, to bear in mind, that an immediate communication exists between the stomach and brain, by means of the eighth pair of nerves, or par vagum; for unless you do this, it is probable that an important symptom, which I shall presently mention, attendant on injuries of

* If no vesication have taken place, I have always found a strong solution of nitrate of silver, applied as a lotion, then powdered with flour, a most effectual remedy.—L.

the brain, will be but imperfectly understood. There is also another circumstance connected with the brain, to which I wish particularly to direct your attention, *viz.* its being the vehicle of the mind; or, rather, I might say, the medium through which the mind is communicated. The influence of the brain on the mind, and *vice versâ*, will be amply demonstrated to you as I proceed.

Symptoms.

Now, when the brain receives an injury, the symptoms stated to be the result of that injury are, general loss of sense and volition, if the injury be considerable; but if not so severe, some portion of sense and volition will remain; for example, when you are called to the bed-side of a person thus situated, you find him to be what is termed comatose. The stomach is affected through the medium of the par vagum or eighth pair of nerves; and from the general communication between the grand sympathetic nerve, and those of the brain, and spinal marrow, the functions of the heart and abdominal viscera become affected. If you speak sharply to him, he becomes roused for the moment, mumbles some brief answer to you, again lies down, and relapses into his former sleepy state: thus you observe partial mental faculties and volition still remain. This state you should minutely note, as it will greatly assist you in your after diagnosis; and you must be upon your guard that you are not deceived here; for a man in this condition very much resembles one in a state of intoxication; and this similitude often proves exceedingly harassing to the surgeon. He is probably sent for to a person who, it is stated, has received a severe injury of the head. He finds him with a very severe laceration of the scalp, together with stupor, and sometimes even stertorous breathing. Not knowing that the individual was intoxicated at the time of receiving the injury, the surgeon attributes the above symptoms to concussion or compression, when, after a few hours, the person recovers from his drunken fit, and it becomes apparent that he received no other mischief than a wound in the scalp.

Effects on the abdominal viscera.

In addition to loss of sense and motion, the fæces involuntarily pass off, from the sphincter ani losing its retentive power through the sympathetic influence of the great sympathetic nerve—the

Bladder.

voluntary power of the bladder becomes for the time extinct—the urine is retained, and you are obliged to pass a catheter for its removal, at the very time when the escape of the fæces cannot be controlled. But the involuntary functions of no organ are so soon affected by injuries of the brain as those of the stomach; this arises from the connexion before explained to you; vomiting, therefore, is one of the first symptoms, though the fæces pass involuntarily, yet there is such torpor of the intestinal canal that purgatives will not easily excite action, and there will be found considerable difficulty in procuring evacuations; the pulse is said to beat laboriously; for the heart being affected, it cannot readily get rid of its contents. The pulse, however, is not slow unless the body be at rest: for upon the slightest exertion it becomes exceedingly quick: the pupils are dilated, and there is sometimes bleeding from the nose, which, when the patient has been kept lying on his back, often occasions vomiting of blood; when the injury has extended to the basis of the skull, producing fracture there, it is generally attended with bleeding from the ears. These cases are very dangerous, and persons usually fall victims to them. In addition to the symptoms already enumerated, there is often partial paralysis, or hemiplegia; squinting is occasionally produced; the natural direction of one or both eyes becoming changed; permanent, partial, or total aberration of the mental faculties may also be added to the consequences already enumerated, arising from injuries of the brain.

The involuntary functions.

Pulse.

Paralysis or Hemiplegia.

Concussion and Compression defined.

When asked to explain the difference between concussion and compression, you answer concussion is simply a shock which the brain has received, more or less severe, attended with laceration or not, and compression arises from either a depressed portion of bone, the extravasation of blood, or the formation of matter; and from whichever of these it springs, the symptoms will be the same.

Symptoms of concussion.

In describing the symptoms and treatment of these diseases more particularly, I will first begin with *Concussion*. When called to a person whom you find in a state of stupefaction, but not to a great degree; regular pulse, tranquil and regular breathing; and the accident has existed some hours, you will generally be justified in

pronouncing that the injury has been trifling: but when the individual has been first seized with vomiting, is incapable of using any muscular power from loss of nervous influence; a total aberration of the mental faculties, with intermittent pulse and breathing, these will be found the diagnostic symptoms of severe injury, and the case a dangerous one. In simple concussion, where the derangement is not so extensive as that just described, and where the patient, upon being spoken to, raises himself, as if awoke from a sound sleep, and where some power of volition still remains, you will find one of the best diagnostic symptoms to be the accelerated action of the pulse upon the patient exerting himself; a man in this state with a pulse at 70, on being raised, or attempting to walk, will have it inordinately quickened, it will instantly beat 130 in a minute; this is a never failing symptom, and where the patient can be made to exert himself at all, will be found a sure characteristic of the disease. There is also in these cases a greater action of the carotids than in health; they beat more violently, though not more quickly, if the patient be at rest; if asked what are the best marked symptoms of concussion, I should say this increased motion of the carotids; the apparent tranquil sleep; the instantaneous relapse to that state, after having been roused; the remarkable excitement of the pulse upon using exertion, and insensibility having immediately followed the injury.

Its effect on the auditory organs.

The diminution of the operations of the mind is often so great in concussion, even where considerable voluntary motion remains, that you cannot, even by hallooing as loudly as you are capable, get any other answer from your patient, than 'eh!' delivered in a gruff under-tone. I have known several very curious circumstances of this kind;—one case was that of a gentleman who had met with an injury of the head, by which concussion had been produced—every endeavour to get a word from him was ineffectual; yet at one period, when the attendants were all absent, he got out of bed, bolted the door, made water, and returned to bed again, in the same manner as though he had been in perfect health: when the servant went back, he found the door fastened; all their knocking was unavailing;

they were obliged to break it open, and then could not procure from him a single word. Indeed, I do not believe the noise of an earthquake would have succeeded in rousing him from his lethargy; yet he could get out of bed, pass his urine, and adopt his ordinary habit of delicacy, by bolting the door. I have caught a man, when labouring under the effects of concussion, with his feet in a chamber-pot, and by the action of his hands, it was evident that he was trying to throw water over his legs; upon the servant going into the room of the same individual some days after, he was found to be attempting to shave himself, and having no lather, he substituted a pot of spermaceti ointment, which he had brushed all over his face.

Mind, memory and language.

I suppose you have all heard of the extraordinary change which the memory sometimes undergoes from the effects of concussion. The first story of this kind that I ever heard was from Mr. Cline. A man was taken to Guy's, in a state of insensibility, in which condition he remained for some time, but at length recovered; and when he did so, no person in the hospital could understand his language; a milk-woman happening to go into the ward one day, heard him, and discovered that he was speaking Welch; he told her that he knew English well before the accident; but, after it, all knowledge of that language was obliterated from his mind. It had been recently acquired; the impression was less strong, and consequently the more easily effaced.

Case.

I witnessed a similar circumstance in the case of a German, who was a sugar-baker in this town, and who had compression of the brain, arising not from any injury by violence, but from pressure in consequence of the formation of matter. This man could speak English extremely well before the compression; but as the compression increased from the accumulation of matter, he lost his English entirely, and I could only communicate with him through the medium of an interpreter. At last he lost the power of speaking even in his native language, and he died in consequence of the accumulation of matter.

Intellectual aberration.

It is curious to observe the gradual change which takes place in the intellectual faculties, as alterations occur in the brain; and the

gradual diminution of ideas which have been more recently acquired, until at length they become totally obliterated. Old persons are observed to be fond of relating anecdotes of their youth, forgetting incidents of more recent occurrence; and the change which takes place in the intellect, from injuries of the brain, is very similar to the effects of age. The patient becomes, as it were, suddenly old, loses impressions of a recent date, and is sensible only of those which he has received in his earlier years. Such is the state of mind very frequently produced by compression of the brain.

Concussion.

With respect to the state of the brain, under concussion, when the concussion is not extremely violent, there is merely a change in the circulation of the brain.

Its effects.

A sudden shock will so far disturb the circulation of this organ, as to produce diminution of the powers of the mind, as well as to impair the functions of the body. I shall have occasion to mention to you a most extraordinary case, in which the functions of the mind were suspended from an interruption of circulation in the brain, for upwards of thirteen months; the patient having, as it were, drunk of the cup of Lethe during all that period. Any change of the circulation in the brain alters, in some degree, the powers of mind and body; but if the agitation be very considerable, the powers of the mind will be for a time suspended. Thus, when a person is said to be stunned, there is a sudden alteration in the circulation in the brain, and a corresponding loss of sensibility; but when the circulation is restored, by the means which I shall presently point out to you, the powers of the mind return with those of the body. When the concussion is very violent, a lesion of the brain takes place; but when it is slight, no appearances can be discovered on dissection which indicate any alteration of structure.

Examination post mortem.

A person may die from another injury, accompanied with concussion; and on examination after death, not the least alteration may be found in the brain. This is not the case, however, where the concussion is violent. I have before me a great number of preparations, from the brains of patients who have died of concussion,

in most of which that organ was considerably lacerated, and some extravasation of blood is observable within the brain. (Several beautiful specimens of lacerated brain, accompanied with extravasation of blood, were exhibited to the class.) These specimens show the effects produced by severe concussion.

Case. I remember a case of a gentleman, an intimate friend of the late Lord Nelson, who fell from his horse at the corner of St. Thomas's-street, in the Borough. He was immediately taken to Guy's Hospital, where he was found to have all the symptoms of concussion, and he was treated in the usual manner. On examination of the body, after death, (for he died eight days after the accident,) the brain was found to be lacerated in several places, and considerable extravasation of blood had taken place. In general, therefore, when the concussion is slight, there will be only an alteration of circulation in the brain; but when it is severe, there will be laceration, accompanied with extravasation of blood, and the symptoms will be found to run into those of compression.

Case. The first case in which I ever saw the brain lacerated from concussion, was one which occurred at the other hospital, in the first year of my apprenticeship, when I was a dresser to Mr. Chandler. As this was the first case of the kind I had seen, I preserved a portion of the brain. The patient had lost the power of speech from a blow on the head; but there was no appearance of any wound or injury to the skull. Mr. Chandler attributed the loss of speech to concussion. On examination of the body after death, it was found that the anterior lobe of the cerebrum was torn, the first effect of which injury was the loss of the power of utterance, or rather a paralysis of the muscles, which deprived him of the power of speech, and subsequently compression and inflammation, of which he died.

Concussion is of two grades. When you are asked, then, as to the effects of concussion, as they may be collected from the appearances on dissection, you will answer, that when the concussion is slight, it is merely an agitation of the brain, by which the circulation is altered; but when it is severe, the brain itself suffers laceration, which laceration

is accompanied with extravasation of blood. By the knowledge of these facts we are led, without difficulty, to the principles of treatment.

Treatment of Concussion.—The great danger which we have to guard against, in the treatment of concussion, is inflammation of the brain. This principle must direct our practice: and in order to prevent inflammation, we must take away a very considerable quantity of blood. Treatment.

By bleeding largely at first, we not only remove existing inflammation, but we prevent that which would otherwise occur. This practice, however, may be carried to excess. There are some persons who say you cannot bleed too much in these cases; but such an assertion only proves their want of understanding. You must regulate your conduct by the symptoms; observe whether there be any hardness in your patient's pulse, and whether he complains of pain in the head, if he have still the power of complaining: watch your patient with the greatest possible anxiety; visit him at least three times a-day, and if you find any hardness of the pulse supervening, after the first copious bleeding, take away a tea-cupful of blood; but do not go on bleeding him largely, for you would by this means reduce the strength of your patient too much, and prevent the reparative process of nature. It is necessary that there should be a slight degree of inflammation, for without this, the reparative process cannot go on, and the patient cannot recover; but it will be your duty to keep this inflammation within due bounds. I shall mention a case in which fatal consequences ensued from the error committed by the surgeon in bleeding his patient to such excess, that the slightest degree of inflammation necessary to the process of adhesion was removed, and the reparative process of nature consequently prevented. Bleeding.

In these lectures, gentlemen, I feel it to be my duty to describe to you surgery as it is—and not in the glowing colours in which it is painted to you in books. You must be content to practise surgery as it is—not as is sometimes fallaciously represented Admonition.

to you. I am most anxious that you should omit nothing which may contribute to increase your professional skill, and enable you to afford the greatest possible sum of relief to the sufferings of your patients; but they who blazon forth our profession as one which is attended with undeviating success, are only deceiving you. You must hear the untoward cases of your profession, as well as those of which the issue is favourable, in order to form a correct judgment in your minds what your profession really is. It is for these reasons, gentlemen, that I shall never hesitate, *coute qui coute*, to detail to you, and perhaps to the public, those cases which have terminated unfavourably. I have a duty to perform, and I shall never shrink from the discharge of it. It is by detailing to you the unfavourable, as well as the favourable cases, that I can alone perform that duty; for it is by such a course alone that I can point out to you the rocks which you are to avoid, as well as the havens in which you are to endeavour to anchor. The case to which I last alluded was one of concussion, accompanied with slight laceration of the brain, which occurred in the other hospital.

Case of over depletion.

The gentleman, under whose care the patient was, thought it right to bleed him, and that he could not bleed him too largely. He accordingly bled, not only from day to day, but twice a day. The consequence of this mode of treatment was, that the patient became perfectly pale, was in a state of considerable dejection, not of the mind, but of the powers of the body, and died without any symptoms of inflammation, ten days after the injury.

Examination.

On examination of the body, it was found that there was a slight laceration of the brain, with some degree of extravasation of blood, but that not the slightest attempt had been made by nature to heal the wound. You are aware that the brain heals, like any other organ, by the process of adhesion; but in this case, the quantity of blood taken from the patient was so large, that the slight inflammation necessary to the adhesive process was removed, and the process of restoration consequently prevented. Still it is often necessary to take away blood, after the first large bleeding; but it

must be taken in small quantities, and you must watch the patient with the greatest possible anxiety, for the symptoms can alone regulate your practice.

Sometimes it is necessary to take away large quantities of blood. Case. I was called to a gentleman who had fallen from his horse, in riding to London. I found him insensible on my arrival. Mr. Constable, who attended him, had already bled him, but I judged it necessary to bleed him again largely, and I took blood in smaller quantities from him day after day, watching the pulse with the greatest anxiety, and bleeding him only so far as to reduce the hardness of the pulse without diminishing too much the powers of his body. The whole quantity of blood taken from this gentleman, by bleeding from the arm, opening the temporal artery, and the application of leeches, as far as this could be estimated, amounted to about two hundred and eight ounces of blood. One hundred and eighty ounces were taken from the arm: yet such was the hardness of the pulse, that at the last bleeding there was some degree of inflammation of the brain indicated.

Bleeding to be employed as a preventive.

You are to use bleeding as a means of preventing inflammation; but you are not to resort to it as a matter of course the moment you are called to a patient under concussion. A man falls from his horse, and the instant he is picked up from the ground, some surgeons think it necessary to take the lancet from their pocket. This conduct is quite irrational; for suppose the pulse could scarcely be felt at the wrist of the patient, and the surgeon were in such a case asked why he proceeded to bleed; what would his answer be? The probability is, that he would have no answer at all ready; or he would, perhaps, say that he bled him because the accident had brought a great quantity of blood to the brain, as if the shaking of the head could have any effect in producing a determination of blood to the brain. It is not with this view that we bleed in concussion, but in order to prevent inflammation. I have seen many a patient who would have died if a large quantity of blood had been taken at the time of the accident. This was the case with the gentleman who was attempting to shave himself, whose

symptoms I described to you this evening. When I first saw him, his pulse was scarcely perceptible. I took a little blood from the arm, and he was immediately seized with convulsions, like an epileptic fit, which I thought would have proved fatal. I closed the wound, and I would not, upon any account, have taken six ounces of blood from him at that moment.

Case.

Some time ago I saw a man, at the other hospital, who had received a blow on the head. He was pale and dejected, and his pulse could scarcely be felt. I said to the dresser, you must not bleed this man at present; there is rather too little action than too much; wait till the pulse rises, and then bleed him. In the evening re-action took place; the pulse rose, and the dresser then very properly bled him. Inflammation was by this means prevented, and the man did well. The principle upon which you should act, gentlemen, is never to do any thing in your profession without a good reason, which, whatever may be the result of the case, will leave your conscience clear. A surgeon who bleeds without being able to assign any other reason than that his patient has received a blow, is not fit to practise his profession.

The next remedy I come to is emetics.

Emetics.

I must say that I have seen emetics of considerable use; the vomiting produced by them does good. I have always considered the efforts of nature to relieve herself, after injuries, salutary; and thus the vomiting which is excited in cases of concussion, acts beneficially by relieving the stomach of its contents, as the accident generally happens to persons in a state of intoxication; and also by propelling the blood to the brain, and thus restoring the powers of life. But the vomiting excited by nature restores the patient to his senses for a short time. He is sometimes relieved, but without continuing so long; he looks about, and lapses into his former state of aberration of mind, from which he had received merely a temporary relief. When emetics are exhibited as a remedy in concussion, there is only one thing that I fear from their use; when there is any extravasation of blood in the brain, or any tendency to apoplexy, then they should be employed with caution;

and it is on that account that I wait for three or four hours after the accident before I order them.

With respect to the exhibition of cathartics, the bowels should be kept open by calomel purges, followed by the infusion of senna, and sulphate of magnesia. The calomel should be given about two hours after the accident; and it will be useful to give to the patient at the same time a quantity of mild fluids to drink, as by this means a disposition to purging is kept up, counter-irritation is, as it were, produced, and the blood is drawn from the brain to the intestinal canal. Submuriate of mercury, with lemon-juice squeezed in water, should be given. Purgatives.

Perspiration on the surface of the body is very desirable, and for this purpose antimonials are employed. The pulv. Ipec. Com. (Dover's powder) is not generally used to produce moisture of the skin, on account of the opium it contains, which confounds the judgment, and prevents your seeing what are the effects of the opium, and what those of the disease; for opium produces the same disturbance to the brain as takes place in concussion; therefore it is not often employed. Diaphoretics.

Counter-irritation is of use, but not until other means have been resorted to; the object of blisters is to subdue the inflammation when other means have failed. I have known a patient, with pain in the head, sickness at the stomach, loss of strength, and throbbing of the carotids, who had been often relieved by blood-letting, for about two hours only after it was done. A person under such circumstances I have known benefitted by the application of a blister; on the principle not of increasing but subduing action, from an excess of which the ill consequences are to be feared. Counter irritants.

For the symptoms after concussion, the trephine used to be employed; but it now becomes a question whether it ever ought to be resorted to as a means of relief under those circumstances? To this I say, if you were to trephine, you ought to be trephined yourselves in turn. What will trephining do? Probably great harm, by disturbing the brain; and if not, no good can possibly result from it. Now for the proofs: first, that it does no good. Trephining.

Case.

Gentlemen, I never lecture to you but from the recollection of some case that has occurred to me. I was very intimate with a Mr. T. of Yarmouth, where I used to spend a good deal of time when a boy; after my apprenticeship was finished, I went down to this place, and I found Mr. T. labouring under the effects of concussion; his mind was not in the least affected: he had received a blow on the forehead from a bludgeon, and he was afterwards frequently seized with sickness at the stomach. I called on him: and when I went into the room, I said, I come to ask you how you are: in approaching me he was obliged to put his handkerchief to his mouth to prevent the contents of his stomach going over me. In his walks he had frequent vomitings; a relation who was at Yarmouth twelve months after this, said to him, that he had better have the trephine applied, and the portion of bone removed: to which he readily consented. After the operation his symptoms were not relieved; he remained just the same; or I should rather say that he was not relieved, for he did not continue long in the same state; he soon got worse and worse; his bowels became costive, the powers of the mind affected, and he died in consequence of the operation, though he had lived two years after the injury, before it was performed. Mr. B., now in Yarmouth, was living with him at the time, and he could tell more of the particulars than myself; but this I know, that he was not benefited by the operation, but injured by it. But for a more direct proof that it is dangerous: Dr. Farre told me that he knew a person who was subject to epileptic fits after concussion of the brain, and that he was extremely anxious to be trephined. The operation of trephining was performed, and he died soon afterwards.

Former practice.

Do not think, gentlemen, that I mention this as an uncommon case; but this used to be the plan adopted with almost all the patients admitted into these hospitals during my apprenticeship; they were all submitted to the operation; inflammation of the membranes of the brain supervened, and nearly all died; recovery being very rare. But do our patients now die from the effects of concussion? No; by bleeding and depletion we rarely lose a

Comparative view.

patient; perhaps we have fallen into the contrary extreme. After the expiration of my apprenticeship at these hospitals, I went over to Paris to see the practice of Desault, at the Hôtel-Dieu; and there I found that never, under any circumstance whatever, did he trephine; and that he was more successful than those who were constantly doing it here. Trephining in concussion is now so completely abandoned, that in the last four years I do not know that I have performed it once: whilst thirty-five years ago I should have performed it five or six times a-year. But I believe that I have omitted one circumstance; and that is, to tell you to pay strict attention to the mind; excessive anxiety must be prevented; for if you suffer the mind to be disturbed, you do little or nothing towards the recovery. I was very much struck, about twelve months ago, with an instance of this: a boy was brought to me from the north of England, who had lost a portion of the skull just above the eye-brow; and I was asked (for it was for this purpose that I was consulted) what protection should be given to the denuded brain. On examining the brain, I distinctly perceived the pulsation was regular and slow; but at this time he was agitated by some means or other; directly the blood was sent with increased force to the brain, the pulsation became more violent; therefore, if you omit to keep the mind free from agitation, your other means will be unavailing.

Trephine abandoned.

Lastly, the treatment of children. As you cannot always bleed them from the arm, you must give the submurias hydrargyri (calomel) with mild drink, so as to purge them; leeches must be applied to the temples; you must open the jugular vein. For the symptoms after concussion, as pain in the head, or sickness at the stomach, you must make an incision through the scalp; put issues in; wash the head with spirits of wine and water, for this is better than any thing else I know; and use the shower-bath two or three times. These are the best means for giving power to the nervous system, and bringing the action of the brain into a healthy state. Sometimes I advise Ungt. lyttæ to be rubbed upon the head, and Pil. Hydr. and Extr. Colocynth. Comp. to be given. Electricity, in

Treatment of children.

nervous debility of an organ, is sometimes useful. In long continued pain of the head, I sometimes make an incision in the scalp, and open an issue, for the purpose of supporting external irritation; and have seen advantage arise from producing a slight exfoliation.

LECTURE XVII.

ON COMPRESSION OF THE BRAIN.

We have to consider the causes which give rise to it, its symptoms, and the treatment which it requires.

Symptoms. When a person is labouring under compression of the brain, it is known by the breathing being stertorous, the pulse slow, and the pupils dilated; to which may be added the symptoms of concussion; when you then find a patient with the apoplectic stertor, slow pulse, dilated pupils, it will generally happen that the brain is compressed.

Causes. The causes which produce compression are three:—1. Extravasation of blood; 2. Fracture with depression; 3. Formation of matter within the skull; these are the three causes which give rise to compression.

From extravasation. We shall first consider compression when produced by extravasation. Now, gentlemen, when the brain is compressed by extravasated blood, the symptoms do not directly occur; the person at the time of the injury is often stunned; recovers himself, and a short time after falls into a comatose state, and then the apoplectic stertor begins.

Case. I will relate to you a case to illustrate this:—A child was playing on a table, from which it fell on a stone floor, and received a severe blow on the head, which caused compression of the brain; the child appeared to recover at four in the afternoon, the time at which the accident occurred being one; pain still continued in the head, the child cried considerably; it went to bed about two hours

before its usual time; during the night, the servant was awoke by the apoplectic stertor of the child, which prevented her from sleeping; when she moved it, the child was not roused; she discovered that it was ill, alarmed the family, and at eight in the morning it died: it was found after death, that a considerable quantity of blood was extravasated in the brain.

Case. The son of a most respectable merchant in the city was driving to his country house at a short distance from town, in a one-horse chaise, when he was thrown out, and pitched with his head to the ground; he was stunned by the fall: he recovered a little, but looked very pale; he said that he was much hurt; a friend who was with him drove him home; in the evening he felt very heavy, laying his head on his hand; symptoms of compression of the brain came on; ten *p.m.*, the family was alarmed; medical assistance called, but at two the following morning he died, all efforts to save him being unavailing.

Extravasation with concussion. Extravasation with concussion renders the case of a different nature; then the symptoms of concussion, such as I described to you on a former evening, come on first, and the apoplectic stertors and other symptoms of compression succeed. Now for a case:—

Case. A gentleman was at a party with some friends. He drank freely of wine, and became inebriated. His home was some distance from the place at which he was spending the evening; and his friends, seeing that he would be exposed to great risk, wished him to stop, but he could not be prevailed on. He mounted his horse; and on the way was thrown off. He was carried home; fell into a comatose state; symptoms of concussion first came on, loss of voluntary motion, at first no appearance of extravasation of blood was present; two, the following morning, apoplectic stertor came on, and at eleven he died.

Post mortem. In this case, symptoms of concussion came on first, and those of compression afterwards. Blood was found extravasated in the brain, as might be expected. It is found, gentlemen, that the extravasated blood, producing compression of the brain, is generally situated in three different parts:—

First, between the dura mater and pia mater. Second, between the pia mater and brain; and, lastly, within the substance of the brain itself. In this case (Sir Astley pointing to a specimen on the table before him) there was a considerable quantity (three ounces), the largest I ever saw effused beneath the dura mater. In this also (pointing to another) there was a large quantity extravasated opposite to the anterior inferior angle of the parietal bone and meatus auditorius externus; and the dura mater itself was torn.

Second, between the pia mater and brain: this is of more common occurrence; and in this case a large portion of the brain will often be found covered over with blood, not that the quantity of blood extravasated is considerable, but a little is diffused over a large space. This portion of brain before me was taken from a man who fell, I believe, from the yard-arm of a ship, and who was carried to the other hospital (Guy's); he died four hours after his admission; and on examining, after death, the vessels going from the pia mater to the brain were completely torn through.

Third, within the substance of the brain itself; this (alluding to a specimen on the table) was taken from a person in the city, who had extravasation within the brain from an accident; after the injury he considerably recovered, though pain still continued in the head; in three months afterwards he died, and on examination there was found in the anterior lobe of the cerebrum a coagulum of blood, no portion of which had been absorbed, as the surfaces close to the brain were quite smooth.

Recapitulation.

These are the three situations in which extravasated blood is principally formed. I do not find any difference of symptoms produced by the different situations of the blood; the compression is produced by the pressure of the blood, and the quantity of blood effused will depend on the size of the vessel of the dura mater that is divided: whatever is the situation then of the blood, the symptoms of compression are the same: if there should be any blood resting on the origin of a nerve, there will be partial paralysis of the part which that nerve supplies.

Treatment.

In the treatment of these cases there is little to be done. If

extravasation of blood occurs with fracture, trephining may be of use. You should deplete freely, for the purpose of preventing inflammation: irritation is to be lessened, the bowels are to be opened, and the patient kept very quiet. If there is a bruise near the fracture, indicating the spot where the effused blood is, you may trephine, that is, before symptoms of excitement come on: when they take place, you must deplete only, and not dream of performing the operation; to do it under such circumstances would be highly absurd, and the height of madness.

ON FRACTURES OF THE SKULL.

Fractures of the skull are not of themselves dangerous, nor are they injurious to the brain; therefore these fractures do not call for any alarm, if care be taken to prevent the inflammation; the danger in these cases is to be apprehended from disturbance in some distant part, irritation of the system, or extravasation; it is not then, I repeat, from the fracture itself that the danger is to be apprehended, but from compression of the brain, extravasation of blood, or irritation in some distant part; therefore, when called to a case of fracture of the skull, you do not operate, but consider the symptoms that are present, endeavour to ascertain from what they arise, and then regulate your treatment accordingly; if the symptoms are those of concussion, the treatment must be directed to it; if those of extravasation of blood, and there is not much excitement, it will be necessary to remove a portion of bone; but if there be fracture only, without any of the symptoms above mentioned, there will be no occasion to operate.

Fractures at the base.

When a fracture occurs at the base of the skull, it is much more dangerous than at any other part, because extravasation is much more likely to take place; or if not, inflammation of the brain, from the violence of the injury received, very often supervenes. The mode in which these fractures are produced, is by falling from a great height on the summit of the head: when all the weight of the body rests on the foramen magnum, and cuneiform process of the

os occipitis, great injury is in this way done; as in very many cases a transverse fracture through the foramen magnum, cuneiform process, and part of the temporal bone is the consequence; a discharge of blood into each meatus auditorius, takes place, and where there is no other mischief, deafness often remains for life.

Case.

A curious fracture within the orbit sometimes occurs, as in the case from which this specimen (pointing to one on the table) was taken, when destruction of life was the consequence of the injury received. I will give you the history of the case:—A child was playing with a scissors, when the point of it entered the upper part of the orbit, between the ball of the eye and the superior eye-lid; the scissors was with difficulty extracted; the child's eye did not become inflamed; after the accident the child walked from Walworth to Mr. W., of Hatton Garden, who attended it; on the 10th day from the time of the mischief, symptoms of compression of the brain came on, rigors, inflammation of the brain supervened, and the child died; on examining the body after death, it was found that the scissors had penetrated through the orbitar process of the os frontis, and lacerated the dura mater; a considerable quantity of extravasated blood was found, and the anterior lobe of the cerebrum was punctured by the point of the scissors, from which it had received the injury.

Effect of a blow.

It now and then happens that a blow received upon the summit of the head will produce a circular fracture of the entire cranium, commencing at the top of the head, passing down on each side through the temporal bone, and meeting at the basis.—Mr. Chandler, late surgeon of the hospital, had a case of this description; there did not appear to be any extravasation or concussion; great irritation and violent inflammation succeeded, which destroyed the patient; and after death, it was discovered that there existed a complete circular fracture of the skull, and that the anterior portion could be freely separated from the posterior. I believe these cases always terminate fatally.

Fracture of the frontal sinus.

There is a curious fracture of the skull which occasionally takes place over the frontal sinuses. When the fracture is simple, if

the nose be blown, the air escapes through the opening in the bone, and getting into the cellular membrane under the skin, renders the forehead emphysematous. If, on the other hand, the fracture is compound, upon blowing the nose, the air rushes through the wound; so that in either case, the nature of the accident may be easily ascertained.

Fractures unite slowly.

Fractures of the skull, if unaccompanied with concussion or compression, as readily unite as fractures of the bones in any part of the body. Here is a curious case (exhibiting a skull) where a circular, or rather oblong, piece of bone was, as you may perceive, completely separated from this part of the os parietale by the cut of a sabre; and yet, from what you here see, it is evident that it became re-united. However, I will send it round, that you may have an opportunity of examining it for yourselves. Fractures of the cranium, therefore, easily unite. Where, however, large holes are made through the skull, the apertures do not again become filled by ossific matter, but by a tendinous structure formed from the bone and dura mater. The holes made in trephining are supplied in this manner, and not by bone. Also, when in fracture of the skull, where the bones are separated to any distance, the interspace will not become filled by bony matter, but remain open as you see it, (showing a skull which had been fractured, and the broken part widely separated.)

Treatment.

Treatment of Fractures of the Skull.—When there is simple fracture unaccompanied with symptoms of injured brain, you must not trephine, neither in compound fracture; but you must, by the application of adhesive plaster, endeavour to heal the wound in the scalp as quickly as possible. Let your constitutional treatment be that of depletion, by means of blood-letting and purgatives. This plan often removes symptoms of concussion, and even extravasation, which accompany these fractures; and often a few hours will show you that the application of the trephine, which you at first might have thought indispensable, is wholly unnecessary. It is wrong, therefore, to be too much in a hurry in these accidents; for irreparable mischief might arise from your converting a fracture,

which was simple, into one that is compound. Wait, then, gentlemen, for awhile, before you operate in such cases, for the purpose of seeing what effects may be produced by bleeding and purgatives. It not unfrequently happens in these hospitals, upon persons being brought in who have received injuries of the head, that the dresser in attendance will bleed them immediately after their admission, and at the same time send off for the surgeon; before whose arrival, however, the good effects of loss of blood are apparent, and the symptoms of concussion, and even of extravasation, have often disappeared. This shows how necessary it is that you should not be too precipitate. If you act prudently, therefore, in these accidents, you will try bleeding and purgatives before you operate; for whether you do so or not, the depletion will prove of the greatest possible advantage in preventing inflammation, from which, arises the principal danger if not kept within bounds.

The next subject to which I shall direct your attention is

FRACTURE OF THE SKULL WITH DEPRESSION.

Fractures with depression.

I will tell you what you ought to do in such cases, and then leave you to act for yourselves. In order to ascertain whether the symptoms arising from depression would come on immediately after the accident, I tried the following experiment;—A gentleman having brought me a large dog, I applied the trephine to his cranium, and took out a portion of the bone. I then, with the handle of a knife, separated the dura mater from the bone; for I found that I could make no impression on the brain until I had done so, and then pressed upon it with my finger. At first the animal did not seem to feel it; but upon pressing more deeply, it produced pain and irritation, and he endeavoured to avoid us. Upon still increasing the pressure, he became comatose, and fell. I kept him in that state for five or six minutes, when, upon removing my finger, he got up, turned round two or three times from giddiness, and walked away apparently little worse for the operation. A gentleman, who felt the animal's pulse during the continuance of the

Experiment.

experiment, stated, that it became slower as the pressure became increased. In man it is the same—slow and labouring.

Apparent depression.

After blows have been received on the head, it often happens that upon making an examination of the scalp, there appears to be depression of bone to a great extent, when, in reality, there is none. Let me put you on your guard here. A person receives a blow on the scalp: the parts immediately surrounding the spot where the blow was received will rise, from the extravasation of blood, two or three lines higher than the part itself; for there the cellular membrane, having been condensed by the injury, will likewise tend to increase the deception: thus the surrounding parts are considerably higher than the middle; and the external character of the contusion is certainly calculated to deceive those who are unacquainted with the nature of these accidents. I have several times seen these affections; but the first case which I recollect was that of a child, brought into Guy's, who had received a severe blow on the head from a brickbat, which had been thrown at it by a man. All present were prepared for the operation, fully expecting that I should apply the trephine; for they felt convinced that there was considerable depression of bone; and when I stated that I should not operate, they exclaimed, "Good God! I wonder what can be his reason." This child, after having been freely bled and purged, in two or three days quite recovered.

I have often been sent for by my dressers to these cases, and have been requested to bring my instruments with me; but upon examination have found that there was no depression of bone, and that the uneven appearance of the scalp was produced by the causes before mentioned.

It also very often happens, in fractures of the cranium, that considerable depression of bone will take place from the external table of the skull being driven into the diploe, and without producing the slightest injury to the internal table; do not, therefore, be precipitate in your diagnosis, nor hastily determine upon performing an operation, which you might afterwards have reason to repent:

these fractures, however, can only occur in those of a middle age, for in the very young and in very old age, the skull is thin and without diploe. I believe in the course of my practice that I have frequently met with this accident, and we have many preparations in the museum which clearly demonstrate their true character; but the three now before me (pointing to three skulls) are, I think, quite sufficient to satisfy your minds as to the nature of this accident; here you see the external table has been driven in, and yet no vestige of fracture in the internal; here is another specimen, with greater depression; and the third still more than either, yet the internal plate is sound. I am not acquainted with the histories of these specimens, but it is evident that the persons recovered by the re-union that has occurred between the parts which were broken.

Suppose you are called to a patient who has had a severe blow on the head, and that, on examining the skull, you find a portion of bone considerably depressed. You may still find this man capable of giving a history of the accident, and that his mind is not at all affected. On the other hand, you may be called to a person who has a fracture of the skull, with depression, and who has lost the powers of mind. In such a case, if the fracture be simple, and there is no wound in the scalp, and no symptom of injury to the brain, it would be the worst practice in the world to make an incision into the part, and perform the operation of trephining; for by making such an incision you add greatly to the danger of the patient, as you make what was before a simple, a compound fracture, and consequently greatly increase the danger of inflammation. Inflammation rarely follows fracture with depression, where the fracture is simple, but very often follows a compound fracture, which is produced by making an incision in the scalp. Never make an incision, therefore, when you can avoid it, or merely because there is fracture with depression, if there be no symptom of injury to the brain. Even if there be symptoms of injury to the brain, and the fracture be simple, do not immediately trepan.

Take away blood, and purge your patient freely, and see how far the symptoms may be the result of concussion of the brain, and not of depression. If the symptoms do not yield to depletion, then, and not till then, perform the operation of trephining.

Case. I was called to a lady who had fallen against a projection of a wall in walking across her parlour. The os frontis was driven in, but there were no symptoms of compression of the brain. I bled her, and guarded cautiously against inflammation, but there was no necessity for elevating a portion of the bone. This lady never had any symptoms of injury to the brain, and she recovered by depletion alone.

Old practice. The old practice used to be, the moment an injury to the brain was suspected, and the least depression of the bone appeared, to make an incision into the scalp. I have heard of a dresser in these hospitals, who, having had no accident during his week, said, "I will make a cut in the head of one of my patients with fracture, for he may perhaps have depression, and I shall in this way have something to do before my week is up." This dresser ought to have had a cut made in his own head. This was putting his patient to considerable hazard; for the simple fracture would, by the incision, be rendered a compound fracture. In simple fracture, then, when it is attended with symptoms of injury to the brain, deplete before you trephine; and when it is unattended with such symptoms, though there may be depression, deplete merely, and never divide the scalp.

If the fracture be compound, the treatment must be very different, because a compound fracture is followed very generally by inflammation of the brain, and it will be of no use to trephine, when inflammation is once formed. It might be thought that it would be time enough to perform this operation when inflammation had appeared; but this is not the case, for if inflammation comes on, the patient will die whether you trephine or not, and you will be so far from arresting its fatal progress by trephining, that the operation will add to the danger of the inflammation. When inflammation of

the dura mater and membranes of the brain has been excited by the depression of the bone, you cannot retard the progress to death by performing the operation.

These principles illustrated.

These principles may be illustrated by many cases. During the first year of my apprenticeship in these hospitals, I saw two instances: one, in a patient of Mr. Cline's, and another in a patient of Mr. Birch's. Mr. Cline's patient was a man who came from Walworth, with compound fracture, from a blow on the head. A portion of bone had been forced into the cavity of the skull. Mr. Cline advised him to submit to the operation of trephining. The man said, "You may do what you like; I am no judge, but you are, so do what you please with me." Accordingly, he walked into the operating theatre to be trephined; the portion of bone was removed; he walked back again to bed, and never had a bad symptom.

Case of fracture with compression.

A short time after, a patient under Mr. Birch, with fracture and depression, was told that he was in similar danger, and advised to undergo the same operation. He was, however, self-willed, and obstinately refused to submit to it. Eleven days after the accident, he was seized with pain in the head, and symptoms of inflammation in the brain, and when he became insensible, the operation of trephining was performed; but it did not arrest the symptoms, and he died of the inflammation. In the other hospital two boys were admitted under very similar circumstances. The os frontis had, in one case, been broken by a kick from a horse, and in the other by a fall on the forehead. In the former case the portion of bone was raised, and the boy did well; but the mother of the other boy interfered to prevent the operation of trephining; and though it was performed after symptoms of inflammation had appeared, he died. It is quite true, that it often happens that fracture, with depression, is frequently not followed by inflammation, even when the fracture is compound; but we cannot be certain of this, and if it does ensue, we cannot save the patient by trephining at a late period.

Use of the elevator.

The rule, therefore, which I always follow, is this:—When I am

called to a fracture, with depression, which is exposed to view, I generally use an elevator, and very rarely the trephine. I put this instrument under the bone, raise it up, and if it has been comminuted, remove the small portions of bone. If, however, one bone is wedged within the other, I apply the trephine for raising the depressed portion of bone. The elevation of the bone is never followed by any mischief; but if you do not raise it, and inflammation follows, it will be too late to attempt to save the life of the patient.

I shall conclude, gentlemen, by mentioning two other circumstances: but they are two circumstances to which, if there be any thing valuable in the lecture, I wish most particularly to call your attention.

Epilepsy from fracture and depression

The first is this:—it sometimes happens, in fracture of the skull, attended with depression, that a small spicular portion of bone will project into the brain, so as to produce and support epileptic symptoms. A negro, who was a patient of Mr. Birch, had fracture from a blow on the head, and a portion of bone was depressed. Shortly after he was seized with epileptic fits, which continued for many years. When he was admitted into the hospital, it was found that there was still a portion of the depressed bone remaining, and the trephine was applied to it. When the circular piece of bone was completely sawed round by the trephine, so that it could be moved from side to side, Mr. Birch found a difficulty in raising it; he put the elevator under it, but still it adhered to something within. At last he took a pair of forceps, and, by using more force, he extracted a little spur or thorn, which had proceeded from the inner side of the skull through the dura mater into the substance of the brain, and was the cause of the epileptic fits. After its removal, he had but one more fit, and completely recovered.

The other circumstance which I shall mention is one which, whether we regard it in a physiological or surgical point of view, is, perhaps, one of the most extraordinary that ever occurred; and, as connected with surgery and physiology, I am surprised it has

not made a greater impression on the public mind than it appears to have done.

Case.

A man was pressed on board one of his majesty's ships, early in the late revolutionary war. While on board this vessel, in the Mediterranean, he fell from the yard-arm, and when picked up, was found to be insensible. The vessel soon after making Gibraltar, he was deposited in an hospital in that place, where he remained for some months, still insensible; and some time after he was brought from Gibraltar on board the Dolphin frigate, to a depôt for sailors at Deptford. While he was at Deptford, the surgeon under whose care he was, was visited by Mr. Davy, who was then an apprentice at this hospital: the surgeon said to Mr. Davy, " I have a case which I think you would like to see. It is a man who has been insensible for many months; he lies on his back with very few signs of life; he breathes indeed, has a pulse, and some motion in his fingers; but in all other respects he is apparently deprived of all powers of mind, volition, or sensation." Mr. Davy went to see the case, and, on examining the patient, found that there was a slight depression on one part of the head. Being informed of the accident which had occasioned this depression, he recommended the man to be sent to St. Thomas's Hospital. He was placed under the care of Mr. Cline; and when he was first admitted into this hospital, I saw him lying on his back, breathing without any great difficulty; his pulse regular, his arms extended, and his fingers moving to and fro to the motion of his heart: so that you could count his pulse by this motion of his fingers. If he wanted food, he had the power of moving his lips and tongue; and this action of his mouth was the signal to his attendants for supplying this want.

The operation of trephining.

Mr. Cline, on examining his head, found an obvious depression; and, thirteen months and a few days after the accident, he was carried into the operating theatre, and there trephined. The depressed portion of bone was elevated from the skull. While he was lying on the table, the motion of his fingers went on during the operation, but no sooner was the portion of bone raised than it

ceased. The operation was performed at one o'clock in the afternoon; and at four o'clock, as I was walking through the wards, I went up to the man's bed-side, and was surprised to see him sitting up in his bed. He had raised himself on his pillow. I asked him if he felt any pain, and he immediately put his hand to his head. This showed that volition and sensation were returning. In four days from that time the man was able to get out of bed, and began to converse; and in a few days more he was able to tell us where he came from. He recollected the circumstance of his having been pressed, and carried down to Plymouth or Falmouth; but from that moment up to the time when the operation was performed (that is for a period of thirteen months and some days), his mind had remained in a state of perfect oblivion. He had drunk, as it were, the cup of Lethe; he had suffered a complete death, as far as regarded his mental, and almost all his bodily powers; but, by removing a small portion of the bone with the saw, he was at once restored to all the functions of his mind, and almost all the powers of his body.

It appears, therefore, that in cases of depression we should not be prevented from trephining, however distant the period may be at which the accident occurred; and the patient may, after any interval, be restored to the powers of body and mind.

LECTURE XVIII.

ON WOUNDS OF THE BRAIN.

Wounds of the brain will often happen, without producing any interruption to the operations of either body or mind. But should the wound be accompanied by either compression or concussion, then the particular symptoms which characterize those injuries will be present. If, however, the wound be a simple incision or laceration, it will often prove quite harmless. Indeed, it frequently

occurs that considerable portions of the brain are lost, and yet the mental and bodily functions continue unimpaired. Epileptic fits and hemiplegia certainly sometimes follow, as effects of such injuries; but, on the other hand, brain to a great extent has been lost without having been succeeded by disturbance of either the mental or bodily functions; numerous cases of this description are upon record; several have fallen under my own observation.

Case. A case similar to the following likewise came under the notice of a surgeon at Brighton. A dresser of the late Mr. Chandler once came to me when I was in the other hospital, and said, "Look here, Sir," at the same time showing me a portion of brain, with a piece of the pia mater attached to it. I went to see this man, and found the representation of the dresser correct; there was a large transverse opening in the os frontis, through which a considerable quantity of brain had been lost. His mind was not at all affected; neither were the bodily powers in the least disturbed; no bad symptoms of any kind followed the injury; the wound healed most favourably, and he was soon discharged. About a year afterwards, while I was at the house of a lady in the city, whom I was attending, a man walked into the room, and said to me, "How do you do?" Not recollecting him, I looked at him with some sort of surprise, as you may suppose, when he informed me that he was the man whom I had seen about a year before in St. Thomas's Hospital, with a wound in the head, and through which he had lost some of his brain. I replied that I could readily believe him. He stated that he had been quite well ever since; he had what he called an opening where he received the wound; was not subject to fits; and to show you that his mind (notwithstanding his familiar "how do you do?") had not sustained any damage from the accident, he was, at the time I saw him, conductor of an extensive business at the house where he was then living.*

* *Case.*—While living in Bridge-street, I was sent for to the Brown Bear, public-house, opposite, to see a man whom I found firmly fixed on the kitchen-grate, with several persons endeavouring to drag him from it. The efforts of these persons being ineffectual, I looked underneath, and found that he was

It occasionally happens, when a portion of the brain has been lost, that a piece of the cranium will, by being driven in, occupy its place; and if, in these cases, no symptoms of compression manifest themselves, you must not elevate the depressed bone: for were you to do so, you would, in all probability, give rise to extravasation, or increase the hazard of inflammation. The late Mr. Chandler had a patient in this hospital, who, on receiving a blow from a boat-hook upon the parietal bone, had a portion of that bone driven into the brain, and at the same time a quantity of the brain was lost: at first there was hemiplegia; this effect, however, soon disappeared. The depressed bone was permitted to remain, and the individual perfectly recovered. Such cases are not uncommon, and I could relate a number of them to you.

Danger attending injuries of the brain.

The danger attending injuries of the brain arises principally from two causes, *viz.* inflammation, and the formation of fungus. 1st, Inflammation, and, 2nd, Fungus; but I am happy to tell you, that both of these may be conquered by scientific and prompt treatment. When the brain receives a wound, you must commence your curative exertions by abstracting as large a quantity of blood from the system as the constitution of your patient will bear; not, however, to such an extent as to prevent the restorative operations of nature. Do not lower the system to such a degree as to prevent inflammation altogether, as was done by the dresser in the other hospital, whose partiality for bleeding I mentioned to you a few evenings since. Though you succeed in keeping down inflamma-

actually empaled on the projecting catch of the falling-bar; I immediately placed a hand on each side of his head, and lifted it off. After being put to bed, I found a wound extending from the coronal suture, on the right side, obliquely inwards about two inches. I removed the hair and portions of bone which had been driven in; the wound was dressed with lint dipped in cold water, and strapped over. Twenty ounces of blood were taken from the arm, and the strictest antiphlogistic remedies employed. For two days he went on favourably, but the inmates of a public-house are not always the best of nurses: I had reason to suspect that they had been giving him spirits, and in consequence I had him removed to Guy's Hospital, under Mr. Key, who completed a cure in three weeks.—L.

tion, fungi will spring up; and here (exhibiting a preparation) you have an opportunity of seeing an example of the disease to which I allude. Sometimes wounds of the brain extend even to the ventricles, and here (showing another preparation) you observe that one of the lateral ventricles was laid open.

How restored. Now, gentlemen, some days after the brain has been wounded, the divided parts begin to unite by means of the adhesive inflammation; if this process cannot effect a cure, granulations form, which at length project through the opening in the skull, and give rise to the fungus before mentioned. Upon proper treatment the safety of your patient depends. If you do not repress the growth of the fungus, there will be violent constitutional irritation, and the life of the person in jeopardy; but, on the contrary, if you attend to the condition of the wound, and prevent the fungus from rising, there will be, comparatively speaking, but little danger.

Treatment of fungus. Well, gentlemen, the treatment is as follows:—You are to apply to the fungus a piece of lint, moistened with liquor calcis, and over this, strapping of adhesive plaster; when you examine the part on the following day, you will find the fungus considerably diminished; you are then to use a thicker piece of lint, and the strapping as before; pursuing this plan, you at length get the fungus to the level of the scalp; but this is not sufficiently low for your purpose, therefore you must still thicken the lint until you have succeeded in getting it even with the edges of the dura mater, in which position it must be cautiously preserved; when, at last, the dura mater heals over it, and your object is accomplished. We witness many examples of such cases in these hospitals. Formerly it was the practice in the treatment of these diseases to remove the bone contiguous to the fungus: immense quantities of bone in this manner were taken away, thereby affording every facility to the growth of the fungus, and which, of course, rapidly increased, until the patient was destroyed. By such treatment as this, no person could possibly recover: the method was a most injurious and stupid one: therefore let me caution you against adopting it. The plan of treatment which I have just recommended to you is

unquestionably the best, *viz.* that of repressing the growth of the fungus until the dura mater and scalp heal over it. This will be illustrated by the following cases:—

Case. John Dent, a boy, aged eleven years, received a severe blow from the kick of a horse, on the anterior and inferior part of the right parietal bone, by which he was stunned. The same evening he was brought into St. Thomas's Hospital, in a state of stupor, with a considerable tumour under the scalp. A longitudinal incision, to the length of two inches, was made, when immediately a portion of brain made its escape, about the size of a hazel nut; and, upon introducing the finger, a fracture was distinctly felt, yet no depression was evident; but on the further division of the scalp, in a transverse direction, and turning back the edges, a very considerable depression was distinguished; in consequence of which the trephine was applied, and one angular piece of bone removed by the metacarpal saw; also, another piece, rather more than an inch in length, which was driven into the substance of the brain, was extracted with the forceps. During the operation, small quantities of brain were continually escaping with the blood; supposed to be about ʒij or ʒiiss. Every depressed portion of bone being now sufficiently elevated, the wound was dressed superficially, and notwithstanding the great degree of stupor and insensibility he laboured under, prior to the operation, his senses returned before Mr. Chandler (who operated) quitted the theatre, and from this time he appeared perfectly tranquil. The next morning he was ordered the common aperient medicine of the house, which was occasionally repeated. The wound was not dressed until the fourth day; when, upon the removal of the dressings, there appeared a disposition to fungus, arising from the brain, which continued to increase for about a fortnight. Mr. Chandler then requested that the lint (with which it was previously dressed) should be dipped in lime-water, and the same degree of pressure made use of as before. His plan had not been persisted in for more than ten days, before every particle of fungus disappeared; but it was observed, a short time afterwards, that the edges of the wound assumed a glossy

appearance; they were, therefore, touched over slightly, every other morning, with the sulphas cupri, which occasioned the wound to contract daily, and, by the latter end of February, it was completely cicatrized. On account of losing so large a portion of bone, the brain could be distinctly seen pulsating through the scalp. He lost no blood from the arm during the cure, nor did any bad symptoms occur.

Case. George Freeman, aged eighteen years, was admitted into St. Thomas's Hospital, July 2nd, 1811, under the care of Mr. Birch, having a fungus tumour arising from the brain. The history of the case was as follows: Seven weeks before, while he was grazing a horse near Tunbridge Wells, he fell asleep, during which time the horse (he supposes) trod upon his head; the blow rendered him senseless, and he remained in this state till he was found by some men, and conveyed home. Immediately after the accident, May the 20th, upon his being put to bed in a comatose state, he was bled largely from the arm; and in the evening, remaining in the same state, also having a great deal of swelling on the scalp, the cupping glasses were applied, of which he was sensible.

On the following morning a crucial incision was made through the whole of the swelling, from which there issued a portion of blood and brain. A large piece of the os frontis had penetrated through the dura mater, nearly an inch into the substance of the brain; which, being removed, he became perfectly sensible when spoken to, and so continued: but the fæces and urine passed away involuntarily. Every thing appeared to do well, until the fungus cerebri* made its appearance, and gave much trouble; it was repeatedly cut away, and pressure applied; which not only produced great pain in the head, but occasioned sickness and vomiting, which immediately ceased when the pressure was removed. About the 15th of June, he lost his appetite, became very sick and faint upon the least exertion; when the bark was given to him, and continued till he left the Wells.

* There were exuberant granulations from the cerebrum.

When admitted into St. Thomas's Hospital, there was a considerable loss of bone on the os frontis, over the right eye, where the pulsation of the brain was evident. A fungus swelling, in a sloughing state, occupied the middle of the wound, which was surrounded with red fleshy granulations; and when the tumour was pressed on, he complained of severe head-ache, which ceased on removing the pressure. On the day following his admission, I was desired to see him; and I immediately cut away the projecting part of the fungus, and recommended pressure to be made on the part, by means of a bandage, applying to the wound a pledget of lint, wetted with lime-water. No other treatment was found necessary; by these means the fungus was kept down, the ulcer gradually contracted, and on the 9th of August it was nearly skinned over, without one bad symptom occurring during the cure. He always complained of head-ache when the bandage was applied tight. He took no medicine while in the hospital.

Case. Mr. Henry, jun. of Keswick, was struck on the forehead by a portion of a small brass cannon, which burst while he was firing it. He was immediately afterwards found in a senseless state, but was in a few minutes able to rise and speak. Mr. Edmondstone, surgeon, was called in to see him, and arrived ten minutes after the accident. He found a wound over the left eyebrow, which he enlarged, and then discovered a comminuted fracture of the skull; the fractured portions of bone were loose and detached; the dura mater was lacerated, so as to allow of the escape of about a tea-spoonful of the substance of the brain. The loose portions of the bone were removed, and the wound dressed. Soon after the operation he was sick; and his pulse being hard, he was bled twice in the following night. On the next day, some more brain, in small quantities, was removed with the dressing. A fortnight after the accident, a fungus arose from the brain, which was treated by the pressure of lint dipped in lime-water, which considerably repressed its growth. Whilst pursuing the above plan of treatment, he one day complained of severe pain in his neck, for which he was bled freely; when, in a few hours after, the fungus suddenly

decreased, and soon entirely disappeared. The wound healed in fourteen weeks, and he has since remained well.

Remarks. I observed a circumstance in this young gentleman, after his cure, which shows the influence of mental excitement in agitating the brain, and in increasing, upon the instant, the quickness of its action.

Something passed in conversation which displeased him: and his brain, which could be distinctly seen beating through the opening in his skull, immediately quickened from eighty to one hundred and twenty in the minute. Struck with this appearance, I watched it for a few minutes, and, as his mind became calm, the pulsation gradually sunk again to about eighty. He had a great dislike to, and apprehension of, the finger being applied to the injured part; and as soon as I touched it, he receded from me, and I saw his brain beating with extraordinary velocity. These circumstances strongly impress a conviction of the influence of mental and corporeal excitement, and of the necessity which exists of guarding against the one and the other.

INFLAMMATION FOLLOWING WOUNDS OF THE BRAIN.

I shall now speak more particularly of the inflammation which follows wounds of the brain, wherein their chief danger consists; which danger is much increased, if the dura mater be the part attacked.

Symptoms of inflammation Upon the first approach of inflammation, the person complains of a great pain in the head; very quickly falls into a comatose state; and, when roused from this condition, the pain is excessive; the scalp, round the external wound, becomes œdematous, for if you press upon it, the impression of the finger is retained; the edges of the wound have a shining glossy appearance, and from the wound itself is discharged a fluid, composed of blood and serum; sometimes the parts about the wound have a sloughy appearance; the countenance is very much flushed, and the carotid arteries beat with very great force; so much so, that if his shirt-collar be open,

you can see the pulsation of the carotids, at some distance from the bed; this circumstance, of itself, would be quite sufficient to convince you that there was a great determination of blood to the brain. The next thing which you observe is, that the patient is seized with rigors, and these follow in very quick succession; hemiplegia likewise often attends, and is generally situated on that side of the body opposite to the wound; the patient remains in a comatose state, but, when roused, will give you (until towards the very last) rational answers to such questions as may be put to him. These, then, are the ordinary symptoms of inflammation of the brain, arising from wounds of that organ.

Formation of matter.

If the inflammation should terminate in suppuration, I have already shown you in a former lecture where the matter would be situated, viz., between the dura mater and skull (this rarely happens), pia mater and tunica arachnoides, pia mater and surface of the brain, and, lastly, in the substance of the brain itself.

Pus between the skull and dura mater.

When pus is situated between the dura mater and skull, trephining for its removal would be attended with complete success; but the chances of finding it there are against you, as it is generally situated between the pia mater and surface of the brain, for which an operation would prove worse than useless. Another situation in the head where matter has been found is, in the longitudinal sinus of the dura mater. This woman (holding up a preparation), seventeen months before she died, fell down stairs, and her head came in violent contact against a chest, by which she became stunned; for some time after the fall, matter was discharged from one of her ears; this at length ceased, and, to all appearance, she was entirely well. The pain, however, again returned with evident symptoms of compression; and sixteen months after the accident she was admitted into this hospital. After some remedies had been fruitlessly tried, and she had been here for a short time, it was thought advisable to apply the trephine; the operation was unsuccessful, and four days afterwards she died. Upon examination it was found that there was a small quantity of pus embedded in the

Case.

longitudinal sinus, as you here see it (exhibiting the preparation). This is the only example of the kind which I have witnessed.

In the tunica arachnoides.

The next part in which matter is situated is between the tunica arachnoides and pia mater, or between the pia mater and brain itself. This last is of most common occurrence, and in this case the matter is diffused over the hemispheres of the brain, in the same manner as I mentioned to you the other evening, that blood is when extravasated on that organ. When the matter is between the pia mater and brain, it will be of no use to operate, as very little will be discharged, there being no communication between one part and another; for the matter is contained within distinct cells, between the vessels which come from the pia mater to the brain.

In the substance of the brain.

The next situation in which matter is found is in the substance of the brain itself. Here are specimens (pointing to some on the table), in one of which matter was lodged in the anterior lobe of the cerebrum, the other in the cerebellum; in fact, it is lodged in various parts, and the only circumstance very curious in this complaint is, that you would not suppose, from the symptoms, that matter was forming; they are those of compression rather than irritation. If the membranes of the brain be attacked with violent inflammation, symptoms of irritation will be present; but if the brain itself, they will be those of compression; and the circumstance which surprises a person who examines the brain of an individual in which matter has been formed is, that so little constitutional irritation existed during its formation: it is in inflammation of the membranes, and not of the brain itself, in which great irritation is present.

Case of a child wounded by a cock.

Here is a curious specimen (pointing to one before him), taken from a child that I had under my care, and on whom I performed the operation of trephining; I will give you the history of the case:— A young child was playing in a yard where there were some fowls, when it received a wound on the head from the beak of a cock. The mother hearing the child shriek, ran to the spot, and found that there was a small wound of the scalp, but thinking that there was

no injury to the brain, she bound it up: in a week afterwards pain in the head came on, together with great constitutional irritation, and the child was brought to me. On examining the head, I found that a circular incision had been made in the bone, and that matter issued through the opening. I said to the mother, if the child is not better by to-morrow, bring it to me again, and I will allow a more free opening for the matter to discharge itself. The next day the child was brought to my house, and I performed the operation of trephining, when I found there was an opening in the dura mater and pia mater, corresponding to that of the bone; the symptoms of irritation were relieved by the operation, those of compression however came on, and in three days from the time in which it was performed, the child died. On examining the part after death, I found that there was a circular incision in the dura mater, the edges of which were hardened and thickened, as you see here (pointing to the very part), a similar state of the pia mater and brain, in size corresponding to the external opening, and an abscess between the pia mater and brain. At that time I had no idea that a wound of the description I have just mentioned could be produced by a bird of this size; but since that period, I have seen an instance of a similar kind: a pheasant, not an English, but an Indian one, made a dart towards the eye of a person, and, instead of striking it, wounded the os malæ; the bird, by means of its beak, struck a hole into the superior maxillary bone, just below the zygomatic arch.

Time at which inflammation occurs.

The time at which inflammation of the brain supervenes after the injury received, is generally about a week: rarely under that time; and this it was that led me to say, on another occasion, that inflammation of the brain was more slow in its occurrence than that of any other organ, in order to put you on your guard. It often happens that inflammation of the brain does not come on till a fortnight, or even three weeks, after the injury: therefore every surgeon who has written on the subject puts you on your guard as to the distance of time this complaint comes on after the accident: he tells you that the patient is not safe till two or three weeks

afterwards. If you read the works of Mr. Pott on the injuries of the head, you will find the circumstance mentioned; and in the work of Mr. Dease, of Dublin, (who has published an excellent treatise on the subject) it is distinctly stated, that inflammation of the brain is occasionally postponed to three or four weeks after the accident occurs, and even then, the patient is not always safe.

Case. I will give you a case relating to this subject:— Dr. Babington and myself were sent for to see a person, a clerk to the firm of Whitbread and Co., who, whilst riding on horseback, and being a short-sighted man, and riding fast, struck himself violently against the bough of a tree which was overhanging the road, and was brought to the ground by the force of the blow. He was taken to Croydon, where Dr. Babington and myself visited him. We found that he had been struck on the os frontis, just above the frontal sinuses, where there was a depression; and this was the first case in which I witnessed emphysema of the forehead produced by blowing the nose. We took all possible care of the case, bled him, regulated his diet, &c., till the inflammation had subsided. He came to town three weeks after the accident, when he asked whether he might go to Rochester, to spend a little time with some friends, who were anxious for him to come. We told him that he might, if he would pay attention to himself, keep his bowels open, and regulate his diet. After the lapse of a week he became extremely ill, inflammation of the brain came on, and he died. On inquiry, we found that he had neglected the directions given him, and allowed his bowels to get costive.

Remarks. It is always a very serious case when there is a depression on the forehead after an accident, and I will mention to you an instance of this kind, which will show you the necessity of enjoining on a patient with this injury strict attention to his mode of living.

Case. A man who had received a wound in the forehead from a pistol-shot came to this hospital: the wound healed kindly, but the depression remained. Whenever this man indulged in the use of

spirituous liquors, he used to come back with violent pain in the head, which was always relieved by blood-letting.

Treatment after inflammation.

As to the treatment of inflammation of the brain, it is the same as for inflammation generally, with this exception only, that blood should be drawn from the temporal artery in adults, and the jugular vein in children. Whenever inflammation of the brain attacks a grown person, take blood from the temporal artery; and when young individuals, from the jugular vein; by these means you abstract blood more readily from the part. Even in adults you may, after opening the temporal artery, if the symptoms be not relieved, bleed from the jugular vein. In addition to this treatment, you purge, produce perspiration, and apply blisters to the head. I have seen poultices, containing some stimulating application, of considerable use. It will now and then happen that trephining will be required; and I will tell you the cases in which it will.

THE OPERATION OF TREPHINING.

Circumstances necessary for the operation.

First. Where there is extravasation of blood between the dura mater and skull.

Secondly. In fractures of the skull with symptoms of compression continuing after depletion.

Thirdly. In simple fractures, with depression, accompanied with symptoms of compression.

Now it generally happens in these last cases, where there is matter between the dura mater and skull, that there is fracture, and this is an indication of the seat of the injury which has been done to the brain; it is also followed by rigors and other symptoms; still it will be right in some cases, where there is no fracture, and the other symptoms, rigors, &c., are present, to penetrate the bone, to see whether matter is lodged between it and the dura mater. When an abscess has formed beneath the dura mater, I have never seen a case recover trephining for it, although that membrane has been opened for its discharge.

Description of the operation.

The operation of trephining used to be one of the most complicated kind, requiring several instruments, the learning of which was in itself quite a study; it is now quite simple, and few instruments only are wanted, which can very easily be put into a small case. Let us go over the instruments formerly used in this operation; but really, gentlemen, they were so numerous, I don't know whether I can count them. They used then a scalpel, rougee, pin, perforator, crown, brush, elevator, lenticular, and a pair of forceps; now you may see (holding a case in his hand) these three instruments will be quite sufficient, a knife, with a double edge, in order to scrape off the pericranium, an elevator, and a trephine having a crown, and a pin which will allow of being easily moved.

Parts on which the trephine must not be applied.

Now, gentlemen, I will tell you in what parts the trephine should not be applied. First, you should never trephine in the line that extends from just above the nose along the top of the head to the tuberosity of the occiput; over the frontal sinuses it is obviously improper; and at the summit of the head you will meet the sagittal suture, where the dura mater adheres with extraordinary firmness, and the longitudinal sinus might also be wounded; and at the posterior part you have the superior portion of the perpendicular spine of the os occipitis; therefore, in this line you ought not to trephine. I should mention this particularly to young persons, who very often disregard this rule, thinking they know much better than those who have preceded them; if, however, they trephine in this part, the more fools they, and I will tell you why: they are running, in operating in this part, an unnecessary risk, by cutting on a long hole covered over by a smooth membrane, when they might do it as well on either side. It would be the folly of presumption to trephine on this line. There are two other parts in which the operation of trephining should not be performed; first, over the anterior inferior angle of the parietal bone, just above the zygoma; secondly, behind the ears, on the posterior inferior angle of the same bone; and why, no doubt, most of you by this time

know; opposite to the anterior inferior angle of the parietal bone is the great artery of the dura mater, and opposite to the posterior inferior angle is the great lateral sinus.

Fractured portions of these bones may be raised by the elevator: and I may observe here, that this is the instrument chiefly used in cases where the fractures are running in the direction of these parts. Elevator to be used.

Mr. Hey's saw is a very useful invention. It is gratifying to state that we are seldom now called to perform this operation. Suppose, however, you were called to a case requiring it, where there was a wound, together with depression of the parietal bone, you would put your finger into the wound, and if the portion of bone depressed were small, you would make a simple incision, and turn the integuments aside, so as to reach the bone. If, by this incision, you found depression with fracture, you enlarge it in the course of the fracture: if the depression were large, you would make a crucial incision, and turn aside the portion of integument, so as to open a space for the application of the trephine: then, with the back edge of the knife (which should be made a little stronger than usual,) you cut through the pericranium, and scrape it off. For this purpose the rougee was formerly employed. [There was a subject on the table, on which Sir Astley performed the operation as he went on describing it.] Now I put the pin on the skull, and the crown being adjusted, I fix it, and begin the circle. Well, gentlemen, having made a circle, I remove the pin: in young persons it will be necessary to do this soon, because the bone is readily sawn through. I never myself saw a case in which the pin entered the brain; but my nephew was present when the operation of trephining was performed, and the *pin was forgotten*, so that it entered the brain, and inflammation of the dura mater came on. I can conceive that a man, in his first operation, anxious how he shall succeed, might forget it. When using the saw, let your bearing on it be as even as possible, else you will be through one part of the skull before another. There is but one danger in performing the operation of trephining, and that is, Hey's saw. Mode of performing the operation.

wounding the dura mater. When trephining on living subjects, you are informed of the progress you are making by blood issuing from the wound when you reach the diploe: and when you see the blood, you will know that you are half through; but, recollect, in very young or old persons there is no diploe; therefore, very few turns of the saw will do. As you proceed with the sawing, you must introduce your probe, to see how nearly you are through; you sound as you go on. When I find that I have sawn through in one part, I introduce the elevator, and lift the portion of bone, the parts not cut through being easily broken. I find by my probe that in the part near the sagittal suture I have sawn through; I introduce the elevator, feel the bone move, and know that a very few turns will do, taking care not to lean on the side through which I have already sawn. The bone can be raised and loosened; I am quite certain that the dura mater is not injured, and by introducing the elevator, the bone may be removed from its place.

Danger of the operation.

Some people say that this is a trifling operation, not difficult to perform, nor dangerous: but they deceive you: it is one of the most dangerous operations in surgery; whilst performing it there is but a single step, a small net-work between your patient and eternity; saw through this, and destruction of life will generally be the consequence. Mr. Hunter made an assertion, that when the dura mater was wounded, the person never recovered; which, though not exactly borne out by the cases which have occurred since, shows the impression made on the mind of a man who was such an observer of nature. Before his death, Mr. Hunter saw a case of a wound of the dura mater recover. It is certain that there is less danger when the dura mater and pia mater are both injured: the danger is more when the dura mater is injured without the pia mater. I will give you the reason: in the former case, where both the dura mater and pia mater are wounded, a fungus immediately projects, and fills up the cavity. If, however, there is only a small opening in the dura mater, and I were to put some quicksilver into it, where would it go?—into the lower part of the spine between the tunica arachnoides and dura matral covering; inflammation of

the dura mater would spread over the whole cavity of the canal, as erysipelas does over the surface of the body; whereas, in the first kind of injury, fungus will project through the opening, which would easily close by the process of adhesion that would take place. I have seen many instances where the dura mater and pia mater have been wounded, but few where the dura mater only has been.

After trephining, the elevator should be introduced to raise the depressed bone, and in this way return it to its natural situation. You see that there is no necessity to operate where there is any additional risk, because an operation in a part where there is no risk can be as well performed, the object being only to raise the bone. The scalp is to be returned over the opening, and a poultice should be applied, which, I believe, is the application most congenial with the feelings, and most conducive to the safety of the patient.

If there be a necessity for taking away more than one portion of bone, the same plan is to be pursued in each operation.

LECTURE XIX.

ON WOUNDS OF THE SCALP.

Their danger.

On this subject I have but few observations to make. Wounds of the scalp are not devoid of danger, and I have known several instances in which apparently slight wounds of that part have destroyed life. They are more especially dangerous if accompanied with contusion. If a person receives a blow from an instrument capable of lacerating the part, and considerable inflammation follows, the wound will sometimes destroy life. There are two ways in which wounds on the scalp occasionally prove destructive of life: first, by producing erysipelas; and, secondly, by producing inflammation of the tendon of the occipito-frontalis: thirdly, by a simple compound fracture, they produce a more extended inflammation of the dura mater.

Mode in which they destroy life.

A man came to the other hospital, a short time ago, with a wound of the head, from a blow which a companion had given him. The dresser thought it too slight a case for admission into the hospital; but a few days after the man returned with violent pain in the head, a considerable swelling of the scalp, and erysipelatous inflammation extending over the whole face and neck. He was admitted into the hospital for the erysipelatous inflammation, of which he afterwards died. Upon examining the body, there was found an effusion on the membranes of the brain between the tunica arachnoides and the pia mater. The other way in which wounds of the scalp destroy life is, by producing inflammation of the tendon occipito-frontalis, which extends over the whole surface of the head. This inflammation covers the scalp and face, and assumes an erysipelatous character, but it is not true erysipelas. It has not the vesicles of blisters filled with serum, which commonly attend erysipelas, but it has a tendency rather to suppuration; and if the constitution has strength to produce this suppuration, it takes place between the tendon and the pericranium. In this way a very extensive abscess is often formed, into which we are obliged to make an incision, in order to discharge the matter, which cannot make its way through the tendon. Extensive disease is thus produced, and the inflammation attending it sometimes destroys life. I have already alluded to a case that occurred recently, in which a person died of erysipelas, which followed the removal of an encysted tumour. The tumour had been removed twice before, and, to prevent its recurrence, an incision was made so deep as to lay bare the pericranium, and in this operation the tendon had been cut through. There is a great deal of danger in inflammation arising from this cause, and it is on that account that I was anxious to point out to you, in a former lecture, the impropriety of making incisions in the scalp merely for the sake of exploring the nature of the injury. Third mode in which wounds of the scalp prove destructive, is by incisions being made to trace fractures of the skull, producing in this way great aggravation of the inflammation, and extending its influence to the membranes of

the brain. An incision in the scalp should, therefore, be never made, but in cases of imperious necessity.

ON INJURIES OF THE SPINE.

Injuries of the spine produce effects similar to those arising from injuries of the head; the spine being liable to concussion, extravasation, fracture with depression, suppuration, and ulceration.

Effects of.

Cases of concussion of the spine are not very unfrequent. They occur more commonly in the lumbar region than in other parts of the spinal column. A violent blow on the loins produces paralysis of the lower extremities. The paralysis, however, is not complete; the person is unable to support his body, but generally some power of moving his limbs remains. This paralytic state, arising from a blow on the loins, is in general easily removed in the following manner:—

Treatment.

You apply cupping-glasses to the part, and take away blood from it several times with the scarificator. If, at the end of a week or ten days, the paralytic state still continues, you must apply a blister to the loins, and keep it dressed with equal parts of the unguentum lyttæ, and unguentum sabinæ. The lyttæ being in this way absorbed into the constitution, diminishes the disposition to paralysis, while the counter-irritation also produces good effects. Such is the plan of treatment to be pursued in cases of concussion of the spine.

Extravasation.

With respect to extravasation on the spine, the examples are but few in which this has occurred. The cases which are more particularly impressed upon my mind are, first, one which was examined in this hospital by Mr. Henry Cline. A person received a severe blow near the cauda equina, by the last dorsal vertebra. He had paralysis of the lower extremities, and shortly after died.

Case.

Case.

The second case was one under Mr. Heaviside, in which I and Dr. Baillie were also consulted. A young gentleman was swinging with a party of boys, when one of his companions pushed him, that he might rise as high as possible, while two others ran in the opposite direction, and caught him in the neck with a rope, as he

descended. He was thrown out of the swing, and when he was taken up, was found to be paralytic in the lower extremities. He soon became paralytic in his upper extremities also, and a few weeks afterwards he was brought to town in this state. It was suspected that there was some disease of the spine, produced by the injury the neck received, when the rope suddenly caught it, but no deformity could be discovered. An issue in the neck was advised, with a view of producing counter-irritation; but before this plan could be carried into effect, the boy died. On examining the body, it was found that one of the vertebral arteries had burst, and that extensive extravasation had taken place from the foramen magnum to the sixth cervical vertebra. The whole sheath of the spinal marrow was covered with blood. Mr. Heaviside has a beautiful preparation made from this subject.

Treatment.

These cases, probably, admit of no remedy where the extravasation is considerable. I do not know what can be done, except to bleed in the first instance, in order to prevent further extravasation; and afterwards to promote absorption, and excite counter-irritation by the application of blisters. I mention these cases to you as worth knowing, that you may make your own observations on them when they occur, rather than as cases about the treatment of which much is understood in the present state of our knowledge. They are of too rare occurrence to enable us to lay down any positive principles as to the mode in which they are to be treated.

ON FRACTURES OF THE VERTEBRÆ.

Fractures, with displacement of the spine, are by no means unfrequent; they have been improperly called dislocations; but dislocations of the spine are extremely rare, and only occur in the cervical vertebræ. What are called dislocations are, in fact, fractures with displacement. It is not that one vertebra is separated from another, for this very rarely happens, and only in the cervical; but that vertebra is broken through. When fracture, with displacement of the spine occurs, paralysis takes place in the

parts of the body situated below the injury. If it occur in the loins, paralysis of the lower extremities follows; the power of retaining the fæces, and of expelling the urine, is lost. When the injury occurs in the dorsal vertebræ, there is paralysis of the lower extremities; the same loss of power in retaining the fæces, and expelling the urine, with this addition, that it is accompanied with considerable inflation of the abdomen. This inflation might lead the surgeon at first to suppose that there was some rupture of the intestines; but after a few hours, when the patient has had free evacuations, this inflated state of the intestines disappears. The inflation is produced by the great secretion of air into the intestines, in consequence of the diminished powers of the part. Symptoms.

When the injury occurs below the fourth cervical vertebræ, paralysis takes place in the upper as well as the lower extremities, though not in the same degree. There is a numbness of the upper extremities, but seldom such a degree of paralysis as to deprive the patient of all power, when the injury occurs below the fourth cervical. The time in which the person dies from these injuries varies according to the seat of the accidents. If it occur in the loins, the patient will generally die in from five to six weeks; if the displacement be very considerable, he may die in three weeks: on the other hand, when the displacement is slight, the patient may live many weeks, and even months. I have known a person live two years after an injury which was supposed to be a case of fracture, with displacement of the lumbar vertebræ. As there was no examination of the body, after death, in the case to which I allude, some doubt must necessarily exist as to the exact nature of the injury; for morbid anatomy can alone teach you the real nature of disease. When fracture with displacement occurs in the dorsal vertebræ, the patient generally lives a much shorter time; though even in this case I have known a person live nine months. A person of the city, named W., riding on Epsom Downs, at full speed, came to a road which led to a chalk or gravel-pit, and finding that he could not stop his horse, he put spurs to him to endeavour to clear the pit. He succeeded in doing this, but the Of the lower cervical. Case.

horse, in consequence of the effort, fell on the opposite side, rolled over him, and broke his dorsal vertebræ. Paralysis of the lower extremities followed, but this gentleman lived four or five months after the injury. When fracture with displacement occurs between the fourth and seventh cervical vertebræ, the patient generally lives four or five days. I have known a person die as early as forty-eight hours after the injury. If the injury occur between the second and third, or between the third and fourth cervical vertebræ, the person dies on the instant.

Of the upper cervical.

Cause of death.

Those who have attended in the dissecting room can readily explain how this happens, and would, perhaps, feel themselves insulted if I were to explain it to them. Those who have dissected less, will excuse me for saying that instant death ensues in this case, because the injury occurs above the origin of the phrenic nerve, which is the only agent in supporting respiration after pressure on the spinal marrow has occurred. The function of respiration, after pressure on the spinal marrow, is supported by the diaphragm only, and when the fracture with displacement occurs above the origin of the phrenic nerve, the diaphragm loses its power, and instant dissolution is the result.*

Fracture without displacement.

Case.

But it sometimes happens that the cervical vertebræ are broken without displacement. When this occurs, some curious circumstances take place. At the time I lived with Mr. Cline, the following case occurred:—A girl received a severe blow on the neck, after which it was found, that whenever she attempted to look at any thing above her head, she was under the necessity of putting her hands behind it, and gradually elevating it to the object. When she wanted to look at any thing beneath her head, she put her hands under her chin, and lowered her head to the object. If any other child in play ran against her and shook her body, the concussion produced uneasy sensations, and she would run to a

* A luxation of this kind can only take place, either forward or backward, consequently, if instant means were employed to restore the parts to their natural situation, the pressure on the phrenic nerve would be removed, and respiration restored.—L.

table, or any place on which she could rest her head, and support it with her hands under her chin until the agitation produced by the shock had subsided. The child lived twelve months after the accident. On examining the body after death, Mr. Cline found the atlas broken through; there was a transverse fracture of the atlas, but no displacement. When she endeavoured to raise her head, the dentiform process quitted its natural situation, and carried back a portion of the atlas; when her head inclined forward, pressure was produced upon the spinal marrow, as it was likewise when the body was agitated. This is a curious instance of fracture occurring in the cervical vertebræ without displacement. With respect to the treatment of fracture, with displacement of the spine, nothing has hitherto been effectually done in surgery.

Mr. Cline's operation.

Mr. Henry Cline was the first person who attempted to give relief in this accident. Being an excellent anatomist, and a most able surgeon, he saw no reason why cases of this kind should not be treated as cases of fracture with depression of the skull. Accordingly he cut down upon the arch of the spinal marrow, where the compression was greatest, and, with a small trephine of his own invention, he sawed through the arch of the spinous process, and took off the pressure on the spinal marrow, by raising the depressed portion of the arch. It is well known, that in cases of fracture where the displacement has been slight, union of the bone has been produced. There would be no difficulty in producing this union, supposing the pressure on the spinal marrow to be removed. There is a preparation in Mr. Brookes's collection, from a case of fracture with depression, where the person lived long enough for the fracture to be united; and in the College of Surgeons there is a preparation presented by Mr. Harold, of Cheshunt, from a case where union of the bone took place after fracture with displacement. There is no danger, therefore, as to the restoration of the arch of the bone, if the pressure on the spinal marrow could be removed; and it was with this view that Mr. Cline sawed through the arch. It is right, however, to mention, that in many of these cases the spinal marrow is itself torn through. In some cases of fracture with displacement,

it is completely torn; in others partially; and in some not at all. In cases where it has not been torn, there would be hope from such an operation; and it is in these cases that the operation has been performed. Mr. Tyrrell has performed the operation since Mr. Cline, but both cases have terminated unfavourably. Whether future experiments may be attended with better success it is impossible to say. The proposal was laudable; the operation was easily performed; and as to the result, if the spinal marrow were not torn, there seems no reason why a person should not recover after such an operation. We are obliged, however, to speak doubtingly on this subject, since the first experiments have been unsuccessful. If you could save one life in ten, ay, one in a hundred, by such an operation, it is your duty to attempt it, notwithstanding any objections which some foolish persons may have urged against it. Suppose any one now present were in this state himself; suppose him put to bed with a paralysis of his lower extremities, and fully acquainted with the inevitable result if nothing were done; would he not be glad to have any attempt made to save him? Would it not be foolish and unmanly to say, he would rather die than have such an attempt made? The operation is not severe; it cannot add to his danger; and as to the pain, no man would regard it. In the two cases in which the attempt was made, the operation did not shorten life; on the contrary, there is reason to believe that it prolonged it. You will be justified, therefore, in making the attempt. Though I may not live long enough to see the operation frequently performed, I have no doubt that it will be occasionally performed with success. There is no reason why it should not; and he who says that it ought not to be attempted is a blockhead.

ON SUPPURATION AND ULCERATION OF THE SPINAL MARROW.

The only case in which I have had an opportunity of ascertaining this disease by dissection, was the following:

Case. A gentleman who resided eight miles from London, had, by a fall,

received a severe blow on his spine, which did not, however, produce any immediate ill effect. Some time after, having been much exposed to changes of weather, he was suddenly seized with pain in his back, which was followed by paralysis, retention of urine, and involuntary discharge of fæces. I was requested to see him on account of the retention of urine, and attended him for a length of time, for the purpose of using the catheter. For several weeks his symptoms remained unchanged, excepting the appearance of a troublesome sore on the nates. Towards the close of his existence, he complained of much uneasiness and distension at the upper part of his abdomen. His appetite failed, he rejected his food, and he had a great deal of fever, with quick pulse, and profuse perspiration. He gradually sunk.

Upon opening the spinal sheath, a milky fluid was found within it, just above the cauda equina; and higher up, about three inches, the spinal marrow was ulcerated to a considerable extent, and in that softened state which the brain assumes when putrefaction has taken place. All the other parts of the body were healthy, except the bladder, which was considerably inflamed. Dissection.

In a case like this, it will be necessary to employ cupping, or leeches, to prevent inflammation: subsequently, counter irritants, such as blisters, tartar emetic; issues, or setons, may also, in some cases, prove beneficial. Treatment.

I shall now proceed to describe to you

ANEURISM.

Aneurism is a pulsating tumour containing blood, and communicating with the interior of an artery. There is one exception to this definition, namely, where aneurism, as it sometimes happens, takes place in the heart. Definition.

Aneurisms are situated either externally or internally; that is, they are either so situated on the limbs as that access may be had to them, and the nature of the disease clearly ascertained; or they are so placed in cavities of the body, such as the abdomen, chest, External or internal.

and cranium, as to render the nature of the disease very often extremely doubtful.

Three stages of external aneurism.

With respect to external aneurism, the symptoms may be divided into three stages. When you have an opportunity of seeing aneurism in its early stage, you will find a small tumour pulsating very strongly—much more strongly than in subsequent stages; for it may be taken as a general rule, that the force of the pulsation is in the inverse proportion of the size of the aneurism. When an aneurism is first formed, it contains only fluid blood; and if you apply your finger to the artery between the aneurism and the heart, you will readily empty the aneurismal bag by the pressure. In this state there is scarcely any pain, and no other alteration in the limb than some irregularity of circulation, producing spasm in the muscles; and when the patient is going to rest, cramps in the legs, and sudden twitchings, which prevent him from sleeping.

Second stage.

The next state in which we find aneurism is, when the blood is beginning to coagulate in the interior of the sac, the coats of which are very considerably thickened. At this time, if you press on the artery, you may empty the sac in part; you will see the swelling re-produced when you take off the pressure. You cannot completely empty the bag by pressure, for a considerable degree of swelling will still remain. There is some degree of pain in the limb below in this stage of the disease, in consequence of the size of the swelling, and the pressure on the surrounding parts. The aneurism becomes a solid swelling, instead of a mere bag containing fluid blood, and the circulation is retarded by the pressure on the surrounding parts.

Third stage.

In the next stage the aneurism has acquired considerable magnitude, and the pulsation is in a great degree lost. Pulsation may be observed in some one part opposite to the opening from the artery, but it is seldom perceived over the whole swelling. A small portion of the blood still continues in a fluid state, but the greater part of it is filled with coagulum. In this state, if the aneurism be behind a joint, the motion of that joint becomes impeded. Popliteal

aneurism is one of very common occurrence; there is an enlargement behind the knee, just at the bend of the joint, with a pulsation; the foot and leg of that side are swollen; the swelling gradually increases, and the aneurism becomes of a dark colour; inflammation of the cuticle covering the sac ensues, vesication of the cutis, to the size of half-a-crown, takes place, and the skin in this part is quite insensible.

Mode in which life is destroyed.

In a few days an eschar is formed, the bag opens; bleedings, one after another, take place, and the destruction of life is the consequence. What you read in books respecting the mode in which death is produced in these complaints is, that the sac bursts, and the patient is destroyed by the sudden gush of blood; but I tell you, gentlemen, it is no such thing; it is not from the sudden bursting of the aneurismal bag that the person dies, but by repeated bleedings from the part. At first the bleeding is small, but as the eschar increases, and the separation of the parts takes place, it becomes more; the wound is produced by means of the sloughing process, like a slough in any other part, and an opening is formed which leads into the aneurismal bag. At the commencement the wound is small, and blood issues from the part; lint is applied to the wound, and the hemorrhage is stopped; but as the eschar proceeds, and the size of the wound increases, the hemorrhage returns; and thus, by repeated hemorrhage, destruction of life is produced, and not by any sudden discharge of blood from the sac; it is not in aneurism of the extremities only that death thus takes place, but in aneurisms that occur internally; in the chest, for instance, the same circumstances happen as I have just mentioned.

Not always fatal.

Aneurisms, if not operated on, are not always destructive of life. I have, however, known the bursting of an external aneurism cause immediate death. A man had an aneurism in the groin, which burst on his making an attempt to throw off his bed-clothes, and to raise himself in bed—he died in a few moments. I have seen gangrene of the foot and leg, as far as the knee, from aneurism, take place, without destroying life. I saw a case where the foot and lower part of the leg became gangrenous in a man labouring under popliteal aneurism; they sloughed off; amputation was

performed just above the ankle, and the patient recovered. Destruction of life then takes place in aneurism from repeated hemorrhage and gangrene. Gangrene of a small part of the limb in aneurism may occur, and still be remedied by means of surgical aid.

Aneurism of the heart.

The history of *internal* aneurism is different from that of the external. I will describe it to you in a few words, though the subject is by far too ample to be properly treated of at present. I mentioned to you just now, in the definition that I gave you of aneurism, that there was an exception to it, and that was the heart itself, when the subject of aneurism. Here is an aneurism (pointing to one on the table) of the heart; this and two others are all that I have ever seen; for what are often called aneurisms of the heart are not really so; they are a simple dilatation of the ventricles. An aneurism of the heart consists of a bag formed out of the parietes of that organ, and in this bag an opening is formed, as in the aneurisms which take place in arteries. In this specimen there is a bag formed of the parietes of the left ventricle, considerably larger than an orange, together with an opening which communicates with it.

Case.

The other instances which I have seen of aneurism of the heart are the following: A soldier of the guards had committed some offence, for which he was severely flogged; being a determined fellow, he resolved not to cry, and whilst he was receiving the punishment he held his breath; a short time after this he was seized with violent pain in the chest; Mr. Palmer, surgeon to the guards, was sent for, and he found him dying, as he thought, of ascites and œdema of the lower extremities. He soon died, and on examination it was found that there was an aneurism of the left ventricle, which had burst, as the pericardium was very much distended with blood.

Case.

Mr. P. of Chichester, surgeon to the militia, was sent for, to see a man who had symptoms of a diseased heart, and intermitting pulsation; he had also ascites and œdema of the lower extremities. This man died, and there was found an aneurism of the left auricle. A curious circumstance in this case was, that the blood had

insinuated itself into the coats of the left auricle; the aneurism was of the size of a walnut; its coats had given way, and nature, as it were, thus unloaded herself. These three cases of aneurism of the heart are the only ones that I have seen.

ANEURISM OF THE ASCENDING AORTA.

Aneurism of the ascending aorta, just at its commencement, where it is covered by the pericardium, is not of uncommon occurrence. Here are two examples of aneurism in that situation (pointing to the specimens on the table) of the size of a walnut; they had burst into the pericardium, which, on examination, was found filled with blood. I will give you a singular case, in order to put you on your guard, as you must expect to meet with thorns as well as flowers in the profession. A man was brought to the other hospital labouring under popliteal aneurism; I told him he must submit to an operation. In order to have the principal artery of the thigh secured, he sat down on the table, and was placed in the usual position; before I had quite reached the sartorius muscle, I saw him stretch himself on his back, and perceived urine coming from the penis. I immediately said, This is more than the expression of pain and the apprehension of danger. He got up, made a gasp; I took out a lancet, opened a vein, but no blood came. I then tried to obtain some from the jugular, but in vain; in three minutes he was quite dead. I said, gentlemen, as you have seen the death, you shall see the examination. He was conveyed to the dead-house; and the next day I opened the chest, and found the pericardium distended with blood, containing from a pint to a quart; and at the beginning of the aorta, just above the valves, there was an aneurism of the size of a walnut, which had burst. It is well that, in this case, the ligature was not applied, or the principal vessel divided, else the surgeon would probably have had the credit of killing the patient.

Case.

I mention this case to put you on your guard, that you should never operate for aneurism till you have ascertained whether there be one situated in any other part; for it frequently happens, that

Admonition.

aneurisms attack several parts at the same time. This I know, that a man came into this (St. Thomas's) hospital, with popliteal aneurism: and the operation was about to be performed, when, on account of a pain in the abdomen, it was postponed. Before the next operating day he had died suddenly, and, on examination, an aneurism was found between the two emulgent arteries. Well, then, before you operate for aneurism, see whether there be pain and pulsation in any other part.

LECTURE XX.

ANEURISM OF THE ARCH OF THE AORTA.

Absorption produced.

When an aneurism takes place between the heart and curvature of the aorta, you find, after a time, from the pressure of the aneurismal bag, the cartilages of the ribs become absorbed, as in the specimen before me (pointing to one on the table), where the cartilages of three of the ribs, and a portion of the sternum, have been absorbed; when the aneurism presses on the lungs, dyspnœa comes on, together with cough, and the complaint is obscure, but at last the fulness on the right side, and the pulsation to be felt by the pressure of the hand on the intercostal spaces, will enable you to distinguish this disease; then the ribs become absorbed, the aneurism presses against the pectoral muscle, absorption reaches the skin, and the sac bursts by the inflammation of the skin, the destruction of the life of the part, and the separation of the eschar.

Case.

I will mention to you a case, which shows how life may be prolonged sometimes by the formation of an artificial sac: a female in the other hospital had an aneurism of the ascending aorta; the skin had become inflamed, the eschar was separating, and a small quantity of blood was discharged; a clot of blood plugged up the orifice of the opening; pieces of lint were applied, over which was put some adhesive plaster, and lastly a bandage. She lived twenty-seven days afterwards; the opening of the wound,

however, gradually increased, and she died in consequence of inflammation of the interior of the aneurismal bag and aorta.

When, therefore, you are called to a person with an aneurism in this part, and when hemorrhage has come on, you can protract life by coating the wound with lint, and endeavouring to form an artificial sac; and by this means you give your patient two or three days, or weeks, to live, allowing him that time for making any preparation he may wish. These cases are, however, quite hopeless, and I have never known one spontaneously cured. Art may prolong life.

ANEURISMS OF THE ARCH BURSTING INTO THE TRACHEA.

These aneurisms are very frequent, and are to be seen just above the sternum. You will find that termination of existence takes place in different modes in these aneurisms. In the specimen before me (exhibiting one on the table), death was produced by the bursting of the artery into the trachea; it was given me by Mr. Davis, and was taken from a man, the subject of aneurism of long existence; rising from his bed one day, the artery must have burst into the air tube, cough came on with a sudden gush of blood, and he died, partly from suffocation, and partly from loss of blood. An aneurism of this kind often causes, by its pressure, dyspnœa and suffocation; it also often presses behind on the œsophagus, instead of in front on the sternum; it will be seen in the back, through the ribs, by the edge of the scapula, between its base and the spine.

Now, gentlemen, I will tell you one or two practical points here, to put you on your guard, and induce you to take great care in these cases. Mr. Dyson, of the city, called on me one day, and said that he had a patient with aneurism of the neck, which he thought was an aneurism of the carotid, and that he should like me to see it. I immediately went with him, and on examining, midway between the clavicle and lower jaw there appeared to be a collection of fluid proceeding to behind the sternum. I told Mr. Dyson, that I was very doubtful of its being an aneurism of the carotid. Some time after this, Mr. Dyson sent for me to go with Practical cases

him to examine the body of this person; we found a small pouch, just behind the sternum, proceeding from the curvature of the aorta. It was of very great importance that a ligature had not been applied: the sac would have been cut through, and destruction of life taken place.

Simulates carotid aneurism.

The late Mr. Burns, of Glasgow, who was an excellent anatomist, and who published a capital work on the surgery of the head and neck, wrote to me to say that he had a case of aneurism above the clavicle, and entertained some thoughts of tying the subclavian artery for it, and asked me some questions relative to it, to which I returned an answer, and said to him, take care, do not deceive yourself, for what often appear to be aneurisms of the subclavian artery, are really aneurisms of the aorta. The operation was not performed. (It is mentioned in Mr. Burns' work.) The patient afterwards died, and on examination it was found that it was an aneurism of the aorta; therefore I mention this to put you on your guard, for after what you have lately seen at Guy's Hospital, don't think the operation an easy one, and that it would add greatly to your credit to perform it. You might very easily mistake aneurism of the aorta for aneurism of the carotid or subclavian arteries.

ANEURISM OF THE ANTERIA INNOMINATA.

These cases in general do not allow of an operation being performed; there is no room for the ligature. Dr. Mott, of America, has put a ligature on this vessel; and for a time the patient appeared to be doing well; but he afterwards died. The operation did him much credit: few would have dared to perform it; and those who might have dared, probably would not have known how. Dr. Mott is an excellent anatomist, and an industrious man.

ANEURISM OF THE DESCENDING AORTA.

When the descending aorta is the subject of aneurism, in its course through the posterior mediastinum, it very often breaks into

the œsophagus, as in the preparation before me (pointing to one on the table), and a similar instance of which may be seen in the museum of the other hospital; when an aneurism presses on the œsophagus, adhesion of the coat of the sac to the œsophagus takes place, and afterwards an opening between the aneurismal bag and gullet is formed; the patient vomits a considerable quantity of blood, and soon dies. I have seen three instances of this kind of aneurism in persons who have died of some other complaint.

ANEURISM OF THE ABDOMINAL AORTA.

When the aneurism is situated above the cœliac artery, a pulsation may be distinctly felt at the scrobiculus cordis; and a symptom which distinguishes this complaint is, that the pressure on the stomach caused by the aneurismal bag produces nausea and vomiting, and small quantities of food are immediately rejected. There was a case in this hospital of aneurism just above the cœliac artery, where the patient had frequent vomiting, constant nausea, and could not bear to take any food. When the aneurism is lower down in the cavity of the abdomen, it often bursts into the intestine. Here is a specimen (holding it in his hand), where there is an opening in the jejunum and the fore part of the aneurismal tumour, of which the patient died. It was taken from a near relation of an eminent physician. Dr. S. brought him, in order that I might give my opinion of a pulsation in the abdomen; he dined with me, we made as light of it as possible, and he was very cheerful at dinner; three weeks afterwards I was sent for, to Henley, to visit him; he was seized with discharge of blood by stool; he revived a little, and hopes of recovery were entertained by his friends; the following morning, however, the discharge of blood returned and he died suddenly.

Symptoms.

Sometimes bursts.

Case.

When the aneurismal tumour presses on the spine, absorption of the vertebræ takes place, as in this instance (exhibiting a specimen); you will also find a large swelling in the loins; but you must be on your guard respecting this swelling, lest it be mistaken

Absorption of the vertebræ.

Confound with lumbar abscess

for any other complaint. One of the surgeons of this hospital, but who is since dead, had a patient with a swelling in his loins; this the surgeon took for lumbar abscess; he took out his lancet, and introduced it obliquely, when some florid blood issued by the side of the instrument. Adhesive plaster was put to the wound, and it healed; he died, however, from the bursting of the aneurismal sac internally. On examination it was found that the swelling was from the aneurismal tumour, the lancet had not penetrated into it, but wounded its coats. There is no pulsation to be felt in the loins from those tumours, nor was there any in the case I have just mentioned, and this is owing to the distance of the swelling from the aorta; thus men that are well informed in their profession may commit mistakes in these obscure cases.

Appearing at the ischiatic notch.

Aneurisms form in the cavity of the pelvis, in the ischiatic notch, and under the gluteus maximus muscle; you will be on your guard, therefore, when you find tumours on your nates. A man was sent from Gainsborough to the other hospital with an aneurism or tumour on the nates: I hesitated at first respecting its nature; hemorrhage came on from the bladder, when it was immediately thought that the aneurism adhered to the bladder, and an opening into it had been formed, as it was afterwards found to be the case on examination. This is all it will be necessary to say to you on the subject of internal aneurisms, as the symptoms will vary according to the seat in which the disease may be found; the digestive organs will be in fault at one time, the urinary at another, according to the part on which the pressure of the aneurismal sac may rest; from the variety of symptoms, the diagnosis will of course be found to be difficult.

ON THE SIZE OF ANEURISMS.

Number and magnitude.

The aneurism before me is the largest I ever saw (a beautiful specimen was here exhibited): it begins in the aorta at the emulgent arteries, and extends into the cavity of the pelvis. It contained blood (and I am not exactly certain how much), but of an enormous

weight. Here (showing another specimen) is a popliteal aneurism of considerable size. The greatest number of aneurisms that I have seen in one case is seven, and this specimen on the table was taken from the man to whom I allude. He died of an aneurism at the bifurcation of the aorta; he also had one at the opposite ham, two above it, one in the groin, and two others. The iliac artery had been tied for femoral aneurism, and the patient did well for some time, but afterwards died. This man was a bricklayer's labourer; had been accustomed to mount ladders, and carry weights up great heights; had been in the habit of exercising his lower extremities a good deal: he was not very muscular, and the fatigue of his occupation was more than he could bear.

Local and constitutional.

I may observe here, that some aneurisms are local, and others general; when they occur in the ham, they are frequently only local; but when between the groin and ham, or in the middle of the thigh, you very commonly find disease of other arteries. Therefore, in popliteal aneurism, you expect to find the aorta and larger arteries healthy.

The age at which they occur.

The age at which aneurisms generally occur is from 30 to 50; at that age, exercise is considerable and strength less. In very old age this complaint is not so common. I have seen a popliteal aneurism in a man of 80, four or five years ago, at the other hospital: on this man I tied the femoral artery, and he did extremely well. On a man of 69 I have operated, and that case did well. I saw a boy in this hospital, eleven years old, with aneurism of the anterior tibial artery. The man of eighty is the oldest, and the boy of eleven the youngest, that I have seen with aneurism. It is more commonly met with between 30 and 50, or rather between 30 and 40, than after that time. In cases of aneurism, the age is no objection to the operation.

Sex.

With respect to the sex in which aneurism chiefly occurs, the male is certainly much more frequently the subject of it than the female. I should say that the proportion of males to females is about five to one: and if we take only cases of popliteal aneurism, the proportion of males would be considerably greater. When

aneurisms do occur in females, they are generally internal. Females are rarely the subjects of aneurism in the limbs; the reason of which is, that they do not exert them so much as the other sex. In the course of my practice, taking hospital and private practice together, I have seen about eight cases of popliteal aneurisms in the female. The number of popliteal aneurisms which I have seen in the male is of course very considerable.

ON THE FORMATION OF ANEURISMS.

How produced. It is necessary that you should clearly understand the manner in which aneurism is produced. The first circumstance that takes place in an artery which is about to produce an aneurismal swelling is, that it becomes opaque, and slightly inflamed. A small yellow spot appears in the part where the aneurism is afterwards formed, and there is a slight efflorescence surrounding it. The process of absorption afterwards takes place, and thins the coat of the artery, so that the texture becomes like that of a fine web. At the same time that this takes place, nature begins to set up a process of defence, which is beautifully exemplified in a preparation (it was exhibited to the class) made from the first aneurism which I had an opportunity of dissecting. This was an incipient aneurism of the aorta; you perceive that the coat of the artery has been absorbed, and opposite to the parts absorbed you observe a layer of adhesive matter, by means of which a defence is set up for the coat of the artery, and the progress of the disease for a time resisted. A covering is thus produced by the adhesive inflammation which shuts up the artery, so as to prevent the immediate escape of the blood.

This preparation not only beautifully illustrates this process, but, by holding a candle on the opposite side of it, you will also observe the opacity which I have just described. As the coat of the artery becomes absorbed, the cellular membrane is glued by this matter to the outer surface of the artery. The next substance which becomes absorbed, if it be an aneurism of the ascending aorta, is the pleura, which forms a portion of the aneurismal bag. Then the lungs

become absorbed, and form a portion of the bag; next the intercostal muscles, with the cartilages of the ribs; then the pectoral muscle; and at last the skin itself, forming the parietes of the aneurism, give way, and there is no longer any thing to prevent the escape of the blood.

Former opinions.

Every aneurism was formerly supposed to be produced by the dilatation of the coats of the artery; but it has been found that this is not the case. It is generally produced, not by the dilatation, but by the absorption of the coats of the artery. For this knowledge we are indebted to Scarpa, who first accurately explained the mode in which aneurisms are produced. He thought they were always produced in this way; but they are sometimes, though rarely, formed in the way in which they were formerly supposed to be uniformly produced; namely, by dilatation. Here is a specimen of an aneurism of the aorta, in which the pouch is formed by dilatation, the coats of the artery still remaining.

Cause of aneurism.

The general cause of aneurism is a diseased state of the coats of an artery, by which it becomes altered in its appearance, and thinner in its texture; but this, although the most frequent, is not the only cause of the disease, for sometimes the artery becomes dilated in its whole circumference, as may be seen by two beautiful specimens in our museum.

Bursting of an artery.

Aneurisms are now and then the effects of the bursting of an artery, under some considerable exertion. I have known two instances of this kind. A gentleman who was out shooting, jumped over a ditch, when, on reaching the other side, his foot slipped, and he fell back into the ditch. At this moment he felt something snap in his ham, and when he attempted to walk, he found himself lame from the accident. He was attended by Mr. Holt, a surgeon, at Tottenham, and was afterwards brought to town, where he underwent an operation for popliteal aneurism. In this case, the aneurism began to form within a very short time after the accident, and it was not more than from three to five weeks afterwards that the operation was performed.

Case.

Case.

The other case in which I have known an aneurism produced by

the bursting of an artery, occurred as follows:—A gentleman whom I was attending for another complaint, in attempting to raise himself in bed upon his hands, felt something snap in his right hand. When I next visited him, he told me the circumstance, and requested me to look at his hand. Upon putting my finger upon it, I felt a pulsating aneurismal swelling. I tried what could be done by pressure; but as this did not succeed, I found it necessary to tie the radial artery at the part where we usually feel the pulse. In this case, a bag of considerable size was formed by the cellular membrane, instead of the usual mode.

Aneurism from a puncture.

A pointed body introduced into an artery will produce all the appearances of aneurism, and require the same treatment. In whatever way, in short, aneurism is produced, the surgical treatment of it will be the same.

Dissection of aneurism.

A curious circumstance may be observed in dissecting an aneurism, after having turned back the aneurismal sac. You would suppose that when you had made an incision in the parts, you would immediately find the cavity in which the blood is contained; but this is not the case. On the inner side of the aneurismal sac a wall of adhesive matter is deposited in layers, so as to enclose the blood as completely as the aneurismal sac itself. Here is a preparation in which the aneurismal sac has been taken away, and yet you find a bag remaining entirely formed of layers of adhesive matter on the outer side of the aneurism. The process by which nature throws up one layer of adhesive matter after another, until a complete bag is produced, is beautifully illustrated in this preparation.

Diagnosis.

You may distinguish aneurism from other diseases by the following marks:—If the aneurism be recent, by pressing your finger on the artery which leads to the aneurism, you will empty the aneurismal bag; but if the aneurism be of longer duration, and the pulsation be but slight, place yourself by the side of the patient, observe carefully the size of the swelling, and, by pressing your finger on the artery above, you will see the aneurism sink down as

you make the pressure, though the sac will not entirely empty itself; and upon raising your hand suddenly, you will observe a jet of blood rush into the aneurismal sac, and raise it to its former height.

In this manner an aneurism may be easily distinguished from another tumour deriving its pulsation from an artery: in the former case, the pulsation will be felt over every part of the tumour, in the latter there will be no pulsation, except in the direction of the artery. I have hurried over some parts of this evening's lecture, as it is my intention to show you the operation for popliteal aneurism, having a subject which will answer the purpose extremely well. I shall postpone, therefore, some remarks which I have to make upon the medical treatment of aneurism, and proceed at once to speak of the surgical operation for its cure. Known from tumour.

ON THE CURE OF ANEURISMS.

Aneurisms sometimes undergo a spontaneous cure. This is a circumstance which you should bear in mind, because in cases where they are so situated as not to admit of surgical relief, it is a consolation to the patient to know that these diseases now and then cure themselves. There are many examples of such a spontaneous cure: I have myself seen some, and many more are to be found in surgical and medical authors. Spontaneous cure.

There is a preparation before us, taken from a man in the other hospital, who had an aneurism, situated just below the groin, which underwent a spontaneous cure. He was sitting before the fire, in one of the wards of the hospital, when he felt something burst in the upper part of his thigh. On examination, he found no blood had issued out, and, in fact, the aneurism had not yet reached the skin so as to be adherent to it. His thigh was, however, enormously swollen; he was unable to use the limb, and was put to bed by the other patients. For three days after a pulsation was found in the aneurism; it then ceased, and the size of the limb began to diminish. At the end of four months the aneurismal swelling had considerably Case.

diminished, and he recovered the use of the limb. Six months after he first felt this sensation, and when he had been discharged from the hospital, I met him as I was walking across the square of the other hospital, I said to him, "Why, Powell, you seem low-spirited; you ought to be cheerful, for you have had a very narrow escape." "Yes," said the man, "I am pretty well, sir, except that I have something alive in my belly." "I hope you have," said I, "for it would be rather awkward if you had not." On putting my hand on his abdomen, I felt a pulsating swelling there. This aneurism shortly afterwards burst into the abdomen, and the man died. On examination of the body, it was found that the aneurism in the thigh, just below Poupart's ligament, had burst under the fascia lata; a great accumulation of blood took place, which pressed upon the vessel, and the femoral artery was obliterated. Sir W. Blizard had a patient at Walworth, with popliteal aneurism, which was cured spontaneously. Mr. Ford mentions several cases; and Dr. Baillie met with two cases of carotid aneurism, which cured themselves. Mr. Crampton, the surgeon-general at Dublin, has given an account of a case in which the aneurism gradually wasted in the abdomen, and obliterated the aorta.

An account of a similar case has been given by Baron Larrey, the French surgeon. An Irish gentleman, whose name does not at this moment occur to me, in passing through this metropolis, on his way to Paris, showed me a preparation from a case of spontaneous cure of aneurism, in which the aorta was obliterated at the loins.

Medical treatment.

From the medical treatment of this disease, I must confess that I have seen but little advantage. Mr. Brown, a surgeon, who had an aneurism of the aorta, was exceedingly strict in his diet and in his exercise; but he lived only a very few months. A gentleman, who had an aneurism of his aorta, took four ounces of food three times a day, and refrained almost entirely from exercise; and although he began this plan in August, almost as soon as the disease was distinctly discovered, yet he died in the following February. The result of my observation is, that two measures only

are useful; the one, abstraction of blood from the arm, when the pulse is hard and full, from which I have seen undoubted benefit arise. The other, the administration of the carbonate of soda, in considerable doses, which, with entire rest, seem to prevent the increase of the swelling: but the soda is at last obliged to be abandoned, on account of its producing petechiæ; the irritability of the body is often so increased by an anti-phlogistic treatment, that the quickness of the pulse which follows, does as much injury as the natural force of circulation.

On the operation for aneurism.

As the spontaneous cure of this disease, however, cannot be so far depended upon as to prevent us from performing the operation in all situations where the artery is accessible, I shall proceed to describe to you the mode of performing the operation in the different parts of the body, confining myself in this evening's lecture to the operation on the femoral artery. As we are occasionally under the necessity of performing the operation as it used to be done thirty-five or forty years ago, I shall, in the first place, say a few words on the old operation.

Old method.

The operation for popliteal aneurism used to be performed in the following manner:—A tourniquet was placed on the limb, and the patient laid upon his face. An incision was then made in the ham, to the extent of the aneurism, and the adhesive matter and coagulated blood removed from the excavation thus made. The aneurismal bag was then wiped out with a sponge, and the tourniquet was slightly loosened, in order to mark the orifice of the artery. The surgeon stood ready with a probe in his hand, and as soon as he saw the blood issue from the upper orifice, he passed it into the artery, and then separating that portion of the artery from the remaining parts, put a ligature upon it. When he had done this, he again loosened the tourniquet, and as soon as he saw what appeared to be venous blood spring from the lower portion of the artery (for the blood from the upper portion of the artery is florid, as arterial blood usually is, but in the lower portion it has the appearance of venous blood), he introduced the probe into the orifice, and put a ligature on the artery as before. An operation like this,

which exposed a very considerable surface, where the artery in the vicinity of the aneurism was diseased, and by which the bones were frequently injured, from the ulcerative process taking place, necessarily led very frequently to fatal results; so frequently, indeed, that it was a disputed point among the profession whether it was better to amputate in cases of popliteal aneurism, or to perform this operation. A man who had recovered after the old operation for popliteal aneurism could, formerly, get money by showing himself at the hospitals; at present it would not be worth a man's while to beg in this way.

Improved by Hunter.

It is to the transcendant talents of that immortal genius Mr. John Hunter, that we are indebted for the great improvement which has taken place in this branch of surgery. But for Mr. John Hunter, we might still have the same difficulties to encounter, and patients labouring under this disease might still have been exposed to the same danger. Mr. Hunter being an excellent physiologist, and an admirable anatomist, applied the powers of his active and inquiring mind to this subject. He said, " I have frequently tied the femoral artery in animals, without injury; why should not I put a ligature on the artery, in the same way, in the human subject?"

Hunter's first efforts.

It is right, however, to observe that Mr. Hunter was led to this train of thought by having under his care a case of popliteal aneurism, of such extent as to have reached the tendon of the triceps, so that there was no room for the application of a ligature between the aneurismal sac and the tendon. He determined, therefore, to make the experiment of tying the femoral artery, rather than amputate the limb. The first operation was not, as might be expected, performed in the very best manner. He was not content with a single ligature, but applied several, which were left hanging out of the wound, and which were afterwards discharged by a process of ulceration. Yet under all these disadvantages, the patient recovered, and lived rather more than twelve months after the operation. On dissection, it was found that the femoral artery was obliterated as far as the arteria profunda. Since Mr. Hunter's time, several slight alterations have been made in the operation for

popliteal aneurism, as every surgeon has his whim; but the principle established by Mr. Hunter remains the same, and that great surgeon has the undoubted merit of having substituted a simple and beautiful operation for one of very considerable difficulty and danger.

The operation for popliteal aneurism described.

I shall proceed to point out to you the several steps of the operation for tying the femoral artery in cases of popliteal aneurism. Mr. Hunter used to make the incision in the middle of the thigh, but experience has shown that it is better to make it one-third of the space downwards from the ilium to the internal condyle of the os femoris, because the artery is more deeply seated in the middle of the thigh than it is higher up; and there are, besides, many anastomosing vessels in the former situation. There are four steps in this operation: first, an incision through the skin, which lays bare the sartorius muscle; secondly, the division is to be continued along the inner edge of the sartorius, exposing the sheath of the femoral artery; thirdly, the incision through the sheath; and fourthly, the putting of the ligature round the vessel. I now make the incision, about four inches in length—[the learned professor proceeded to perform the operation on the dead subject]—which completely exposes the sartorius muscle; I then separate its inner edge from the parts with which it is in contact; this lays bare the sheath, and I now find the femoral artery and the vein exposed. There is a little septum between the artery and the vein, which you should take care to observe. Introduce the aneurismal needle under the artery, taking care to disturb the parts as little as possible. Separate the cellular membrane to the extent of about an inch; and take care not to include the saphena nerve, which is a small branch of the anterior crural nerve, in the ligature. If the saphena nerve should be taken up, you will ascertain it by the irritability which is immediately excited. Having brought the ligature under the vessel with the aneurismal needle, all that remains is, to tie it with what is called a surgeon's knot, which does not slip. In this consists the whole operation. If you should have separated the artery from the sheath to any considerable extent, two ligatures will

be necessary, which must be applied close to the part where the vessel is connected by the cellular tissue to the sheath; but if you should not have disturbed the artery, one ligature will be sufficient.

LECTURE XXI.

OPERATION FOR POPLITEAL ANEURISM.

Medicinal treatment.

As the time of last evening was occupied in performing the operation for popliteal aneurism, I left one or two points unnoticed which it will be important to bear in mind, therefore I will state them now. In the first place, it has been conceived that considerable relief might be afforded in cases of aneurism, by medical treatment. It is natural to expect that if by any means the action of the heart and arteries be diminished, the result would be that the aneurismal bag would yield less, and consequently be reduced: experience does not, however, justify this conclusion. I will tell you a case which exemplifies the truth of what I state.

Case.

A gentleman came to town, and was operated on for popliteal aneurism; he recovered in the usual time, no untoward circumstances occurring during his recovery; in twelve months afterwards, he became afflicted with aneurism of the aorta, just at its curvature. He came to London, and having been under my care before, he applied to me again. On examination I discovered the aneurism. A consultation was held on this patient in July, when it was agreed that he should be kept low, be occasionally bled, and be allowed small quantities only of animal food, as it was hoped that by this means the action of the heart and arteries would be considerably lessened. Well, this regimen was prescribed in July; the patient adhered very rigidly to it; but the February following he died, from the bursting of the artery into the chest, having lived a shorter period than usual in these cases. Now it is probable that he would

have survived longer, had he been treated otherwise; and I will explain to you how it is that keeping the patients so low does not agree with them; by keeping them so low, the constitution is rendered irritable, and then whatever is lost in the momentum of the circulating fluid, is gained in velocity. I have seen loss of blood in the treatment of aneurisms occasionally useful. When the chest is affected, and breathing laborious, it will be right to take blood; and the best state in which the body can be kept is a little below par; that is, a little under the natural state. Strict attention must be paid to regimen; and it would be highly improper to give stimuli of any kind.

Cure by pressure.

The second point is the chance of obtaining a cure by the application of pressure on the artery or aneurismal bag. Very many years ago, I had an iron ring made, with a pad on the outer side, and a screw on the opposite: this was put on the limb, pressure on the outside was made against the thigh, and on the inside against the artery; the use of this was worse than the operation. I applied it on a man at the other hospital, and I will tell you how long he kept it on—twenty-four hours only. In three hours from its first application he began to complain of pain; in a few hours afterwards it became worse; and in less than twenty-four hours the man said that he would submit to any operation rather than suffer the pain: therefore it is impossible to practise it. I have tried the same experiment on the upper extremity, but without its leading to any useful results. This plan of pressure on arteries does not succeed, and therefore ought to be abandoned.

Later improvements.

Well, gentlemen, I will describe the alterations which have taken place in the mode of performing the operation for popliteal aneurism since the time of Mr. J. Hunter. Mr. Hunter made the incision in the middle of the thigh; the spot where it is made at present is one-third down, as in the middle of the thigh the artery is deeper situated; well, therefore, one-third down the thigh is the place where you ought to operate. Now, Mr. Cline (with whom I formerly lived) thought that it would be an improvement in the operation, if, instead of allowing the ligature to remain till the

process of ulceration had begun, he removed it before that period, that hemorrhage might be prevented, and the operation rendered simple; and in the first case of popliteal aneurism which he had after he thought of this plan, he tried the experiment, laid bare the artery, applied a broad ligature, and tied it firmly on the artery; but in order to prevent the knot slipping, he put between it and the vessel a small piece of cork. The first case on which he tried this, succeeded perfectly well. [Here the learned professor, pointing to a specimen taken from the man on whom this experiment had been tried, showed that the artery was quite obliterated.] The ligature remained on till the adhesive process had begun; but before ulceration had taken place, the wound suppurated, and ultimately closed. The patient died some time after of an affection of the lungs; and on examination of the body, the artery was found as just described; but on repeating this mode of operation, it was soon ascertained that it produced more irritation than the other. Here is an example (pointing to a specimen), in which the artery ulcerated a short time after the broad ligature had been applied; it led to great irritation, and the process of ulceration was rendered more speedy; therefore the operation cannot be performed; and Mr. Cline, with all the candour for which he is so remarkable, gave it up, as an operation, however feasible, yet one that was attended with considerable risk.

Mr. Abernethy's method.

Well, then, it has been proposed, and very ingeniously, by Mr. Abernethy, that two ligatures should be applied, and the artery divided between them. Now this idea arose from the circumstance, that where the ligatures are applied to arteries after limbs have been removed, no hemorrhage comes on; but the two cases essentially differ: in the one, where amputation has been performed, retraction of the artery, before the application of the ligature, has taken place; it is already drawn into the cellular tissue, and there is no danger of after hemorrhage from its retracting any more: but in the other, where ligatures are applied on arteries for the cure of aneurisms, as soon as the process of ulceration commences, hemorrhage often ensues from the retraction of the vessel, which

had not taken place before. I had a case in the other hospital, which was going on well to the fifteenth day, when, as he was lying on the bed, a sudden rush of blood occurred, and had there not been a dresser in the room at the time, he must have died; ligatures were applied a second time. If an artery is whole when the ligatures are applied, separate it from the cellular membrane sufficiently to allow of retraction: but if the artery is divided, as after amputation, there will be no occasion, as the vessel has already retracted before the ligature is applied, and this is the reason that there is less danger from hemorrhage when one ligature only is applied, than when there are two.

Mr. Cline's experiments.

But this operation led to another dangerous consequence—there was the danger of the slipping of the knot. Mr. Cline, senior, in the operation for popliteal aneurism, put on two ligatures, and whilst the dresser was sitting by the patient, hemorrhage came on; the tourniquet was instantly applied, and Mr. Cline sent for: when he came, on looking into the wound, he saw one of the ligatures loose, and floating in the blood. On examination, he found that the ligature had escaped from the upper part of the artery, and that the lower one had nearly slipped. He immediately applied two fresh ligatures. Therefore there is the danger of the knot slipping where there are two ligatures used; and on this account it has been recommended that a needle should be put through the artery, with a fine ligature in it, as by this means the danger from hemorrhage would be prevented.

Dr. Jones's method.

It was found by Dr. Jones, who has written an excellent work on the methods nature adopts in restraining hemorrhage, that if fine ligatures were applied on arteries, they would cut through the internal coat, and leave the external undivided; the elastic coat would remain whole. He tried experiments on animals, and from these he learnt that, when fine ligatures are applied, inflammation takes place, and the adhesive process is, in a very short time, produced, by which means the canal becomes obstructed; he therefore recommended, that in operation for aneurisms, fine ligatures should be applied only for a few hours, and then removed.

Experiments.

In consequence of this, I adopted the plan in the case from which I took this specimen (pointing to one on the table), in order to see if it would succeed; it has been tried in the following cases, and is an operation that ought not to be performed. In the first place, a fine ligature was put on the femoral artery, tied tightly, and in a few hours removed; the result of the operation was, that the pulsation was stopped for a short time, but in a few hours it returned, and the size of the aneurism began to increase. A consultation was held, and it was determined that a ligature should be applied in the usual way, and allowed to suppurate and ulcerate, and the patient did extremely well. In two other persons I tried this plan; one for an aneurism on the popliteal artery, the other for an aneurism on the radial artery: in the first case I used a fine thin ligature, and tied it very tight; in thirty hours I loosened it. Now, when this man was on the table, I said to myself that the operation was not founded on a right principle. I looked at the wound and saw that the adhesive process had commenced, and that in drawing the ligature out, I had destroyed all the adhesions which nature had set up: the pulsation had not ceased, and I pulled the ligature tight, and allowed it to remain forty-two hours longer, and then removed it; thus, after the lapse of seventy-two hours in the whole, it did not return. Thirteen days after this, as I was coming into the square of the other hospital, one of my dressers said that hemorrhage had come on from the man in Job's ward, from whom the ligature had been removed, and that it was evidently arterial. I said that this was exceedingly curious. I went up, and found that it was the case; a tourniquet was applied; the hemorrhage did not return, and the patient did extremely well. If the ligature, after being on for seventy-two hours, does not produce adhesion, the uselessness of *temporary ligatures* does not admit of a doubt—*they ought to be abandoned*. In the aneurism of the radial artery, I removed the ligature twenty-four hours after it had been applied, but the pulsation returned; I made an incision on the tumour, and applied a ligature above and below, and the aneurism was cured.

Trials of various ligatures.

It would be an extremely desirable thing if any person invented

a ligature composed of materials which would admit of solution: he would, by such an invention, greatly serve his profession. It has been said, that ligatures formed out of the untanned skins of kids will answer such a purpose; that they will become absorbed; but they do not, I understand, succeed. I thought that a ligature made of catgut would admit of solution, and I tried it on a man of eighty years of age, on whom I performed the operation for popliteal aneurism: the catgut ligature was cut close to the vessel; the wound healed over, and no bad symptom followed. The experiment succeeded, it is true, in this case; but I have used the catgut ligature in three other cases since, and did not find it at all superior to the common ligature: in each of the three cases, it came away by suppuration and ulceration, as in common cases; it did not therefore succeed. In the old person there was less tendency to inflammation, and that was the reason of it succeeding.

Experiments on dogs.

I made some experiments on dogs, with a view to ascertain the solubility of catgut. I tied the carotid of a dog, and used the catgut ligature; in a fortnight after I killed the animal, and found that the ligature had not been dissolved, but that it had cut through the artery, and was situated in a cyst, like that which is formed round a ball, between the divided ends of the vessel, in a quiescent state; therefore this substance does not admit of solubility, but will remain sometimes without producing irritation. On the whole, catgut ligatures are not at all superior to the common ones. Some animal matter of the form of gluten, made into ligature, might do; but this is mere conjecture. At present there is no ligature known which is capable of being dissolved and removed by the absorbents.

The mode of ligature.

Well, gentlemen, I have made all the observations respecting the improvements in the operation for popliteal aneurism that I intended, with the exception of the plan of cutting the ligature close to the knot, and then leaving it to its fate, and to come away as it can; but experience shows that the irritation which is produced by this mode is attended with great mischief. This is the plan Mr. Hunter adopted, when he put the ligature for the first time on the femoral artery, in operating for popliteal aneurism; the wound closed

kindly, and the ligature afterwards came away by suppuration and ulceration. Since Mr. Hunter's time it has been tried again, but is now nearly given up by all in the profession.

Present mode. On the whole, rest assured, that the best mode of applying the ligature is that now commonly adopted; tie a tight knot with a fine ligature, and then cut one end of the ligature close to the vessel, and let the other hang out of the wound. If, in the operation, the artery has been disturbed much from the surrounding cellular membrane, for an inch or so, apply two ligatures, and divide the artery in the centre, and there will be room for the retraction of the artery; but if, on the contrary, it has not been much disturbed, apply only the single ligature; broad ligatures must, however, on no account, be used, as they are very likely to produce constitutional irritation, and consequently cause the parts to suffer for a great length of time.

After treatment. When the operation is performed, what you should do is this: you are to bring the integuments close together by means of strips of adhesive plaster, leaving, however, a small space between each, so that the matter may escape through the interstices. No bandage, or roller of any sort, should be applied, as the blood-vessels of the limb would be compressed by them, and injury be done to the part. As for the position of the limb, it should be placed on a pillow, and on its outer side. If the patient were to rest on his heel, two evils would be likely to arise; first, there would be the necessity of supporting the knee by placing something under the ham which would stop the circulation in the vessels of the part; and, secondly, there is danger to be apprehended from gangrene, from the heel resting long in one position, as this is apt to produce sloughing of the parts. The outer position, then, is the one you should choose, occasionally changing it, so as to prevent pressure in any one particular part.

Warmth necessary. Be on your guard, gentlemen, to preserve the warmth of the limb, for there is danger from gangrene in cold weather. Some years ago, I was very near losing a patient by not attending to this

Case. circumstance. A young gentleman on whom I had performed the

operation for aneurism, complained when I visited him (which was in the evening of the same day) of a weight in the foot: this induced me to look at the limb, which probably I should not otherwise have done, and I found that the foot was quite cold and benumbed, which was occasioned by there being no fire in the room at a time when the weather was very cold. I sat down by the bed-side of the patient, and kept rubbing his leg and foot with a warm flannel till heat was restored to the limb. Ever since that time I have wrapped the limb up in a piece of flannel or a stocking, and sometimes put jars filled with hot water to the feet, particularly if the weather is cold, then the part will be preserved gently warm.

A dresser's ignorance exposed.

I once saw a patient lost by the folly of a dresser at the other hospital. In the evening after the operation, seeing the limb a little swollen, he said to the sister, "Suppose you apply the white wash (liq. plumbi. super. and water) to this?" On the following morning gangrene came on, in consequence of the cold produced by the evaporation; power of the circulation in the limb became destroyed, and the patient died.

Circulation maintained.

The means by which the circulation is carried on when the femoral artery is tied is by the arteria profunda; from this, anastomosing vessels are sent off, which communicate with branches from the anterior tibial. It sometimes happens that the aneurism will be reproduced by means of a vessel which comes off above the part where the ligature is applied, and enters the artery just above the aneurismal sac, and thus reproduces the aneurism. I scarcely should have mentioned this to you, if I had not seen an instance of this a short time ago, in a man at Guy's, who had been operated on by Mr. Key for popliteal aneurism, and who was discharged cured. This person came back to the hospital with another swelling in the ham, and a pulsation in it, in the same spot as the former aneurism: he had suffered considerable pain; the integuments of the knee were very rigid, and the bone, from the long-continued pressure on it, had become in a diseased state. I amputated the limb, and found the aneurism reproduced of the original size, and an artery could be distinctly traced going from a little above the tumour up the thigh.

Aneurism reproduced.

It therefore happens that aneurisms are reproduced by means of arteries which proceed from above the spot where the ligature is applied, to just above the aneurismal sac: these cases are, however, extremely rare.

Separation of the ligature.

The time at which the ligature separates is generally from the twelfth to the fourteenth day; the fourteenth day is generally the extreme; the twelfth day the minimum of separation; but it is variable according to the different kinds of ligatures used. I have seen a ligature remain on as long as twenty-eight days, where a broad one had been used; I have known a ligature come off as early as the fifth day, but in this last case it was put on the brachial artery for a puncture made in bleeding; on the eighth day it had come off, and no hemorrhage ensued; therefore, if early inflammation ensues, the separation will be repaid; but if there be a broad ligature, and the inflammation indolent, it will be from twenty-five to thirty days. Here let me give you one or two practical hints. If the ligature comes away, and without any hemorrhage, you will think the patient safe: he is not so by any means.

Case of a sailor

A man was pushing a knife through a cable, when it slipped, pierced the left thigh, and wounded the femoral artery; a tourniquet was applied, the best that could be made, for the accident happened on board a vessel in the river; he was brought to Guy's Hospital, and I was sent for. On my arrival, I found the knife had perforated the artery, and therefore applied a ligature above, and below the vessel; on the fourteenth day, they separated, about nine in the morning, I believe; about twelve he began to wash and clean himself, and soon after a jet of blood took place. I was sent for, applied other ligatures, and he was obliged to keep his bed nearly as long as before, though I think the ligatures separated a day or two sooner. When they separate, therefore, be on your guard, and let the patient remain quiet two or three days afterwards.

Aneurism of the anterior and posterior tibial arteries.

The operation which has been shown to you, gentlemen, for popliteal aneurism, is the one used for aneurisms of the anterior and posterior tibial arteries, situated at the upper part. I saw Mr. Lucas, the father of Mr. Lucas, the late surgeon at Guy's, perform

that operation for aneurism of the anterior tibial artery. But this operation is not to be performed when the aneurism in these arteries is near the foot; I have not seen an aneurism of the posterior tibial behind the inner malleolus, but I have of the anterior tibial on the front of the foot. I saw Mr. H. Cline, in an aneurism of the anterior tibial, cut down on the tumour, and apply a ligature just above it, but it did not succeed. In these aneurisms, you must make an incision on the sac, and apply a ligature both above and below it. The femoral artery sometimes forms an aneurism just opposite, the hip joint and below Poupart's ligament. I have also seen it at the origin of the arteria profunda; but if the aneurism be placed any where between the groin and the middle of the thigh, it would be better to tie the external iliac artery.

Inguinal aneurism.

LECTURE XXII.

ON THE TYING OF ARTERIES.

We are, this evening, gentlemen, to consider the subject of the taking up of the arteries, in the different parts of the body, for aneurism.

THE APPLICATION OF A LIGATURE ON THE EXTERNAL ILIAC ARTERY.

It is not at all an uncommon occurrence to meet with an aneurism of the femoral artery just below Poupart's ligament, of which here is a specimen (pointing to one on the table), exactly similar to the aneurisms which occur in the ham. Now, with respect to recurring to the operation in this complaint, I have performed it in nine different instances for aneurism of the femoral artery: one of those persons was a surgeon, who has since married, and is extremely well. The mode in which the operation is performed is as follows:—

The operation described.

First incision. [There was a subject on the table during the whole of the lecture, on which the learned professor showed each operation.] I do not make a straight incision in the course of the artery, but one of a semilunar form. I begin the incision a little above the abdominal ring, and extend it, in the shape of a crescent to the edge of Poupart's ligament, and then continue it to about an inch and a half from the inner side of the spine of the ilium, where it terminates. By this incision I lay bare the tendon of the external oblique muscle; in the second I divide this tendon, and expose the internal oblique and transversalis muscles. Having arrived at this step of the operation, there will be no occasion to make any further use of the knife. The next step will be to raise the internal oblique and transversalis muscles from Poupart's ligament, by introducing the finger behind them. Well, having done this, you reach the passage of the spermatic cord, and you feel it distinctly; and then behind this the pulsation of the iliac vessel. You now draw up the internal oblique and transversalis muscles with the finger, at the same time elevating the spermatic cord a little, and then carry the finger into the abdomen, behind the peritoneum, and you ascertain the beating of the iliac artery. Having found the artery, I put the aneurismal needle into the opening, and introduce it under the vessel. You will recollect that the artery is accompanied by a vein, and that the vein is on the inner side; the artery on the iliac, the vein on the pubic side; the operation may be performed without the least difficulty, and is as easy as tying the femoral artery; there is only one circumstance that occasions the least danger; and that is the epigastric artery passing up from the pubic side of the iliac vessel, and on the inner side of the incision; but this, however, may be avoided. I will clean the artery a little from the surrounding parts, and take it up; it is very desirable to ascertain that the vein is not secured, because the interruption to the return of blood would be very injurious; if the artery should be exposed as much as it is on the subject before me (an inch and a half), two ligatures must be employed, but if a small portion only of the vessel is laid bare, a single ligature will be all that is required. When you use two

Situation of the artery.

ligatures, you will separate them from each other, drawing one upward, and the other downward, and leaving about three-quarters of an inch of the vessel exposed at the extremity of each ligature: for if this be not done, on dividing the artery, there will be danger of the ligature slipping off; the instrument with which the artery is usually divided is the probe-pointed bistoury; when it is done, retraction of the vessel immediately takes place; there will be no danger of including the nerve in the ligature, as the anterior crural does not accompany it: the vein and artery are included in the sheath, and the nerve is on the outer side. Now the edges of the wound are to be brought together, strips of adhesive plaster are to be applied, and the ligatures are to be allowed to come away by suppuration and ulceration.

How the circulation is carried on.

Here is a curious specimen (exhibiting a preparation) showing the mode in which the circulation is carried on after the external iliac has been tied; the limb has been injected, and the anastomosing vessels are distinct; you also see the part of the iliac artery where it was tied. If, then, you were asked what carries on the circulation after the external iliac has been tied, your answer would be—the gluteal principally; this passes out through the ischiatic notch, comes over the ilium to the groin, and enters the femoral artery, a little below Poupart's ligament; the second artery is the ischiatic; it arises from the termination of the internal iliac, passes out of the pelvis between the trochanter major and tuberosity of the ischium, to the back of the thigh, and sends a few branches to the arteria profunda and external circumflex arteries; the third artery is the obturator, it passes out through the obturator foramen, and joins the internal circumflex artery; also the external pubic communicates freely with the internal pubic; therefore, if asked by what vessels the circulation is carried on after the external iliac has been tied, you would say, principally by the gluteal.

ON SECURING THE INTERNAL ILIAC ARTERY.

An operation of extraordinary difficulty; it has been performed

by Mr. Stevens, of the West Indies, and since by two other individuals, one of whom was Mr. Atkinson, of York, for the purpose of securing the internal iliac artery. None but a man endowed with the knowledge which Mr. Stevens possessed would have dared to undertake such an operation; but Mr. Stevens was educated by Mr. Burns, of Glasgow, an enterprising man, and a most excellent anatomist. He was brought up in his dissecting room, and this it was that led Mr. Stevens to the idea of doing it.

The operation described.

The operation consists of making an incision on the inner side of the spine of the ilium, by which you cut through the abdominal muscles, and reach the peritoneum, which you turn to the opposite side, in order that the artery may be reached. Now, in this operation there is considerable difficulty in separating the ureter from the artery, because it crosses just at the bifurcation of the iliac artery, and if a man had not been well acquainted with the anatomy of the part, as Mr. Stevens was, he might include the ureter in the ligature, and thus cause destruction of life. I put the ligature round the artery (the learned professor continued showing the operation on the dead body), that you may see it is the internal iliac which I have secured; I would not, however, have ventured to perform this operation, if it had not been performed by another; I should have doubted my own powers and skill. It is an operation highly creditable to any one who performs it, but particularly to him who first attempted it.

In what case it should be done.

In what case then, would a surgeon be called on to perform this operation? Why, for an aneurism of the gluteal artery, just at its commencement, so that it cannot be reached under the gluteal muscle; the operation must be performed in the manner I have just shown you.

TYING THE AORTA.

Case of tying the aorta.

I was sent for one day to go to the other hospital to see a man with violent bleeding from just above the groin, in consequence of a rupture of the external iliac vessel high up; the man had long been a patient there; the integuments had sloughed, and the patient

was exceedingly reduced from loss of blood. Under these circumstances, I thought myself justified in performing the operation of tying the aorta; for this step I have been greatly abused, but abuse, gentlemen, does no injury; it shows a malicious and bad disposition on the part of those from whom it proceeds, and on a man possessing the *mens conscia recti* it will have no effect, unless he be destitute of common sense. I was situated as I have just described, when I tied the aorta; I knew that the aorta had been obliterated within the chest, and that the circulation had been carried on by the intercostal arteries going from above to just below the spot where the aorta was obliterated: the insides of the ribs are covered with numerous vessels. A gentleman of Dublin had a preparation, in which the aorta had been obliterated in the abdomen; and in this case the circulation was carried on by the lumbar arteries going from above to below the part where the vessel was obliterated; I had not the least doubt but that if the aorta was obliterated, anastomosing vessels would carry on the circulation, on the same principle as in any other part of the body; the greatest danger is not from gangrene when the ligature is applied on the aorta, nor is any thing to be apprehended, as far as regards the carrying on of the circulation; but the danger consists in including the nerves, as I will presently show you.

Experiments on dogs.

Here is a specimen of a dog (pointing to one on the table), in which the aorta has been tied, and the circulation was carried on by the lumbar arteries; it is a very easy operation on the dog, and any one may perform it. I will tell you how you should do it; you must make an incision on the side of the transverse processes of the lumbar vertebræ, cut through the muscles and peritoneum, and then you may easily carry the aneurismal needle under the vessel, and bring it out of the wound, in order that you may see that you have not included the aortic plexus: if this be secured in the ligature, a paralytic affection of the lower extremities will be produced: now I wish particularly to state this, as I believe it to be entirely new, and that nothing new has been said on this

subject in books. In the two first animals on which I performed this operation, I thought the paralysis was owing to the interruption of the circulation, but on repeating the experiment, I found it was produced by including the aortic plexus. If the aorta be well cleaned, and a ligature applied, and the vessel be returned to the abdomen, the dog runs about as if nothing had been done to it; and in five minutes after, it will eat bread out of your hands, if it has been previously accustomed to it. The operation, I repeat, is exceedingly easy, and a boy may perform it. Well, after you have done this, wait a short time, kill the animal, and inject the arteries, you will find that the lumbar vessels on the inner side of the abdomen, and fore part of the spine, had carried on the circulation. The reason of the paralysis in the case I have just alluded to was, that the aortic plexus was included, and the result was the destruction of life. Unfortunately, however, in the human subject you cannot make your incision near the spine, but must do it in the fore part of the abdomen to get at the aorta. If a case were to offer itself, similar to that I have told you of, I would immediately perform the operation again; and my own conviction is, that it can be done, and with success. At the time I tied the aorta, the patient appeared dying; after the operation had been performed, I was pleased in a remarkable manner to see him in the evening sitting up in bed, adjusting his clothes; if the vessel had not been secured when it was, he would not have lived an hour. On the following morning, signs of constitutional irritation came on, in the evening he became much worse, and in forty hours from the time of the operation he died.

Dissection. No peritoneal inflammation, but at the edges of the wound, which were glued together by adhesive matter, excepting at the part where the ligature protruded. The thread had been passed round the aorta, about three quarters of an inch above its bifurcation, and rather more than an inch below the part at which the duodenum crosses the artery: it did not include any portion of the omentum, or intestine. Upon cutting open the aorta carefully, a

clot of more than an inch in length was found to have sealed the vessel above the ligature: below the bifurcation, another, an inch in extent, occupied the right iliac artery, and the left was closed by a third, which reached as far as the aneurism: all were gratified to observe the artery so completely shut in forty hours. The aneurismal sac, which was of a most enormous size, reached from the common iliac artery to below Poupart's ligament, and extended to the outer part of the thigh. The artery was deficient from the upper to the lower part of the sac, which was filled with an immense quantity of coagulum. Here is a specimen, (the learned professor exhibited the aorta, which he tied,) in which you see a coagulum above and below the spot where the ligature was applied, sealing the extremities of the artery.

The operation described.

Now, gentlemen, if I should perform this operation again, the only difference that I would make, would be to cut the ligature close to the vessel, where it should take its chance, either to become encysted or absorbed. I commenced the incision in this operation in the linea alba, two inches above the umbilicus, and carried it to the same distance below, taking care, in my descent, to avoid the umbilicus, by giving it a semilunar turn or curve. I was astonished to find with what ease I could pass my finger down to the artery. However great the apparent difficulty of performing this operation, there was in reality none. The principal danger appeared to arise from the irritation produced in the intestines by the ligature, and that is the reason why I should cut the ligature close to the vessel. During the operation the fæces passed off involuntarily, and the patient's pulse, both immediately and for an hour after the operation, was 144 in a minute. I applied my hand to his right thigh immediately after the operation, and he said that I touched his foot, so that the sensibility of the leg was very imperfect. Time will show us whether this operation will be successful or not. I know, for my own part, that I would not hesitate to have my own aorta tied, if it would save my life for only forty hours.

ANEURISM OF THE CAROTID.

I have twice performed the operation of tying the common carotid on account of the existence of aneurism; and as both these are already published in the Medico-Chirurgical Transactions, it will be only necessary to give a short account of them here, and of the mode in which this operation is to be performed.

Case. The first case is that of Mary Edwards, æt. 44. The swelling occupied two-thirds of the right side of the neck, pulsated very strongly, and the integuments at the most prominent part of the tumour appeared very thin. It had existed six months previous to the operation, which was performed as follows:—On November 1, 1805, I made an incision two inches long, on the inner edge of the sterno-mastoid muscle, from the inferior part of the tumour to the clavicle, which laid bare the omo and sterno-hyoideus muscles, which being drawn aside towards the trachea, exposed the jugular vein. The motion of this vein produced the only difficulty in the operation; as, under the different states of breathing, it sometimes presented itself to the knife tense and distended, and then as suddenly collapsed. Passing my finger into the wound, to confine that vein, I made an incision upon the carotid artery, and having laid it bare, I separated it from the par vagum, and introduced a curved aneurismal needle under it, taking care to exclude the recurrent nerve on the one hand, and the par vagum on the other. The two threads were then tied about half an inch asunder, being the greatest distance they could be separated: on account of the short space, I did not divide the artery. As soon as the threads were tied, all pulsation on the tumour ceased, and the wound was superficially dressed.

Immediately after the operation, she was seized with a severe fit of coughing, which continued half an hour, when she became more tranquil, and slept six hours during the following night. She continued in a favourable state until the 17th, the tumour diminishing, and the wound healing: when the wound again opened, the

tumour increased, and became painful; she had a violent cough, great difficulty in swallowing, and a high degree of constitutional irritation. She gradually got worse, and died on the 21st.

Inflammation of the aneurismal sac; having extended to the base of the brain. Owing to the pressure of the tumour, the pharynx would scarcely admit a goose-quill. The cause of her death then, was the inflammation of the aneurismal sac and parts adjacent, pressing on the pharynx and deglutition, and upon the larynx, so as to excite coughing, and to impede respiration. Dissection.

The second case was that of John Humphreys, who had an aneurismal tumour on the left side of the neck, about the size of a walnut, extending from the angle of the jaw to the thyroid cartilage. The operation was performed in Guy's Hospital, on the 22nd of June, 1808, in the same manner as in the preceding case, only that the artery was divided between the ligatures. The patient had scarcely one unfavourable symptom after the operation: the ligatures came away on the 15th of July. The wound closed slowly, and the man returned to his employment on the 14th of September. Case.

TYING THE SUBCLAVIAN ARTERY.

The middle of your incision should be opposite to the external jugular vein, and centre of the clavicle. Speaking anatomically, the view of the parts exposed in this operation may be thus described (Sir Astley exhibited them): here you see the omo-hyoideus muscle crossing obliquely above the clavicle, below the sterno-cleido-mastoideus upon the inner side, and the jugular vein passing immediately opposite to the centre of the opening. Mr. Key informs me that in the operation which he performed at the other hospital, for securing this vessel, that it was much facilitated by a free division of the clavicular portion of the sterno-cleido-mastoideus, and that after having done so, he was enabled, with a common aneurismal needle, to introduce the ligature under the vessel. Soon after commencing this operation, you meet with The operation described.

branches of nerves from the axillary plexus—you must carefully avoid including these in the ligature; for it would be a fatal error if you were to tie them. The scalenus anticus being the boundary of the artery on the inner side, you cut down for the purpose of finding its inner edge; this you will find a useful guide.

First done by Dr. Post.

I have lately heard a person say, but do not know upon what authority, that the operation for tying the subclavian artery has been successful, but upon one side only. The first person who succeeded in this operation, was Dr. Post, of Philadelphia, an exceedingly clever, industrious surgeon. Since this gentleman, several others have performed it, and the results favourable—a gentleman of the name of Liston, of Edinburgh, is one—Mr. Bullen, of Lynn, in Norfolk, another—and you have lately seen a very successful one in the other hospital.

Mr. Keate, sen., the uncle of the present Mr. Robert Keate, performed the operation below the clavicle, and the first time he did so it was completely successful; there may happen cases of axillary aneurism when the operation below the clavicle would be the best and safest, but unquestionably in ordinary instances that which I first described, *viz.* the one above the clavicle, is by far the most preferable. If, gentlemen, you were asked what artery chiefly supported the circulation after the subclavian had been tied, your answer would be the superior scapular. The late Mr. Taunton, lecturer on anatomy, had in his possession an excellent specimen of natural obliteration of the subclavian artery, and in this example the superior scapular had become very much enlarged.

TYING THE BRACHIAL ARTERY.

For a puncture in venesection.

This artery very seldom requires to be secured in consequence of aneurism; but it is often rendered necessary from other causes, such as wounds, and some of these wounds indeed, as in bleeding, give rise to aneurism. When an aneurismal tumour at the bend of the arm has been thus formed, let me recommend you not to cut

down upon it in order to secure the vessel; rather tie the brachial artery at the middle of the arm, and not make an incision upon the swelling at the middle of the elbow. To put a ligature upon the vessel here, amidst a mass of extravasated blood, is tedious, difficult, and dangerous.

Fatal case.

A young gentleman in the hospital bled a man, and in doing so penetrated the radial artery; thirty-seven ounces of blood were lost before he could succeed in stopping it; in three days the pressure caused so much pain that the man requested it to be lightened; this was done, and the bleeding returned; at the end of the week one of the surgeons deemed it prudent to secure the vessel, and he did so at the part where the wound had been made; the operation took an hour in performing, and it was excessively difficult to find the vessel. On the following day there were much irritation and inflammation, and on the tenth day from the accident he died.

Case of the Barber-surgeon.

When I was with Mr. Cline, about forty years ago, one of my fellow-apprentices came up to me in a great fright, and said, "Lord! Cooper, what do you think I have done?" "Something very bad, surely," replied I, "or you would not look so pale." "Why, I have just been bleeding a man, and in doing so have punctured his radial artery." "Well," I said, "is he in the hospital?" "Oh, no, I have taken care of that; I bound up his arm as tightly as I could, and sent him away." In two or three days this man came back, and showed his arm to the surgeon, who, very properly, upon seeing what was the matter, made light of it; told him that a trifling operation must be performed, and in a few days he would be quite well. The man, upon hearing that he was to be again cut, would not consent, and left the hospital. As he was walking up Holborn, he happened to see the shop of a barber-surgeon, and in he went; this learned gentleman, after having inspected the tumour, said that he would soon give him relief, by letting out the matter with his lancet; well, he thrust in the instrument, and the moment he did so, out gushed a quantity of arterial blood; this so frightened the barber, that he rushed out of his shop, and left the poor patient to manage for himself; fortunately some person

happened to be in the way, who bound up his arm, and brought him to the hospital; one of the surgeons put a ligature on the artery, and the man ultimately did well.

The operation. In tying the brachial artery, there is only one circumstance of any importance to bear in mind, and it is this: the vessel is accompanied by the median nerve; now, if you should include this in the ligature, it would either destroy the patient's life or cause paralysis of the limb. When you are about to secure the brachial artery, the direction for the incision is the inner edge of the biceps muscle, and this cut almost immediately lays bare the median nerve.

Aneurismal varix. When the brachial artery is punctured with the lancet through the vein in bleeding, an adhesion is sometimes produced between the one and the other; and the blood flowing from the artery into the vein, causes an enlargement of the latter, opposite the elbow joint. The swelling is called aneurismal varix, from the enlargement of the vein, and from its connexion with the artery. The swelling acquires the size of a pigeon's egg, and then it usually ceases to increase. There is a pulsation in the swelling, with a thrilling sensation, and a hissing noise. If the artery be compressed above, the swelling becomes flaccid, and can be emptied of its blood; but if the arm be compressed below the swelling, the pulsation continues, and the size of the swelling remains unaltered. The brachial artery, above the varix, becomes enlarged, owing to the greater quantity of blood which it conveys.

The swelling of the vein proceeds to the size that I have mentioned, and then becomes stationary. A woman, with this altered state of the circulation, used frequently to exhibit her arm to the students for many successive years, and it seemed to remain annually the same.

No operation has been required for this disease, in any case which I have seen of it, as it is not a dangerous state, either to the life, or even to the arm. It renders the arm weaker, and nothing more serious arises from it.

Case. Mr. Atkinson, a most respectable surgeon at York, sent me an

account of a case, in which an operation had been performed for this disease, and it proved fatal.

When the accident has recently occurred, it may be cured by the following plan. Treatment.

A young lady was brought to my house by the surgeon who had the misfortune to prick the brachial artery in bleeding. The wound had healed, but an aneurismal varix followed, of the size of a pigeon's egg, attended with strong pulsation, a thrill, and a hissing noise. I ordered it to be compressed with a dossil of lint and a roller; but it did not succeed in subduing it. I then directed that a circle of iron should be put round the arm, with a pad, which could be screwed down on the brachial artery, in the middle of the arm, between the shoulder and elbow joint. This she bore without much suffering, and gradually the swelling at the elbow subsided, and pulsation in the brachial artery, and in the tumour could not be perceived. As the gentleman, who attended the case with me, was well acquainted with Mr. Abernethy, he took the young lady, at my request, to Mr. Abernethy, to show him the cure of this disease. Case.

TYING THE ULNAR ARTERY.

When this artery is required to be secured, what is the anatomical direction for the incision? Why the tendon of the flexor carpi ulnaris: if you make your cut upon the inner side of this tendon, you will directly perceive the ulnar artery and ulnar nerve. This then is the part where the vessel may be most easily and safely tied.

In aneurism of the ulnar artery, situated at the wrist, it is right to open the sac, to tie the artery above and below the opening, taking care to exclude the ulnar nerve, which closely accompanies the artery.

TYING THE RADIAL ARTERY.

In aneurisms of the radial artery at the wrist, which are frequently

occurring by wounds from glass, the aneurismal sac must be opened, and the artery tied above and below the opening.

For aneurism. What is the anatomical direction here?—the answer is, the tendon of the flexor carpi-radialis—cut upon the radial side of the tendon, and you will immediately find the artery close to its edge. Instead of putting ligatures upon these vessels at the wrist for aneurism, or wounds of the palmar arch, it has been recommended to employ pressure, by means of cork folded in lint, and bound down by a bandage. This practice, when used, leads to great inflammation and irritation—and I would advise you against using pressure generally, and more especially as regards the ulnar and radial arteries, as they can be so easily tied if you possess the least anatomical knowledge; and if you do not know anatomy you had better never touch the body at all.

TYING THE CAROTID ARTERY.

When this vessel is to be secured, it is desirable to make the incision as high as you can; the upper boundary, therefore, will will be the angle of the jaw, and below the omo-hyoideus: make your incision first, then high up, on the inner side of the sterno-cleido-mastoideus; upon drawing aside the edge of which you will distinctly see the omo-hyoideus obliquely crossing the artery. (Sir Astley here exhibited it in the dead body.) I have laid bare the carotid, and will now show you what you must principally take care to avoid in this operation, *viz.*, the par-vagum, which accompanies the artery; if you were to tie this nerve you would endanger life; well then, when you are about to pass the ligature round the vessel, if you raise it a little, you can readily discover whether the nerve be in contact with it, and thus guard against an accident which might lead to a fatal result.

Aneurisms of the scalp and their treatment. I will now conclude the lecture by saying a few words on aneurisms from arteries of the scalp. The first case of this kind that I saw was sent to me by Mr. Toulmin, of Hackney: in this instance I tied the artery proceeding to, and from, the tumour. If

the aneurismal bag be not very large, you may cut immediately across it; apply a piece of doubled lint, then adhesive plaster, and over the whole a roller. If the swelling is small, that is not larger than a walnut, adopt another mode, which is to make a circular incision completely down to the occipito-frontalis tendon. In this manner the connexion between the blood vessels and the aneurism is destroyed: and, by applying a dossil of lint and strips of adhesive plaster, you speedily succeed in getting rid of the disease. I saw a case of aneurism of the posterior aural artery, and for its cure, tied all the vessels which were leading to and from it. I should have done better, by making the circular incision, that I have just described, round the tumour.

LECTURE XXIII.

ON HYDROCELE.

HYDROCELE is an accumulation of water in the tunica vaginalis testis; the anatomy, therefore, of those persons who say that the fluid is contained between the tunica albuginea and the tunica vaginalis is exceedingly faulty. Such a description is entirely false; and I scarcely need tell *you*, gentlemen, that the water is completely enclosed in the cavity of the tunica vaginalis. If the question were put to you, where is the water situated in hydrocele? the answer would be what I have just stated; and if you gave any other, it would be directly perceived that your knowledge of the anatomy of the part was but imperfect. Definition.

The situation of the water in hydrocele is precisely similar to water in the pericardium; and what should we say of the man who would assert that this water was contained between the pericardium and heart? Why, gentlemen, we should feel assured that he was entirely ignorant of the matter, for water in the pericardium is Hydrops perecardii.

situated distinctly within it: and so is water in hydrocele completely within the tunica vaginalis.

Hydrocele of two kinds.

Hydrocele is a generic term, and a multitude of tumours have received this appellation. It is now, however, usually confined to two; I should, therefore, say that hydrocele is of two kinds, *viz.*, 1st, of the tunica vaginalis; and, 2d, of the spermatic cord.

HYDROCELE OF THE TUNICA VAGINALIS.

Described.

Well, then, of hydrocele in the tunica vaginalis. The swelling at first shows itself at the lower part of the testicle, and gradually rises till it arrives at the abdominal ring; is of a pyriform shape; largest two-thirds of the way downwards; a little less at the bottom; and smallest at the ring.

Symptoms.

The common formation of hydrocele is unattended with pain, excepting, however, in those cases where it has been the result of inflammation; but, generally speaking, there is no pain, and the patient accidentally discovers the existence of the swelling, and often not until it has arrived at considerable magnitude. Commonly there is no redness of the scrotum—no discoloration.

Situation of the testicle.

The ordinary situation of the testicle in hydrocele is two-thirds of the way down the tumour, at the posterior part. Here, I say, is its usual situation; but in this respect it sometimes varies, as I shall presently show you. In performing the operation for hydrocele, it is of the utmost importance that you should have an exact knowledge of the situation of the testicle, for ignorance in this respect has often led to its being pierced by the trocar. You can easily discover the position of the testicle by a careful examination of the swelling, and by squeezing it with some degree of force at every part. When you press upon the testicle, you will find that part of the tumour more firm; the patient will manifest much uneasiness, and complain that you give him a good deal of pain: in this manner, then, you can readily discover where it is situated.

The weight of the tumour is but little (this of course means

Fig 1.

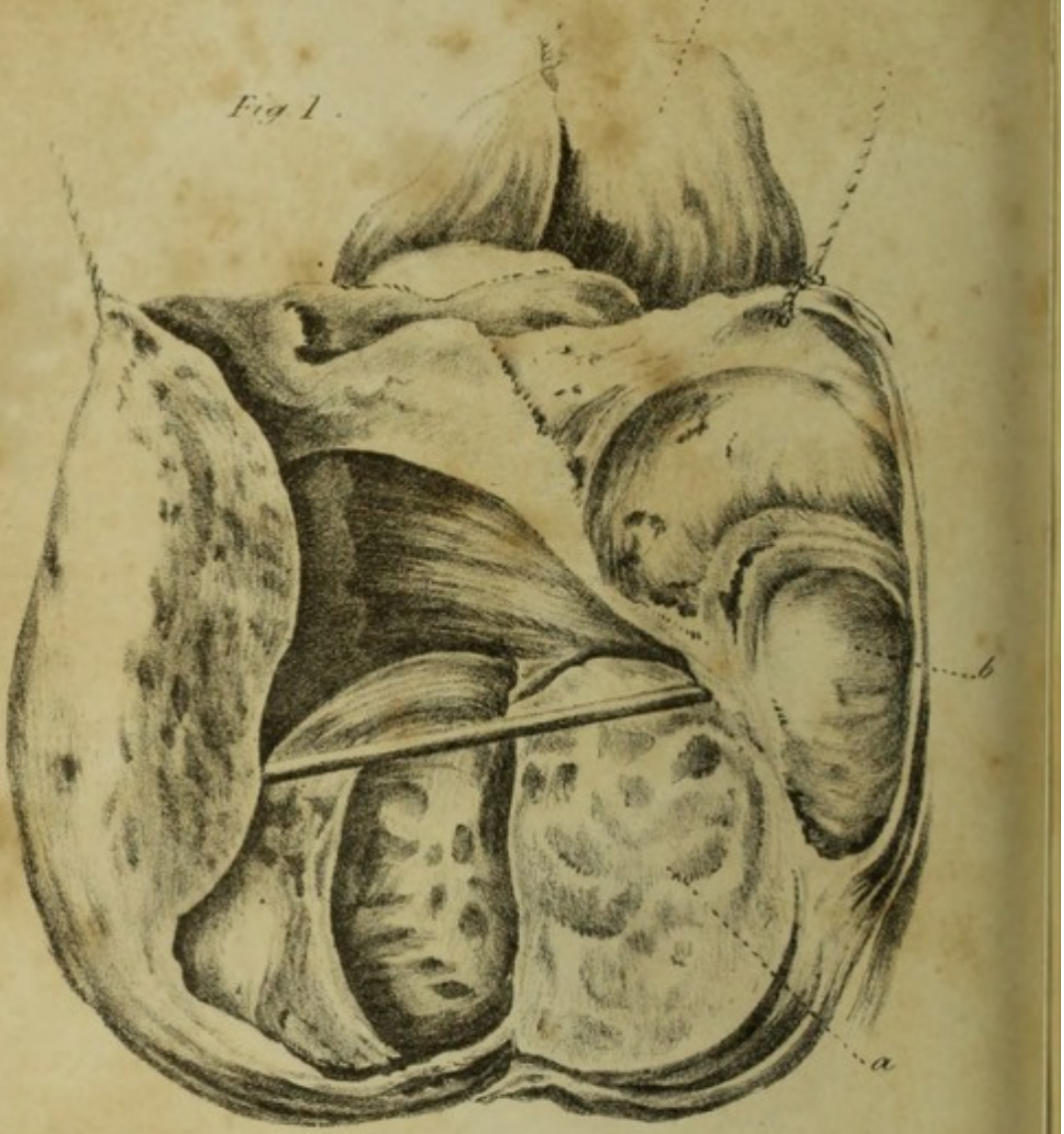


Fig. 2.

Fig. 3.

PLATE I. A.—MORBID ANATOMY.

Fig. 1. This is a preparation in the collection at St. Thomas's Hospital before my time, therefore I know nothing of its history. It is excessively hard—in some parts cartilaginous, in others ossific.

a a, with large spots of cartilage, and some bone.

b, epididymis enlarged and hardened.

c, spermatic cord enlarged.

Fig. 2. This represents the testis of Dr. Monsey, given to the collection at St. Thomas's Hospital, by Mr. Thompson Forster. The body indicated by the letter *e* is supposed to be a third imperfect testis; the doctor had the appearance of having three testes; but this was probably a chronic tumour of the cord.

a, spermatic cord.

b, epididymis.

c, body of the testis.

d, vas deferens.

e, supposed third testis.

f, epididymis.

g, testis.

Fig. 3. The common hydrocele of the tunica vaginalis.

a, spermatic cord.

b, tunica vaginalis reflexa.

c c, testis covered by the vaginalis testis.

d d, cavity in which the serum is contained.

comparatively); when you lift it, you will be astonished at its lightness, which will at once convince you that it is not a solid substance. The next thing you notice is, if the part be not very much distended, that the swelling will be moveable, *i. e.*, if you firmly grasp it at its base, the fluid will ascend, and the tumour increase at its upper part; therefore, its lightness, mobility, form, freeness from pain, and the history of the case, constitute its distinguishing characters from other diseases. But there are two other remarks by which the disease may be known, one of them decisive and the other nearly so: these are, first, its sense of fluctuation; and, second, its transparency. I have just told you, that if you press upon the lower part of the swelling, it would decrease there and increase at the upper part, fluctuation at this time becomes evident to those who are accustomed to such examinations. Its transparency, or rather its semi-transparency, may be discovered in the manner I shall presently explain to you. This characteristic feature has been denied; I have certainly seen the tunica vaginalis so much thickened in very old cases of hydrocele, and in persons who had long resided in hot climates, that the examination required nicety and caution; but still a little art, as I shall presently explain to you, will enable the surgeon to form a correct diagnosis.

Diagnosis.

Well, then, such are the common marks by which you distinguish hydrocele; but there are other varieties, and these I will mention to you; first, the water of hydrocele sometimes forms *two* swellings. I have before told you that the shape of the tumour is usually pyriform, and that the water gradually rises till it arrives at the abdominal ring; now, in this variety of two swellings, a portion of the water collects above the ring, giving rise to a tumour there; thus a swelling is formed above and below, the narrowest part being at the ring.

Varieties of Hydrocele.

A surgeon unacquainted with this circumstance, upon looking at such a case would say, "Oh! this is not hydrocele, but hernia," and he would be strengthened in that opinion by seeing the upper part dilate upon coughing, in consequence of the impulse that it

May be confounded with hernia.

would receive from the contraction of the abdominal muscles. Its transparency and lightness, however, would readily enable him to distinguish this complaint from hernia. Why, this very day, a

Case.

gentleman came to me under the following circumstances: when he came into my room, he informed me that he had been twice tapped, and that he did not think the operations had been well performed: I looked at the swelling, and found that it extended to the abdominal ring; I examined the part very carefully, and requested him to cough; the moment he did so, the swelling was evidently forced down; well, said I, this may be hydrocele, but I shall not tap you; I requested a candle to be brought; no transparency was observable; I desired him to lie down upon the chairs, when I found it to be hernia, and reduced it. This, then, shows how cautious we ought to be in such cases, before we introduce the trocar, for I might have been misled by the history of this case, and have proceeded at once to perform the operation of tapping: had I done so, in all probability, the trocar would have passed into this gentleman's intestines. It was a hernia which had succeeded hydrocele.

Double cavities.

Another variety met with, is that in which a fluctuating swelling will remain, after a considerable portion of water has been removed. The first case of this kind that I saw was sent to me by Dr. Chest, and Mr. Roberts, of Gloucester. The patient had been under the

Case.

care of those gentlemen, and had been tapped for hydrocele: a quantity of water was drawn off, but still a swelling remained. He was sent to town for me to see him, at which time the hydrocele had become nearly as large as before. Upon hearing the history of this case, the impression upon my mind was, that when the operation for tapping had been performed, the operator had let the canula slip out of the tunica vaginalis, which circumstance, I thought, had led to the retention of a portion of the fluid. Well, believing this, I passed in the trocar and canula myself; some water came away, but not all; this struck me as being very strange, for I had taken great care to keep the end of the canula within the tunica vaginalis. I examined the remaining swelling; found fluctuation; then tried it with a candle, and saw that it was transparent. Well, sir, I said,

this is water now, introduced the trocar again a little way from where I did at first, and off it ran. The fluid, in the second instance, had nothing of the yellow appearance of that which is drawn off in hydrocele, but on the contrary, was as clear as water.

Necessity of knowing the relative position of the testicle.

I have before mentioned to you, that the testicle in hydrocele is commonly situated at the back part, and two-thirds of the way downwards. Here, however, there is great variety, and it is even sometimes found in front. I will tell you how this happens. The person is attacked with inflammation in the tunica vaginalis, before any collection of water has taken place; adhesive matter is thrown out, probably at the fore part, which occasions permanent adhesion between the middle and outer coat of the testicle: should serum be secreted after this, of course it would be lodged at the sides and posterior part. What would the consequence be, if, in such a case as this, the trocar were to be introduced in the usual situation? Why, that it would pass into the testicle.

Case.

A gentleman of great importance in this town, consulted his regimental surgeon for a swelling in the scrotum; it was pronounced hydrocele. The operation of tapping was resolved upon; but when the trocar was introduced, it passed only into a solid substance, and no water came away. The surgeon stared, and said, "Sir, I am a little mistaken in this case; you have a diseased testicle here, instead of hydrocele, as I at first supposed, and it is necessary that the diseased part should be removed." But the gentleman, being a young man, did not think it would add much to his enjoyment to lose a testicle—*(loud laughter)*—and thought that it required some hesitation before he resolved upon such a measure; consequently he did hesitate, and the result was, that he consulted another surgeon. Upon examination, the testicle was found at the fore part of the swelling, and the fluid at the sides and bottom. Whilst taking off his clothes, some copper-coloured eruptions having been seen, he was asked if there was any enlargement of the bones; when the right tibia was found considerably swollen. He was put under a course of mercury, for these secondary symptoms, which soon got well. The hydrocele still remained, and as the surgeon who first

saw this case was right in his first opinion as to its nature, he was sent for to repeat the operation of tapping. He now introduced the trocar at the side of the swelling, instead of the fore part; the water was withdrawn, and the patient perfectly recovered. This case shows the necessity of extreme caution in determining the situation of the testicle before the introduction of the trocar.

Hydrocele above the testicle.

The testicle is sometimes found at the bottom of the swelling. Now (holding up a preparation), here is a curious thing. This hydrocele, you observe, was situated between the testicle and abdominal ring, the testicle being quite at the inferior extremity of the tumour. Adhesive inflammation, in this instance, had completely united the middle to the outer coat; consequently, the descent of the water had been prevented.

Result of inflammation.

Here is another preparation, in which the water had collected at the sides, adhesion having taken place before and behind.

Another variety.

Here is another preparation, in which it appears as though the hydrocelic sac had arisen from the tunica vaginalis, in the same manner as an aneurismal sac is occasionally formed from the coats of an artery.

Encysted hydrocele.

In hydrocele, it sometimes happens that the fluid is formed in a distinct bag or cyst, between the tunica vaginalis and tunica albuginea; this complaint is usually combined with common hydrocele.

State of the tunica vaginalis.

There are great varieties with regard to the state of the tunica vaginalis; and it is found much thicker in those persons who have for a long time resided in hot climates, such as the coast of Africa, or West Indies, than in such a climate as our own. When, therefore, you find a tumour about the testicle, apparently solid, but of little weight, you are to be very cautious in your diagnosis; you are somewhat called upon to explore the swelling with a lancet; that is, puncture it lightly where there is the most appearance of fluctuation; and often when least expected, the testicle will be found in a healthy state.

After the water has been discharged, it frequently happens that

the tunica vaginalis, in consequence of its extreme thickness, will remain in large folds.

The tunica vaginalis has, in a few instances, been found ossified. Mr. Warner, formerly surgeon at Guy's, met with an example of this. There is a similar preparation in the museum at the other hospital, which any of you might see by applying to Mr. Stocker. Mr. Beaver, formerly a student here, accidentally discovered a case of it in our dissecting-room.

Appearance of the fluid.

Then, with regard to the contents of hydrocele, it is usually yellow serum. But sometimes small cartilaginous bodies are found in the fluid; when these are seen, they prove that the hydrocele had existed for a very long time, and are always proof of its age.

Congenital hydrocele communicating with the abdomen.

There is another variety which I ought to mention here; it has been called the *congenital hydrocele*, in consequence of a communication having from birth existed between the tunica vaginalis and cavity of the abdomen. When the parts are natural and perfect, there is no opening leading from one to the other, as you know; but occasionally the natural closure does not take place, and then a fluid may descend from the abdomen, and collect in the tunica vaginalis. In this manner, sometimes from ascites, the scrotum will become greatly distended; and here, in such cases, is the best situation for tapping. The hydrocele of which I am now speaking may be readily discovered from any other, in consequence of your being enabled, with ease, to return the water into the cavity of the abdomen: this you can effect by placing the person upon his back, and then elevating the scrotum.

Case.

The first case of this variety of hydrocele that I saw was sent to me by Mr. Dobson, of Harrow. The patient being a very young person, I was apprehensive of peritoneal inflammation, if I injected; it occurred to me that I might succeed in shutting up the communication with the abdomen by means of a common truss, when I might afterwards safely tap and inject for the radical cure. A truss was accordingly applied over the ring, and ordered to be worn for two years; at the end of one year Mr. Dobson wrote to me to say that the lad was quite cured. Now this I did not expect.

What had happened was this: the pressure of the truss had succeeded in destroying the communication between the tunica vaginalis and abdomen, and then the water had become absorbed. I advise you, should you ever meet with such a case, to pursue a similar practice; for, as you see in this case, the opening which exists may be closed, and if the person's health be good, the water may be absorbed, thereby rendering an operation unnecessary. The result of that case gratified me exceedingly.

Diagnostic characters.

Diagnosis.—Now, then, as to the *best* mode of distinguishing hydrocele. When a patient comes to you with a fluctuating swelling in the scrotum, in which the testicle is enclosed, you order a candle to be brought; then, squeezing the tumour at the posterior part, you distend the front so as to make it tense; apply the skin of the little finger, and that covering its metacarpal bone at the outer side, to the surface of the tumour, and then cause the candle to be held as close as possible opposite to where the two skins meet. In this way you will never fail to discover the transparency of hydroceles which are formed in this climate; and it is only the clumsy, awkward mode in which the experiment is made, that occasions any person to be unsuccessful in it, which, if conducted differently, would lead to a satisfactory result. I have seen individuals, however, from Sierra Leone and the West Indies, in whom the tunica vaginalis had become so much thickened as to render the hydrocele perfectly opaque.

Differs from Hernia.

From Hernia it may be distinguished by the occasional return of the hernial swelling into the abdomen; by the dilatation of hernia in coughing; by hernia descending from the abdomen, and by hydrocele augmenting from below upwards. Hydrocele and hernia are, however, sometimes combined in the same individual, when the hydrocele is placed before the hernia. Hydrocele is sometimes met with below an adhering omental hernia. Fluctuation and transparency are also diagnostic marks of hydrocele.

From varicocele.

Hydrocele may be distinguished from varicocele by placing the patient in the recumbent position, in which varicocele disappears.

Diseased testicle may be easily distinguished from hydrocele by

its weight and flatness, and the pain and sickness which it occasions; and often by the discolouration of the skin covering it, and by the semi-transparency and lightness of one tumour and the heaviness of the other. Differs from diseased testicle.

There is one disease somewhat difficult to distinguish from hydrocele, *viz.* hæmatocele: this is a collection of blood in the tunica vaginalis testis, and produces in form an exactly similar tumour to hydrocele; but the history of the case is quite different, and your best guide. If you ask how it happened, the answer is—"Why I was riding, when the horse became restive, began to plunge, and threw me forward on the pommel of the saddle; I soon afterwards discovered this swelling." Then, if you inquire whether there were any marks or bruises in the skin of the scrotum, the answer will be, "Oh, yes; it was black and blue." Whenever you find a swelling thus suddenly formed after a blow, having the figure of hydrocele, you may be certain of its being blood. Hæmatocele.

But, gentlemen, guard against mistaking this complaint for diseased testicle. I was once present in the other hospital when a healthy testicle was removed, owing to this error; and some years since, one of the first surgeons in this town, after having removed a tumour from the scrotum, and when the gentlemen were leaving the theatre, desired them to wait a moment, and he would show them the disease of the testicle. However, upon cutting the part open, the great bulk proved to be blood, and the testicle was in a perfectly sound state. Such an unfortunate occurrence as this a man must for ever lament. Sometimes mistaken for diseased testicle.

The cause of hydrocele appears to depend upon increased secretion, as the vessels are dilated, though there is generally no inflammatory action. Its cause.

Inflammation of the testicles will give rise to hydrocele; for as the inflammation disappears, hydrocele forms. This can generally be removed by exciting absorption: for which purpose give the pil. hydrarg. submur. comp., and apply to the scrotum a lotion composed of liq. ammon. acet., having dissolved it in some of the ammon. mur. These means will be found to have considerable From inflammation

influence in this hydrocele, which results from inflammation; but in the other they have none.

Spontaneous cure.

Hydrocele, if left to itself, will often undergo spontaneous cure. A man was brought into the other hospital with a sloughing of the scrotum, a consequence of an inflammation occasioned by a hydrocele; the water was, in this case, discharged hy a natural process, and nature performed a radical cure by effecting a permanent adhesion of the parts.

Case.

Hæmatocele is sometimes founded on hydrocele. Dr. Saunders, formerly teacher of medicine at Guy's, had a hydrocele, for which he applied to Mr. Lucas, my colleague at Guy's, to have it tapped. In stepping upon a chair to reach a book, he fell against the back of the chair, and received a blow upon the scrotum, which reproduced, as he thought, his hydrocele, and in a few days he went to Mr. Lucas to have it tapped, but, upon the introduction of the trocar no water passed; the doctor then consulted several surgeons, and at length Mr. Cline made an incision into the part, and the tunica vaginalis was found full of coagulated blood, which was discharged, a poultice applied, and he soon recovered.

Not always produced by a blow. Case.

Hæmatocele is not always produced by a blow. I attended, with Mr. Hicks in Bond-street, a gentleman who had a large pyriform swelling in the left tunica vaginalis, which had never been painful, and which had an obscure fluctuation. I made an incision into the swelling, in the presence of Mr. Hicks, and discharged near a pint of fluid blood. This swelling did not succeed a blow, but to excessive exertions which this gentleman had been in the habit of making.

Palliative treatment of hydrocele.

I shall conclude this lecture by describing to you the *palliative* treatment of hydrocele, reserving what I have to say on the *radical* or *curative* treatment until we next meet.

When persons are afraid of the curative treatment, or when it would be attended with inconvenience, as also in old people, the palliative will be demanded. It is a very simple operation, and one which any person can perform. Remember that the testicle is two-thirds of the way downwards at the posterior part; introduce,

therefore, the trocar in the fore-part obliquely upwards, indeed almost perpendicularly, to avoid wounding the testicle; but as I have before shown you that the testicle occupies different situations in the tumour, you cannot introduce the trocar with safety until you have ascertained the precise spot where the testicle is lodged, and then you will of course take care to avoid it. Let me observe, that whether you perform the operation for the palliative or curative treatment, withdraw the trocar the instant you believe that the canula is within the tunica vaginalis; and once having the trocar in, take care to keep it there until the operation be concluded; and the most effectual way to do this is by grasping the tumour at the posterior part, so as to keep it tense where the trocar entered. I generally use a trocar and canula of small size. Some persons recommend a lancet and probe to be employed; it is mere nonsense: if they had ever performed the operation, they would not do so. Such suggestions can only emanate from people who are destitute of experience and knowledge.

If you wish to accomplish this operation bloodlessly, to prevent internal bleeding, and the formation of hæmatocele, keep the patient, at the time you are doing it, in the erect position. There is no necessity for any after application; on the following day the wound will be well.

It requires repetition in proportion to the dropsical tendency existing in the person. In some it will be necessary once a month; in others, once in three months; but, generally speaking, the usual time is every six months.

Not always devoid of danger.

Insignificant as this operation appears, it has been known to cause the destruction of life. Two instances are within my own knowledge. One of the cases was operated upon by Mr. Green, who resides a few miles from town, and the other by myself. Mr. Green's case was published in the journals, therefore I need not scruple to mention it; but Mr. Green possesses too much manliness to regard a notice of an unsuccessful case, and it must be a mean despicable mind that would. The case is as follows:—An elderly man applied to Mr. Green with a hydrocele, which he a few days

Case.

afterwards tapped. The following day the man's business led him to walk to town; on the next day his scrotum became inflamed; the third there was a gangrenous spot; and, on the fifth day from the operation, he died.

Case. The other case was the father of one of our dressers. I performed the operation on a Saturday; the following day he walked to Pancras church; on the Monday inflammation began to show itself in the scrotum, when he sent for me; on the Thursday gangrene had taken place, and on the Saturday week after the operation he died.

Let me advise you then, whenever you perform this operation on old persons, to make them keep their beds for a few days afterwards. Some individuals are destroyed by the slightest touch; while others, on the contrary, are not killed, do what we will to them.

LECTURE XXIV.

ON THE OPERATIONS FOR THE CURE OF HYDROCELE.

Not cured by rupture. HYDROCELE is not cured by the accidental bursting of the sac; when this takes place, it is followed by a temporary cessation of the hydrocele, which either returns again, or is succeeded by hæmatocele.

Case. A gentleman who had been subject to hydrocele for many years went to the continent, and whilst riding out on horseback, struck himself against the pommel of the saddle; for several hours afterwards the swelling was considerable; diffused instead of circumscribed; absorption, however, soon took place; the swelling gradually lessened, and the gentleman thought that his hydrocele was cured; in fact, he congratulated himself on it. Not long after this the swelling returned, and when he came to England, he called on me, and I performed the operation for hydrocele, which presented nothing peculiar.

Another case of the bursting of a hydrocele occurred in the person of Dr. Saunders, of the other hospital, a person well known in the profession. Whilst standing on a chair to reach a book, he slipped his foot, by which means he received a blow on the scrotum, which was enlarged from a collection of water in it. Mr. Lucas, late surgeon of Guy's, who had been in the habit of tapping him for this complaint, was sent for immediately after the accident, to perform the operation again; the swelling was very large, and Mr. Lucas, not at all suspecting that the character of the complaint was changed, put a trocar into the scrotum, but no water came, which alarmed the doctor considerably. A consultation was held, at which many of the most eminent professional men of this town were present; the scrotum was swollen and harder than natural, blood was extravasated into the tunica vaginalis; it was determined to attempt to relieve the swelling and ecchymosis by stimulant lotions, but these failing, an incision was then made into the scrotum, when there was found some coagulated blood, which had been substituted for the water. Thus then a blow on a scrotum affected with hydrocele will change that disease into hæmatocele, which can be afterwards cured by an incision.

Case of Dr. Saunders.

The cure of hydrocele is effected in three ways: 1st, by absorption; 2dly, adhesion; 3dly, granulation. Now I observed to you in the last lecture that when hydrocele is produced in the common way, medicine or local applications have hardly any influence on it; when it arises from a relaxed state of the vessels, stimulating medicines and blisters have no effect on the complaint. But I also stated on a former evening that hydrocele is produced by an inflammatory state of the parts, and that in these cases absorption by stimulating lotions should be promoted.

Three modes of treatment.

I will now further add, that in young persons and children, who are not unfrequently subject to this affection, cure by absorption alone is effected, that is, by giving the hydrargyri submurias, scammony, rhubarb, and other medicines, so as to dispose the constitution to absorb. The liquor ammoniæ acetatis and ammoniæ murias are the local applications generally made use of to promote

Cured by absorption.

absorption in the parts, and what we do to facilitate the operation of these remedies, is, to have a bag or suspensory truss to hold the scrotum, and this is fastened by two tapes round the abdomen, just below the umbilicus, and kept constantly wet with those fluids, in order to stimulate the absorbents; therefore be on your guard about performing an operation for hydrocele in young persons, as the cure can be effected by absorption alone; there are a few exceptions, however, to this rule, but they are exceedingly rare, as in almost every case of hydrocele in young persons or children, the water will be absorbed.

The operations

With respect to the adhesion of the tunica vaginalis in the cure of hydrocele, this is effected in three ways, by injection, seton, or incision; but the use of injection does not always produce adhesion of the tunica vaginalis; here is a specimen (pointing to one on the table) which was taken from a captain of a ship one morning, on whom I performed the operation for hydrocele by injection, by which he was relieved of every symptom of the complaint; several years after this he was taken extremely ill, and I was consulted by his attendant surgeon; he was dying of some organic affection; I desired the surgeon to remove the testicle and tunica vaginalis from the side on which the operation had been performed, as soon as the patient was dead, which was done; on examination it was found that the tunica vaginalis did not adhere completely, there were a few adhesions in some parts but not generally; the injection did not produce adhesion, but a new series of actions was set up, a deposit was secreted, and the ends of the arteries were sealed, so that any further secretion was prevented.

The operation by incision.

The process of granulation is set up when an incision is made in the scrotum, and extraneous bodies introduced, but this requires considerable caution; some surgeons use one mode of cure, some another; various are the operations which have been proposed, but most have now yielded to that of injection. In the operation by incision you divide the scrotum and tunica vaginalis, on the front part, so as to allow the water to escape, but it was soon found that this was not sufficient to effect a cure, and it was then recommended,

that after the incision had been made, a portion of the tunica vaginalis should be cut out: but this operation is followed by high constitutional irritation; it is true that it sometimes effects a cure by preventing the return of the hydrocele, but it also does it by killing the patient; in fact, the very last time that I saw this operation performed, a violent inflammation and sloughing of the scrotum ensued; why, gentlemen, any one rather than undergo such an operation, would submit to have a hydrocèle all his life; the mode of relief is too cruel for so trifling an inconvenience.

By tent or seton.

The next mode is that of introducing a tent into the tunica vaginalis; a small incision is made through the tunica vaginalis and scrotum, and a piece of lint or sponge is introduced, so as to prevent the sudden escape of the water; the water gradually issues out, during which time adhesion and granulation often takes place; but this sometimes fails. Caustic and setons were formerly very much used, two remedies, about which there was as much bandying and quarrelling among the members of the profession as if the world were at stake on the issue—two remedies, which now are not only generally abandoned, but which I should be ashamed to own ever having used; such is the folly of quarrelling in our profession; as for arguments on subjects which are only to be settled by observation, they are of no use; and persons who argue thus *à priori*, without a knowledge of facts, which alone ought to form the basis of argument in our profession, want that judgment which conducts a a man best through life; but many were the advocates of caustic as a cure for hydrocele; and the way it was used was by taking the potassa fusa, and applying it to the fore part of the scrotum, till an eschar, of the size of a sixpence, is formed, which produces an irritation to the extent of half an inch, or three quarters of an inch around, and then the eschar so produced destroys the skin and tunica vaginalis; as soon as the inflammation arises, the water escapes, then the parts sometimes become glued together, and granulations arise. Well, gentlemen, this remedy soon fell into disrepute; 1st, on account of its uncertainty; 2dly, because it was dangerous to life; here is a specimen (pointing to one on the table),

taken from a person who died from the application of caustic, and this gives me an opportunity of showing you the state of the parts after the use of this application. The operation with caustic is dangerous to life, and ought not to be performed.

OPERATIONS AT PRESENT USED FOR THE CURE OF HYDROCELE.

Recapitulation

There are but three operations I know of, which are occasionally had recourse to in the cure of hydorocele: 1st, setons; 2dly, incision; 3dly, injection.

Setons may be used for children.

Setons are very rarely used, but I tell you, that they may now and then be, advantageously. The seton should be made in the following way: you should take a curved needle, and carry it into the tunica vaginalis and scrotum, just at the point where the trocar had been previously introduced, and include two inches above the point where the needle enters, and bring it out sufficiently long; the result is, inflammation generally ensues, water gradually escapes, and as this takes place, adhesion of the tunica vaginalis comes on: this operation for adults has been generally abandoned, because better means have been employed; it is in those young persons whose hydroceles do not give way to the absorbent plan above-mentioned: then, if children about two or three years old have hydroceles, rather than inject, use the needle and thread: the thread should be allowed to remain for ten or fourteen days till inflammation and the adhesive process be set up; this plan is much better for children than that of injection, because there is no difficulty in doing the former, and there is considerable in the latter: for the operation of putting a ligature through the scrotum and tunica vaginalis is effected before the child knows any thing about it; in fact, after it is done, the child may run about, the knot being allowed to remain; the water escapes by the side of the seton; for children, then, I believe this to be the best mode.

Operation by incision.

The second plan is by incision. There is a difference in performing this operation now to what was done by Mr. Hunter, who had recourse to it in preference to that by caustic or seton;

Mr. Hunter used to put a little poultice into the part, after the opening had been made into the tunica vaginalis; a surgeon, who was present when Mr. Hunter was performing the operation, had mistaken the plan which he adopted, for having heard of the introduction of a poultice into the wound, he had brought materials for making one, flour, &c., and he began to mix it up in the man's scrotum; Mr. Hunter, always ready to catch an idea, sprinkled after this some meal or flour into the wound, so as to prevent instantaneous adhesion, and promote granulations. This operation gives you the means to prevent the return of hydrocele in many cases, yet it is an operation not perfectly unexceptionable; there are cogent reasons against performing it, but if there be any suspicion of a disease of the testicle, it may be done. In old persons it is not justifiable, and I would advise you against doing it in them. Here is a specimen (exhibiting one) where death ensued after the operation I have just described; a surgeon to one of these hospitals, who has been long since dead, introduced a bit of lint, dipped in oil, into an incision which he had made into the scrotum; the result was great constitutional irritation, and death; therefore there is danger of this operation in old persons, from the irritation which is likely to arise.

The modern operation described.

I shall now proceed to describe to you the operation which has superseded all others, namely, the cure of hydrocele by injection. At the time I was attending Mr. Hunter's lectures, the town was divided in opinion as to the best mode of performing the operation for hydrocele. So great was the difference of opinion among the students of the different hospitals, that it was quite ridiculous to observe their warmth on this subject, when there arose a plain, simple, effectual operation, which every body has since adopted. For this we are indebted to Sir James Earle, who, in thinking upon this subject, conceived that injection of the tunica vaginalis was likely to be the best means of producing adhesion, and preventing the further formation of disease. Thus he proposed at once a most ingenious but simple mode of curing a disease, about which there had been so many disputes. I cannot help feeling delight when I

find a brother in the profession rendering himself useful to mankind by an invention of this sort. When we see so much trash issuing from the press, which is called surgery, it is gratifying to find, in a work like Sir James Earle's, a simple and effectual plan of curing a disease proposed and at once adopted by the whole profession. I do not think Sir J. Earle has received the due meed of merit to which he is entitled for this improvement. I have, myself, always spoken of him in the same terms as this evening, and I shall ever continue to do so. The instruments required for this operation are an elastic bottle, with a stop-cock, a trocar, and canula. The elastic bottle should be of moderate size, and only half the quantity of fluid contained in it should be thrown in at a time, lest the action of the cremaster should force a part of it into the cellular tissue. If this happens, inflammation and sloughing may take place around the part at which the canula is introduced. The trocar should be two inches long, and the canula should be but small. The trocar and canula should be put separately into the box, for if you are obliged to put the trocar in the canula, it will soon contract, rust, and be unfit for use. The fluid used for the injection should be of a stimulating kind. If you use port wine, the proportion of wine and water should be half and half. If it be old port wine, you may mix five parts of wine with three of water; but if the wine be such as is commonly got at taverns and public-houses, in which there is a good deal of log-wood or sloe-juice to make it astringent, and a good deal of brandy to make it strong, a less proportion of wine must be used, as the injection would otherwise be too stimulating to the tunica vaginalis. Brandy, or spirits of wine, may also be employed; in the latter case, take one part of spirits of wine to fifteen parts of water.

Injection of zinc.

The injection which we generally use in the hospitals is the sulphate of zinc, in the proportion of one drachm to a pint of water. A gentleman, on being told that we employed the sulphate of zinc in hospitals, for injection in hydrocele, exclaimed, "Oh, I suppose you do this to save your wine." It is not to save our wine, however, gentlemen, that we prefer this solution, but because we are

better enabled to judge precisely of the strength of the stimulus by the use of the sulphate of zinc than by that of wine, which is subject to so much adulteration. Water itself will produce a stimulating effect, if used cold. A gentleman, whose name does not immediately occur to me, has written a treatise, in which he produces several cases of the successful treatment of hydrocele, by an injection of cold water. You must not suppose, however, that one fluid will answer the purpose as well as another; for I remember a case in which an injection of milk, which was used by the surgeon on the supposition of its being a bland fluid, produced most horrible inflammation. The tunica vaginalis suppurated, and when an incision was made to discharge the matter, the milk came out in curds, and a great quantity of pus had been produced.

Mode of operating.

Be upon your guard, therefore, against making experiments of this kind. When you inject for hydrocele, you should place the patient in the recumbent posture, which will enable you to perform the operation more steadily. Before you introduce the trocar and canula, make it a rule to squeeze the scrotum and tunica vaginalis, so as to make the part where the fluid is most distinct, very tense; then introduce the trocar and canula obliquely, in the same manner as in the palliative mode of treatment. Having passed the trocar and canula into the tunica vaginalis, withdraw the trocar, and push the canula alone carefully upwards, so as to prevent an injury to the testicles or spermatic cord. You should nip the tunica vaginalis round the canula, to guard against the instrument being diverted, and thus throwing a portion of the fluid into the cellular tissue. Having taken this precaution, you are gradually to throw up the injection, turn the stop-cock, so as to confine it in the tunica vaginalis, and move the scrotum from side to side, so that the fluid may reach every part of the surface. The fluid should be suffered to remain from about four to five minutes. While it remains in the tunica vaginalis, the patient will complain of a good deal of pain; he will first feel as if the testicle were squeezed; he will then feel the pain running along the course of the spermatic cord at the spinal process of the ilium, and at the loins where the spermatic plexus

of nerves arises, and lastly, at the neck of the bladder, in the course of the vas deferens. The pain will be greater or less in proportion as the patient is more or less irritable. It is to be observed, however, that the degree of subsequent inflammation is generally in the inverse ratio of the pain suffered at the time of the injection. If a man lies tranquilly on the table, and tells you that he does not feel much pain, he will in general have a considerable degree of inflammation the next day. On the other hand, when much pain is felt, it is generally the effect of nervous irritability, and little inflammation follows it.

After treatment.

I have been under the necessity of bleeding and giving large quantities of opium to a patient, in consequence of the severity of the pain produced by injection, and yet no inflammation was produced. You may say that this was in consequence of the bleeding; but this is not the case; the pain arises from irritation in the nervous, rather than the vascular system, and inflammation does not readily follow it. When you have suffered the fluid to remain five minutes, and withdrawn the instrument, you need not apply any thing to the part, but tell the patient to walk about as usual in the course of the day if he feels but little pain. If he should feel much pain, tell him to lie down, take his dinner that day, and his glass of wine after it, if he has been in the habit of doing so. After a few hours have elapsed, inflammation will probably come on.

If inflammation do not come on.

Above all, tell your patients to come the next day, that you may see whether the inflammation, which is necessary for the cure of hydrocele has been produced; if it has not, you must not despair of producing it. Take the part in your hand, and touch it here and there until the patient feels a good deal of uneasiness. Then desire him to take a long walk, and to take an additional quantity of wine after dinner. In this way you will generally succeed in producing such a degree of inflammation as will be sufficient to effect a cure.

Should inflammation come on.

It sometimes happens, however, in constitutions which have a great disposition to inflammation, that the injection will act so violently as to produce suppuration. When there is danger of this,

which you may ascertain by the great pain and redness of the scrotum, make an incision with the lancet into the part, and discharge the contents, and if the opening be not large, the cure will be effected by the adhesive process. Do not suppose that the operation for hydrocele by injection, simple as it is, altogether devoid of danger. There have been some instances in which death has followed, and many in which life has been endangered by it. Some gentlemen who now hear me, have had opportunities of witnessing the practice of the hospitals for many years, and they must have seen many cases, in which extensive sloughing has been produced in consequence of injury caused by throwing the injection into the cellular tissue.

Fatal case of injecting the cellular tissue.

I will tell you a case which happened shortly after I became surgeon at the other hospital. I injected the tunica vaginalis of a patient for hydrocele, but did not succeed in curing him, for he came back two years after with his hydrocele as large as ever. He was naturally enough disappointed with me for my want of success, and he chose to put himself under the care of Mr. Forster. Happening to cast my eye on the man, as I passed through the wards, I asked him what was the matter with him, and he said, "Why, sir, I have got hydrocele; the disease which you attempted to cure has returned." Some time after I did not observe the man in the ward, and upon asking what had become of him, I was told that he had gone out of the hospital; but as I was walking home over the bridge, the man who told me so, accosted me and said, "Sir, I beg your pardon for telling you a story; but the truth is, that man about whom you asked, has, indeed, gone out of the hospital; but I omitted to say, that he is dead." The truth is, that one of the dressers, who was a very steady young man, performed the operation of injection, and that an accident happened to him, which, unless great care be taken, might have happened to any body. He did not attend sufficiently to keeping the canula within the tunica vaginalis; the consequence was, that a portion of the fluid went into the cellular tissue. The man experienced excruciating pain, and the dresser immediately withdrew the canula,

but very little of the fluid came out. Violent inflammation of the scrotum ensued, which went on to gangrene, and the patient died. Dr. Farmer recently met with a similar case, in which sloughing was brought on from the fluid being injected into the cellular tissue, and the result was the destruction of life. Great care, therefore, should be taken to prevent the fluid from escaping by the side of the canula.

Hydrocele of the spermatic cord.

I shall conclude this lecture with a few observations on hydrocele of the spermatic cord. This disease may be defined as a collection of water in the spermatic cord, but it is necessary that you should know the situation in which the water is collected. The part at which hydrocele of the spermatic cord takes place is in the tunica vaginalis, between the testicle and the abdominal ring, sometimes extending above the ring, and on that account it is often mistaken for inguinal hernia. By pressing your finger along the parts until you have passed the abdominal ring, you may judge of the nature of the tumour by its blue and semi-transparent appearance, by its being entirely unattended with pain, and by its not running into the abdomen like inguinal hernia.

Mistaken for hernia.

Treatment.

The best mode of treating this disease is to make an incision in the tumour, for injection would, in this situation, be difficult and dangerous; to introduce your finger into the sac, so as to ascertain that there is no communication with the abdomen, and then introduce a small quantity of flour to promote a slight internal irritation. In this manner, the cure of hydrocele of the spermatic cord may be readily effected.

LECTURE XXV.

DISEASES OF THE TESTICLE.

Before we proceed to the morbid structures of the testes, it may not be unacceptable to give the anatomy of those parts in their healthy state, and in order the more effectually to facilitate that

object, the descriptions will be illustrated by drawings from actual dissection, and coloured after nature.

THE ANATOMY OF THE TESTES.

(Extracted from Sir Astley Cooper's Work on the Testes.)

Relative situation of the testes.

The testes are contained within the scrotum, at which they are suspended at unequal heights; for the left testis very generally hangs lower than the right. Two advantages arise from this circumstance—First, that when the thighs are approximated, they are not pressed against each other; but one being received above the other, they are enabled to elude the violence which they would otherwise sustain:—Secondly, this difference in their heights permits the suspension of the penis to the left side, instead of its being placed directly forwards.

SCROTUM.

Scrotum.

This part is composed of two portions of the common integuments united in the middle; and the place of their union forms a prominent line, which is called raphe. This line, which begins at the frænum, descends under the penis to the scrotum, passes in the centre of the perinæum, and is lost at the anus. The skin of the scrotum is abundantly vascular, and secretes perspirable and sebaceous matter; and the sebaceous glands are chiefly placed in the line of the raphe.

The scrotum varies greatly in its appearance and size; for under the influence of cold, it is small, contracted, and wrinkled; under heat, it is relaxed, smooth on its surface, and greatly extended.

Its arteries.

The arteries which supply it with blood, are three in number on each side—*viz.*: the external pudic; the perineal artery of the internal pudic; and, thirdly, an artery from the epigastric. The *external pudic* is the second branch of the femoral artery, springing from that vessel a little below Poupart's ligament, and beneath the

origin of the external epigastric artery. The pudic divides into two branches:—the first passes to the upper part of the scrotum, and crosses the spermatic cord, at which part it sends branches to the fore-part of the scrotum, after which it supplies the skin of the penis and pubis; this artery is necessarily divided in the operation for castration and strangulated hernia. The second branch of the external pudic descends upon the side of the scrotum, and supplies its lateral portion with vessels.

The second artery of the scrotum is the *perineal*, which proceeds from the internal pudic artery; which latter vessel, after passing out of the pelvis, near the sciatic nerve, at the edge of the pyriformis, and at the lower part of the ischiatic notch, is continued to the inner side of the tuberosity and ramus of the ischium; and after having given off its external hemorrhoidal artery to the anus, it sends its perineal branch forwards between the bulb and crus penis. The perineal artery passes upon the septum scroti, supplying it with blood-vessels, and is continued forwards to the raphe where it anastamoses with the external pudic. In its course it sends vessels to the accelerator urinæ and transversus perinei. The *scrotal artery* of the epigastric descends from the epigastric soon after its origin. It first sends a branch down upon the spermatic cord, which is distributed to the cremaster muscle; and then a larger branch descends upon the side of the symphysis pubis to the skin and fat of the pubis; it next anastamoses with the external pudic artery, and descends to the inner and upper part of the thigh, and to the back-part of the scrotum, anastamosing there with the perineal and external pudic arteries.

Veins of the scrotum.

The veins of the scrotum return their blood by the side of their corresponding arteries: the external pudic vein passes into the femoral vein at the groin, the perineal vein into the internal pudic vein, and the veins at the back of the scrotum into the epigastric vein. The skin of the scrotum is so thin, that the veins may be seen through it.

Absorbents.

The absorbent vessels of the scrotum are large and numerous: they pass into the glands of the groin below Poupart's ligament; so

that when the scrotum is diseased, the irritation is extended to the inguinal glands.

The nerves of the scrotum are derived from three sources.

Nerves of the scrotum.

First, from a *lumbar scrotal nerve*, which arises from the first and second lumbar nerves. It passes over the quadratus lumborum, to send branches to the abdominal muscles and to the skin. It penetrates the internal oblique muscle on the inner side of the spinous process of the ilium, and over Poupart's ligament. It takes its course between the tendon of the external oblique and the internal oblique muscles, and with the spermatic cord penetrates the external abdominal ring, and directly divides into numerous branches, which supply the skin of the groin, the scrotum, and skin of the root of the penis.

Secondly, the *external spermatic nerve*, which passes from the second lumbar nerve, and is distributed to the cremaster, and to the cellular tissue of the scrotum. It also sends a branch under Poupart's ligament to the skin of the groin, and of the inner and upper part of the thigh.

The *perineal nerve*, or pudendus inferior, accompanies the perineal artery, passes between the accelerator urinæ and erector penis, and divides into two sets of branches:—the first passes to the skin of the scrotum laterally; the other set is continued to the septum scroti, and to the centre of the fore-part of the scrotum: it also gives branches to the rectum, sphincter ani, transversus perinæi, and accelerator urinæ.

DARTOS.

Dartos.

On the inner side of the integuments of the scrotum a muscle is supposed to exist, which is called the dartos, and to which the motions of this part have been attributed; but it exists only in the imagination of the anatomist: for it is clear that the motions of the scrotum are not the result of muscular action; they are vermicular, gradual, and not sudden contractions; they are not voluntary; they

are not obedient to the mind; but they result from changes of temperature, and therefore seem to depend upon the lessened diameters of the arteries and veins of the part, and of the diminished quantity of blood which they contain.

CELLULAR TISSUE OF THE SCROTUM.

Cellular tissue

Within the scrotum a long loose reticular membrane is found, which proceeds from the inner side of the integuments to the external covering of the spermatic cord and testis. Nature has formed it rather reticular than adipose, to prevent any increase of bulk under corpulency. It is long and loose, to permit of great freedom of motion in the testis, and to enable it to elude the influence of violence.

Opposite to the raphe it is more condensed than at any other part, and it is there named the septum scroti; although it is not truly a septum, for it is permeable to air and water; and when the scrotum is œdematous, the dropsical effusion passes through the septum, so that the whole of the reticular membrane is distended.

From the septum scroti, reticular fibres pass to the covering of the testis, to preserve each testis in its situation.

The septum scroti is supplied with blood from the perinæal artery, and that vessel anastamoses freely with the external pudic. When the testis, in a diseased state, adheres to the septum, these vessels are greatly enlarged, and often furnish a troublesome hemorrhage, if each divided vessel be not secured in a ligature.

SUPERFICIAL FASCIA OF THE CORD.

Superficial fascia.

When the scrotum, and the cellular tissue with which it is lined, are removed, the spermatic cord appears covered with this fascia, which also descends to the testicle. It first proceeds from the surface of the tendon of the external oblique muscle of the abdomen, which it covers, and it is joined to the edges of the external

Fig. 1.

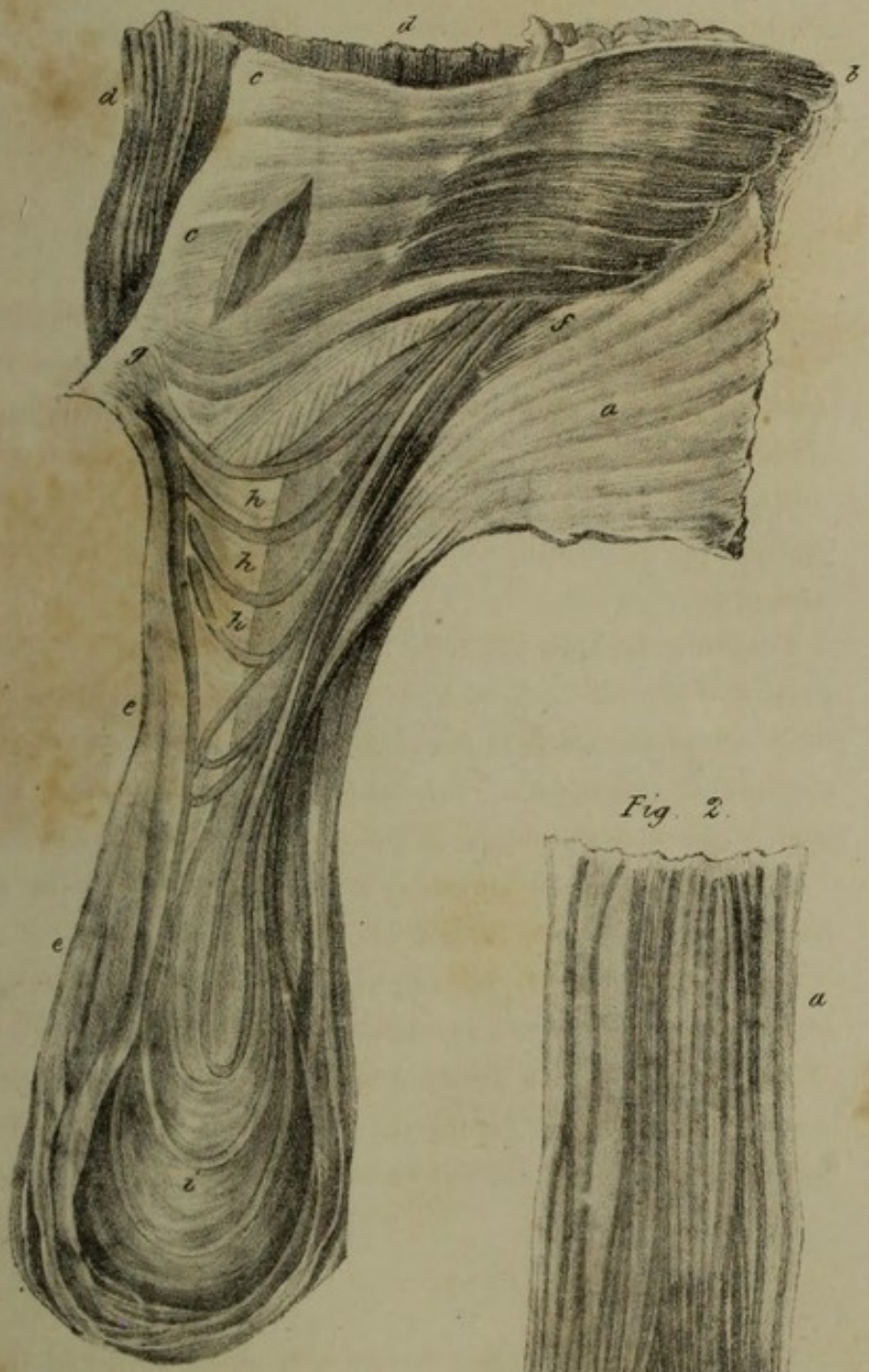


Fig. 2.

PLATE I. B.—ANATOMY OF THE TESTES.

This shows the origin, course, and insertion of the cremaster muscle.

Fig. 1.

a, tendon of the external oblique muscle.

b, internal oblique.

c c, its tendinous sheath on the rectus.

d d, rectus muscle.

e e, superficial fascia of the spermatic cord.

f, origin of the cremaster muscle from Poupart's ligament, and from between the internal oblique and transversalis muscles, with which it blends.

g, its attachment to the sheath of the rectus.

h h h, the loops which are brought down by the descent of the testis into the cremaster.

i, the testis, and the insertion of the cremaster.

Fig. 2. The tendinous sling formed by the cremaster to cover the testis.

a, fibres of the cremaster enveloping the spermatic cord.

b b, the sling formed by the cremaster upon the tunica vaginalis.

abdominal ring, and from thence descends upon the spermatic cord to the lower part of the testis. It is internally attached to the cremaster muscle and its tendon; externally to the cellular tissue of the scrotum. It forms a purse, to support the testicle when the scrotum is relaxed; it attaches the testicle to the scrotum by sending to it a reticular membrane, and it envelopes and connects the superficial vessels and nerves with the spermatic cord.

CREMASTER MUSCLE.

Cremaster.

This muscle next appears in the course of the dissection, enveloping the spermatic cord, covering it entirely, and inserted into the tunica vaginalis; but as the cremaster belongs to the cord as well as to the testis, I will proceed with the dissection of the testis, and afterwards describe the cremaster.

TUNICA VAGINALIS.

Tunica Vaginalis.

This membrane, when first raised, is found to be covered entirely by the tendon of the cremaster muscle, which envelopes its outer surface, and is inserted into it; and until this be cut through, the true tunica vaginalis does not appear.

When the insertion of the cremaster muscle is cut away, the tunica vaginalis is found to be a very delicate and thin membrane, formed from the peritoneum, and descending from the abdomen before the testis. It is composed of two portions: the one loose and detached from the testis, excepting posteriorly and laterally; the other, which adheres to the surface of the tunica albuginea, and which covered the testis whilst in the abdomen; but when examined in the scrotum, the two portions are connected, and are continuations of each other.

Tunica vaginalis reflexa.

The first, or loose portion, is the tunica vaginalis reflexa, and the adhering portion the tunica vaginalis testis: between the first and second there is a cavity, into which a vapour, or halitus, is naturally

secreted, and which, when poured out in a diseased quantity, produces the complaint which is called hydrocele.

The tunica vaginalis is a reflected membrane, like the pericardium, pleura, and peritoneum. The tunica vaginalis reflexa passes loosely over the fore-part and sides of the testis; and being continued to its posterior edge, there turns over the epididymis to the surface of the testicle, covering and adhering to the tunica albuginea; and in a similar manner on the other side, excepting on that side there is no epididymis.

Tunica vaginalis testis.

The tunica vaginalis testis can be dissected from the tunica albuginea but to a short distance, as it soon becomes incorporated with the surface of that membrane.

Behind the tunica vaginalis reflexa, and the tunica vaginalis testis, the testicle is placed, contained in its tunica albuginea; and the spermatic vessels, the vas deferens, the absorbents, and the nerves of the testicle enter it posteriorly, and do not penetrate the tunica vaginalis; and the testis may be cut into behind, without injury to that tunic.

Relative position of all the coverings.

In this dissection, then, the scrotum is first cut through; next the cellular tissue; thirdly, the fascia superficialis; fourthly, the cremaster muscle; fifthly, the tunica vaginalis reflexa; sixthly, the tunica vaginalis testis; and then the testis, with its covering of tunica albuginea, is exposed.

The tunica vaginalis is a serous membrane, and forms a cavity, which communicates with the peritoneum and cavity of the abdomen before birth, but is usually shut after birth by adhesion, when it becomes a small thin cord, situated on the fore-part of the spermatic vessels. The fluid which it secretes, when abundant, has the colour and other properties of serum, being a solution of albumen. It is coagulable by heat, and various chemical agents. The tunic is supplied with vessels from the spermatic artery, and artery of the vas deferens, from which its halitus is secreted. Its veins open into the spermatic veins. Its absorbents pass upon the spermatic cord with those of the testis and with them into the

Fig. 1

Fig. 2.

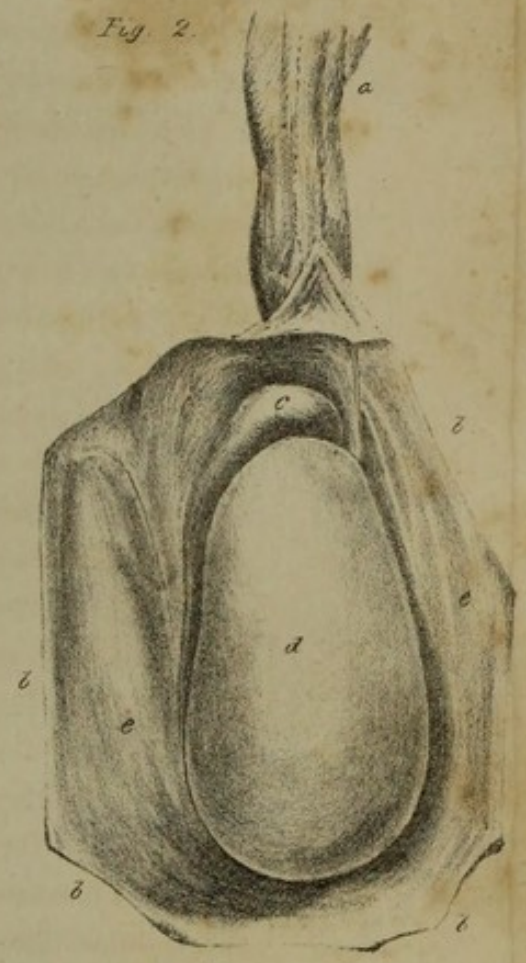


Fig. 3

Fig. 4.

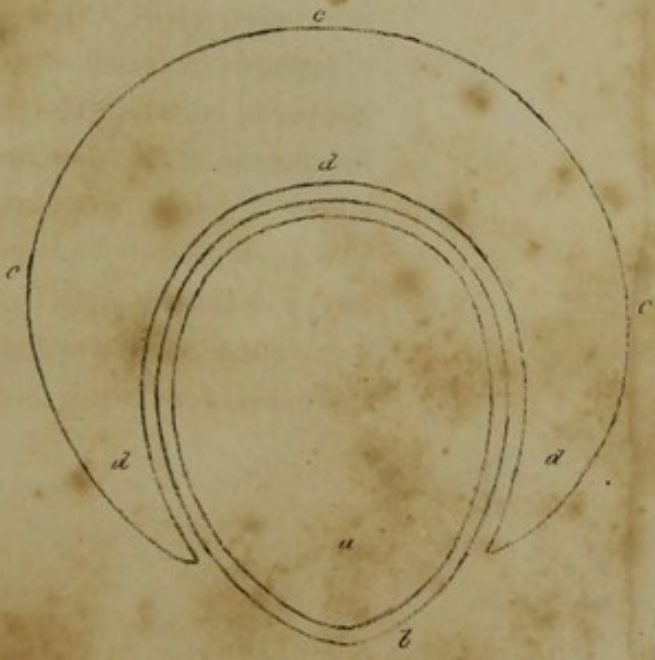


PLATE II.—ANATOMY.

Views of the tunica vaginalis and tunica albuginea.

Fig. 1. Shows the tunica vaginalis.

a, spermatic cord.

b b b, the cremaster.

c c, the tunica vaginalis reflexa.

d, tunica vaginalis on the epididymis.

e, tunica on the testis.

Fig. 2. A front view of the tunica vaginalis.

a, spermatic cord.

b b b b, tunica vaginalis reflexa.

c, epididymis covered by the tunica vaginalis.

d, testis covered by the tunica vaginalis testis.

e e, serous cavity.

Fig. 3. Posterior view of the testis and tunica vaginalis.

a, spermatic cord.

b, vas deferens.

c c, cords or ligaments of the vas deferens.

d d d, testis devoid of the tunica vaginalis.

e e, tunica vaginalis.

Fig. 4. A diagram of the reflexion of the tunica vaginalis.

a, the testis.

b, tunica albuginea and back of the testis, devoid of the tunica vaginalis.

c c c, tunica vaginalis reflexa.

d d d, tunica vaginalis testis covering the surface of the tunica albuginea, and incorporated with it.

abdomen; and its nerves are in part derived from the spermatic plexus, and in part from a branch of the external spermatic. It possesses considerable sensibility, and, irritation of it produces sickness. In the healthy state, when opened, no fluid is found in it; but a vapour arises, and it becomes dry.

When the tunica vaginalis reflexa is opened, the cavity which is situated between it and the tunica vaginalis testis, is exposed; and through the latter membrane, which is semi-transparent, the tunica albuginea testis appears. The general form of the testis and epididymis may be observed, the latter being placed upon the upper posterior, and outer part of the testis; beside which a little vascular membranous body is also seen upon the anterior extremity of the caput epididymis. Epididymis.

OF THE TESTIS.

This organ is oviform, and its largest extremity is placed upwards and forwards. It is situated obliquely, being neither horizontal nor perpendicular, but in the diagonal of the two. Testis.

It is divided into anterior and superior, posterior and inferior extremity; into anterior and inferior, posterior and superior edge; and into its two lateral surfaces. Its anterior edge is most rounded; the posterior least so; the two sides are convex, although flatter than the anterior edge. At the posterior edge the spermatic vessels enter, and this part is devoid of the tunica vaginalis. The upper extremity of the testis is capped by the epididymis.

The axes of the testis are three: the longest is two inches in a healthy well-formed testis, and it passes from the anterior and upper extremity to the posterior and lower. The second axis is one inch and a half, and it passes from the posterior superior, to the anterior and inferior edge; whilst the third, or transverse diameter, passing from side to side, is one inch and one-eighth in length. The weight of a healthy testis and epididymis is about an ounce.

OF THE TUNICA ALBUGINEA TESTIS.

This strong fibrous membrane forms a complete covering to the Tunica albuginea testis.

glandular structure of the testis, leaving a cavity in which it is contained; but at the upper and posterior part of the testis, a little to its outer side, the tunica albuginea turns in towards the centre of the testis, and forms a triangular process, which, from its situation, I should call mediastinum testis.

This inverted portion of the tunica albuginea sends forth numerous ligamentous cords. Some of these cords pass directly from the mediastinum to the anterior edge of the testis, and form pillars, which are strongly fixed to the inner side of the tunica albuginea, to prevent the separation of its sides; others, and the greater number, but smaller cords, descending upon the seminiferous tubes, send forth lateral membranes, which form purses, to enclose the lobes into which the glandular structure is divided; and these are met by similar ligamentous cords and membranes from the inner surface of the tunica albuginea, to complete the envelope of the lobes of the testis.

The tunica albuginea, therefore, is not merely a simple bag to enclose the glandular structure of the testis, but it forms a process which splits into ligamentous cords; and these send forth lateral membranes, which divide the glandular structure into lobes, in which the seminal tubes are contained.

The membranes and cords not only support and connect the seminal tubes, but they form beds, upon which arteries, veins, absorbent vessels, and nerves, are spread. They have been called septa; but they really envelope the seminiferous tubes, convey to them the blood, and form bags, which support, confine, protect, and nourish the tubular structure of the testis.

The outer surface of the tunica albuginea is covered by the tunica vaginalis testis, and this is formed of the peritoneum, which covered the testis whilst still in the abdomen. It is very thin, and is soon incorporated with the surface of the tunica albuginea, from which it can be separated only to a small extent; but as it is a serous membrane, it renders the outer part of the tunica albuginea a secreting surface.

The tunica albuginea is by dissection farther divisible into two layers or portions. The outer tunic is fibrous, tendinous, and

inelastic, resembling the sclerotic coat of the eye, and external portion of the dura mater; and like other tendinous structures, it is endowed with but little vascularity. It is strong and inelastic, to protect the tender tubular substance of the testis from violence; for the most severe blow or pressure rarely injures it, whilst suspended in its natural situation; and although extravasations of blood into the tunica vaginalis are not uncommon, yet the testis generally escapes any severe injury; as blows inflicted upon the eye produce great ecchymosis in its neighbourhood, yet how rarely is the eye itself ruptured.

The inner coat or layer of the tunica albuginea I should call the tunica vasculosa; for in it the spermatic artery ramifies. It is easily separated by dissection from the outer layer, excepting at the anterior edge of the testis, where some of the internal ligamentous cords are fixed; but it may be entirely separated from the outer layer of the tunica albuginea, so as to form a separate preparation, enclosing the tubuli, and leaving the outer layer of the tunic with the spermatic cord. This tunica vasculosa is easily demonstrated, by filling the arteries and veins with fine injection: the testis is then cut open, and the tubuli removed, when this membrane is seen highly vascular on the inner part of the tunica albuginea.

Whilst the outer layer bears a strong resemblance to the dura mater—like it being tendinous and inelastic, and like it forming processes internally—the inner membrane of the tunica albuginea resembles the pia mater, being reflected inwards on the lobes of the testis, and forming a bed, on which the branches of the spermatic artery ramify, and supplying with vessels the membranes which envelope the tubuli.

The arteries which supply the tunica vasculosa pass between this coat and the proper tunica albuginea before they divide into minute branches, to supply the membrane which is reflected inwards. Some branches of the spermatic veins also ramify upon the surface of this membrane; but the greater number pass, upon the ligamentous cords, into the glandular substance of the interior of the testis, and upon this membrane absorbent vessels are also found.

OF THE LOBES OF THE TESTIS.

Lobes of the testis.

The tubuli seminiferi are disposed in numerous lobes, which are contained in the tunica albuginea. These lobes are pyriform: their stalk, or commencement, is turned to the upper and posterior edge of the testis, and their bases to the anterior and lateral parts of the tunica albuginea. These lobes receive suspensory cords, or ligaments, from the mediastinum testis, which send out membranes, to be spread over the lobes, and which meet others springing from the anterior edge and sides of the testis (see plate); thus the lobes are suspended in the ligaments and membranes, and by them confined in their situation, so as to be incapable of being displaced: for, if the tubes had been merely loosely suspended within the tunica albuginea, they would have been continually liable to derangement from concussion, or to be torn asunder by violence.

OF THE TUBULI SEMINIFERI.

Tubuli Seminiferi.

The cavity formed by the tunica albuginea is in a great measure filled by the tubuli seminiferi, which, as I have stated, do not hang loosely within the cavity, but are divided into two sets of lobes: first, into large lobes, which are enveloped in membranes, and connected with the larger ligaments or pillars of the testis; and, secondly, into an infinite number of small lobes, each also contained within a membrane. The larger lobes are composed of numerous tubuli clustered together; the smaller are formed of a single tubulus, and sometimes of two tubuli. The larger lobes are pyriform, their stalks attached to the rete, their bases to the inner side of the tunica albuginea. They are situated between the stronger pillars of the ligaments of the testis, as they pass from the mediastinum to the inner part of the tunica albuginea; and the vascular membranes by which they are enveloped, pass from one ligament to the other; and the smaller lobes are also disposed in vascular membranes, and supported by smaller ligaments and vessels.

PLATE. III.

Fig. 1.

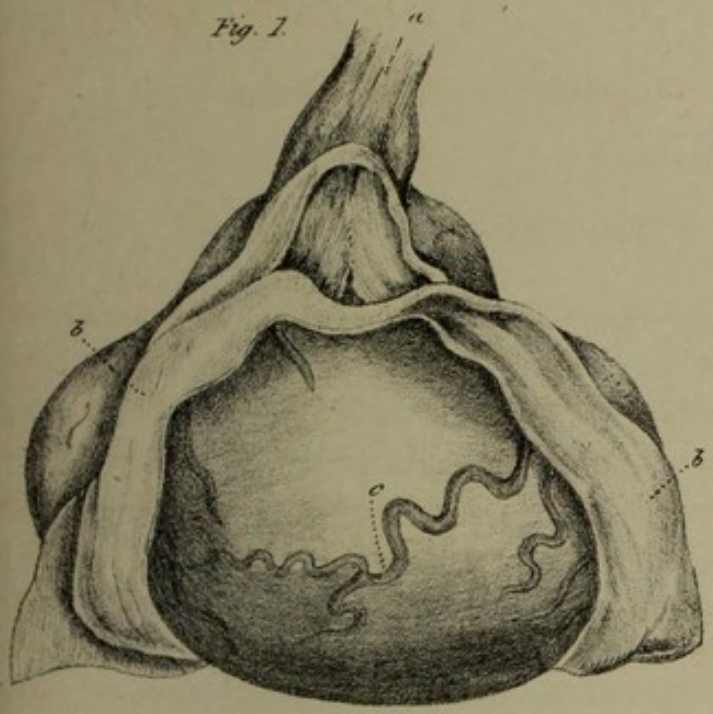


Fig. 2

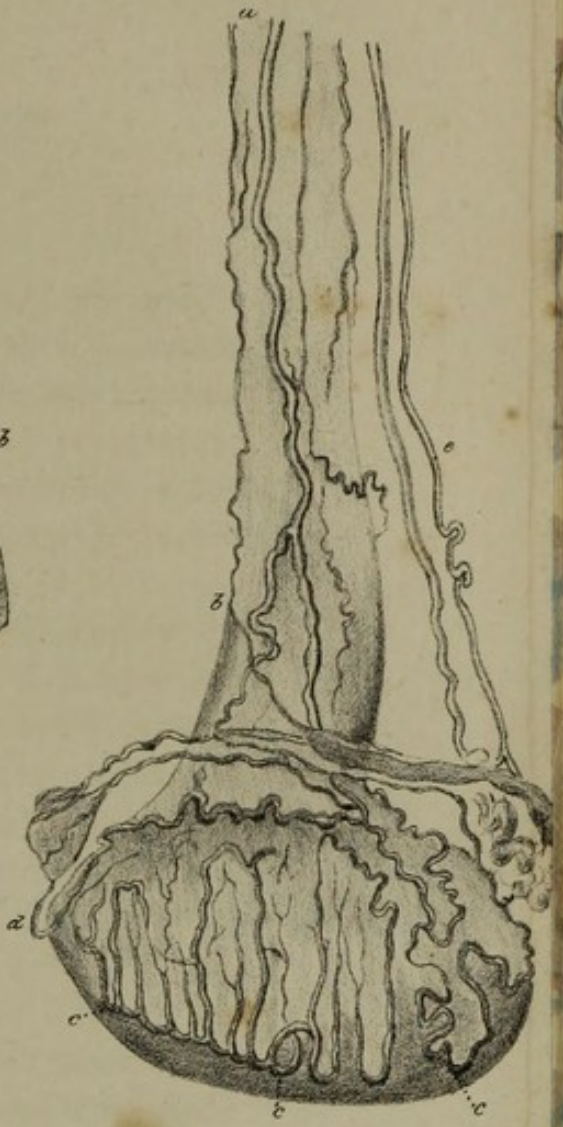


Fig. 3.

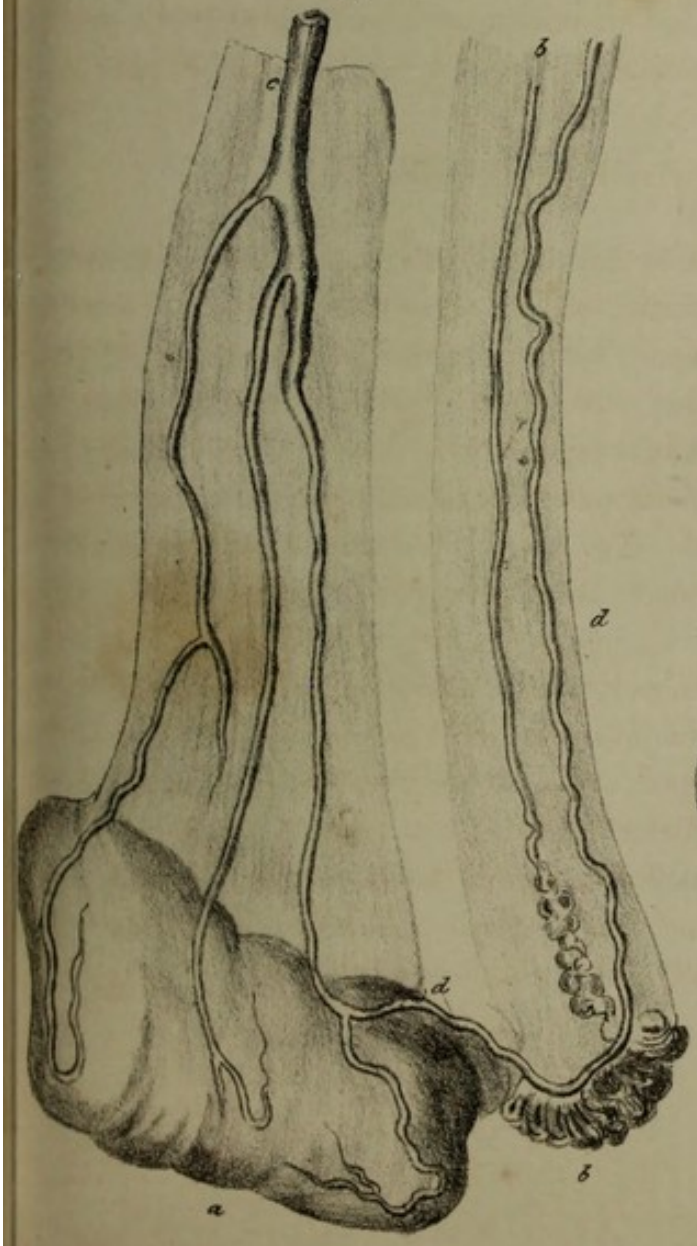


Fig. 4

PLATE III.—ANATOMY.

Fig. 1. Shows the external portion of the tunica albuginea cut open, and turned aside to show the internal vascular layer, with the spermatic artery taking its tortuous course upon it. With care, this layer may be entirely dissected from the thicker tendinous coat.

a, spermatic cord.

b b, external portion of the tunica albuginea cut open.

c, the internal vascular layer.

Fig. 2. Minute injection of the spermatic artery; yet the vessel is filled with a coarse injection.

a, the spermatic artery sending branches to the cord.

b, arteries of the epididymis.

c c c, spermatic artery in the testis, displaying its arches below, and its inverted branches first ascending and then descending.

d, another, and superior arch in the mediastinum.

e, artery accompanying the vas deferens, arising from a vesical artery of the hypogastric.

Fig. 3. Shows the deferential artery.

a, the testis.

b b, vas deferens.

c, spermatic artery.

d d, the deferential artery anastomosing with the spermatic.

Fig. 4. Perpendicular and longitudinal section of the testis.

a a, mediastinum testis.

b b, the lobules of the tubuli attached to the mediastinum, and proceeding to the tunica albuginea, on which the vascular enveloping membrane appears.

Each tubulus begins from one of the canals which form the rete; and, passing through a small hole in the mediastinum testis, it becomes excessively convoluted, and forms a conical or pyriform body, the basis of which is turned to the inner side of the tunica albuginea, and the convolutions are placed nearly at right angles with the long axis of the tubulus. Each tubulus may be unravelled, when it is found to be composed of a long, single, and convoluted vessel, the convolutions disposed nearly in parallel lines, and nearly transversely to the long axis of the lobe.

With these tubuli, thrown into larger and smaller lobes, and supported by ligaments from the mediastinum, is the cavity of the tunica albuginea filled. The blood-vessels distributed upon the lobes are as follows:—First, the *spermatic artery* passes in two large branches on the opposite side of the testis to the epididymis; and between the outer and inner layer of the tunica albuginea, they are continued upon the inner coat towards the anterior and inferior edge of the testis. There they form an arch of communication, from which vessels pass upwards and backwards upon the membranes which cover the lobes of the tubuli; and when they have reached two-thirds of the way to the mediastinum, they divide into two branches, which turn back on each side towards the anterior edge, and supply the membrane abundantly with vessels. The smaller lobes receive a little vessel at each extremity.

The principal branches of the *spermatic veins* enter the testis in a different manner to the arteries; a few pass on each side upon the surface of the lobes, but the greater number descend upon the mediastinum, and are continued upon the ligaments of the testis, between the larger lobes, to the anterior edge, where they become inverted, to be distributed upon the extremities of the larger lobes; and they also meet some small veins which pass in at the anterior edge, and which are distributed upon the extremities of the lobes.

OF THE RETE.

By the term Rete, is meant a set of canals which receive the

Rete.

semen from the tubuli; and it is to be distinctly understood, that these canals are not placed in the cavity of the tunica albuginea, as the tubuli are, but that they are situated between the layers of the tunica albuginea itself, in a substance which I have called the mediastinum. This substance is placed at the posterior edge of the testis, but a little inclined to its outer side; and it is situated opposite to the epididymis.

Manner of dissecting it.

To dissect this structure clearly and distinctly first make a transverse section of the testis, and then, looking at its divided edge, it will be seen that the tunica albuginea is at that part readily divisible into three layers. The first layer turns upon the spermatic cord, uniting with the sheath which covers its vessels. The second layer unites with a similar layer on the opposite side, and forms a thick substance, between the fibres of which, interstices are left for blood-vessels and absorbents: whilst the internal layer, uniting with that on the opposite side, as well as with the preceding layer of the tunica albuginea, forms the process which I have called mediastinum, which projects into the testis between the tubuli; and it is in this substance that the seminal canals of the Rete are placed. The mediastinum is therefore composed of two bodies—the upper placed towards the spermatic cord, the lower towards the centre of the testis:—in the upper are situated blood-vessels; in the lower, the canals of the Rete; and from the lower proceed the pillars which are stretched to the inner side of the tunica albuginea, to bind its sides together, and smaller ligaments are also sent to the lobes of the tubuli, to envelope and support them.

If an incision be made in the long axis of the testis, from one extremity to the other, the mediastinum will be seen projecting downwards and forwards amidst the tubuli, reaching more than three-fourths the length of the testis, and its edge terminates in forming its ligaments. In a testis which measured an inch and three quarters, the mediastinum was an inch and an eighth in length.

Canals in the rete.

In the whole length of the mediastinum, canals are passing, which form the rete, and when a transverse section is made of the mediastinum, these canals are very visible to the naked eye: they

pass in a longitudinal and waved direction, from the posterior to the anterior part of the mediastinum, and are situated in it more to the anterior and lower than to the posterior edge of the testis. And hence I have observed that the mediastinum is composed of two parts: the back part of blood-vessels; the anterior of seminal canals, which form the rete.

In these canals of the rete, the tubuli terminate by single vessels, which pass through small apertures, between the ligaments of the mediastinum, and they enter the anterior edge, as well as into the sides and extremities of the rete: but at the posterior edge of the mediastinum they do not enter. The rete terminates at the upper and posterior extremity of the testis, by forming the vasa efferentia. The mediastinum descends towards the centre of the testis, and the central tubuli there enter it, whilst the others pass into its sides. The back part of the mediastinum has a very convoluted artery passing from one extremity to the other. The veins also ramify upon the back of the mediastinum, and send vessels through it, which pass between the ligaments and lobes of the tubuli.

Mode of injecting them.

Having traced the canals of the rete, and found that they were situated in, and completely enclosed in the tunica albuginea, it struck me that I might inject these tubes with glue, or even coarse injection, by passing a fine silver or steel pipe into the canals of the rete; and having made trial of this plan, I have injected the tubuli seminiferi with coloured fine injection, and the vasa efferentia were also readily filled, and have been thus able to make some beautiful preparations, more easily dissected, and much less easily spoiled, than those which are made by injecting the tubes with quicksilver. The rete can even be filled with coarse injection; and the beginnings of the tubuli and the vasa efferentia will receive the injection. If the injecting pipe be placed in the back of the mediastinum, the injection readily escapes into the absorbent vessels, and those of the spermatic cord become filled.

OF THE VASA EFFERENTIA.

Vasa efferentia.

The tubuli contained in the cavity of the tunica albuginea and

the canals of the rete, situated between the layers of the same tunic, compose the bodies of the testis; and the seminal vessels next in order are the vasa efferentia. These vessels are placed between the testis and epididymis, and become therefore the medium of communication of the testis and its appendix, the epididymis. They proceed from the anterior and upper extremity of the rete, and pass to the epididymis, in which they terminate. The greatest number of these vessels which I have seen is fifteen, and from thirteen to fifteen exist in a healthy testis; but they are very often found in a diseased state, and obliterated so as to be reduced to the number of six or seven; but this does not prevent the organ from continuing to perform its functions, as the semen is still readily conveyed by the remaining channels into the epididymis.

Origin in the Rete.

The vasa efferentia arise singly from the rete, and they terminate in the epididymis, in different parts of it, so as to leave the epididymis a single tube. Prior to their termination, they each form a conical body, in which the seminal tube is divided with extreme minuteness, just before its termination in the epididymis. A small band of communication is continued along the surface of the vasa efferentia, to receive the termination of those vessels. Between the vasa efferentia and the lobes which they form, strong ligamentous cords are found, intended for the purpose of strengthening the connection between the testis and epididymis; and the tunica vaganilis which is reflected over them, is a denser structure than in other parts. The vasa efferentia have the general form and character of the tubuli testis, only that their direction is reversed; they begin from the rete, in single vessels, a little convoluted, and then, by their excessive convolutions, they are formed into conical bodies: they differ from the tubuli in sending forth a vessel to the epididymis, instead of terminating in a blind extremity. The first vas efferens has the readiest communication with the epididymis, the second a smaller, and so on, although they all ultimately communicate with it.

OF THE EPIDIDYMIS.

Epididymis.

This body may be considered as an appendix to the testis, and

Fig. 1.

Fig. 2.

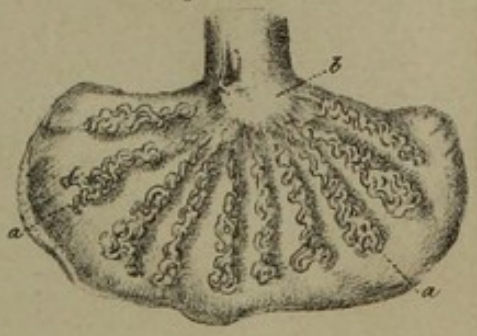
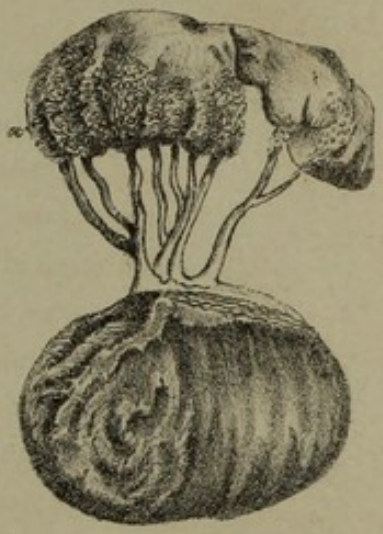


Fig. 3.

Fig. 4.

Fig. 5.



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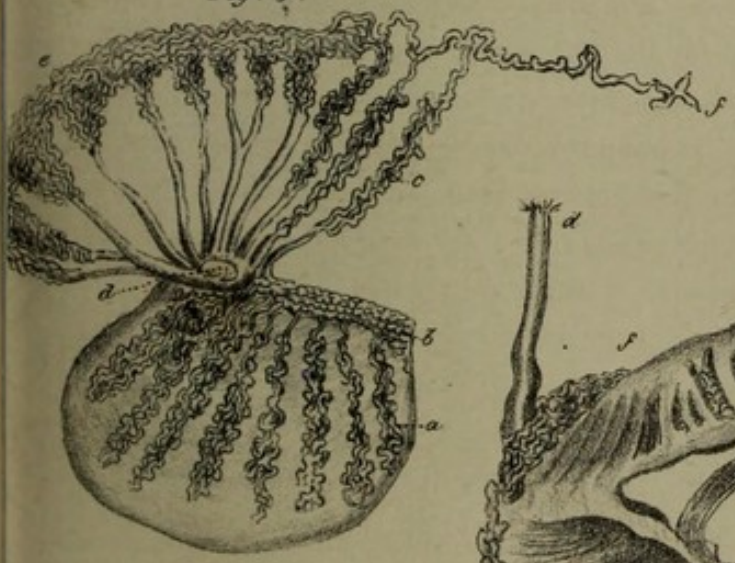

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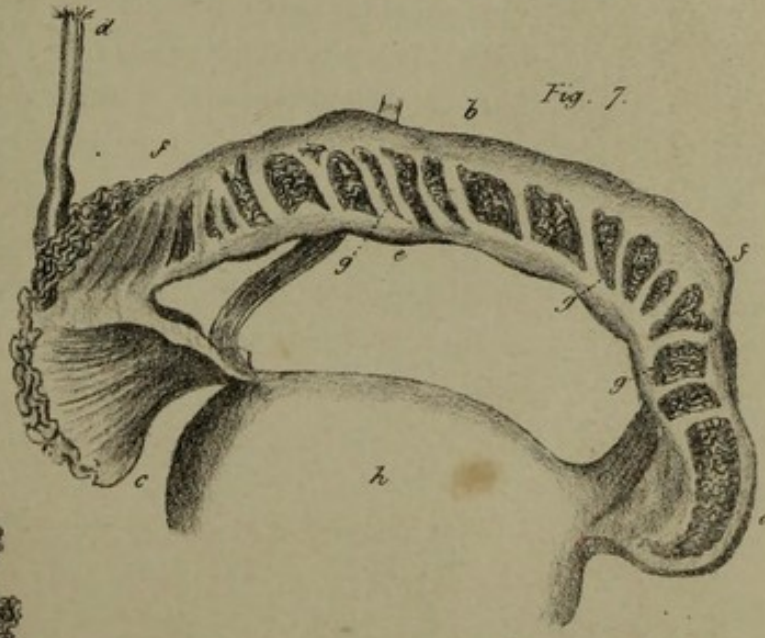


Fig. 8

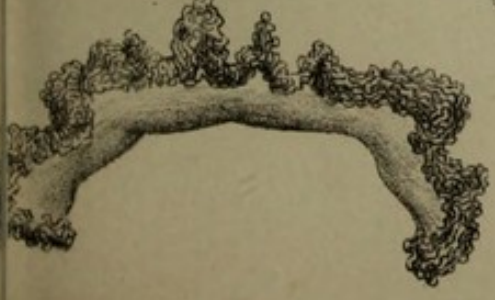


PLATE IV.

Fig. 1. Veins of the spermatic cord and testis filled with coarse injection, and unravelled.

a, testis.

b, the epididymis.

c, vas deferens, with some curious sacs upon it, three of which are seen.

d, first cluster of veins.

e, second cluster of veins.

f, veins accompanying the vas deferens.

g g, communicating veins between *d*, *e*, and *f*; several veins are seen coming from the epididymis.

Fig. 2. Tubuli injected.

a a, tubuli.

b, the rete.

Fig. 3. A similar section showing the rete and tubuli.

Fig. 4. Tubuli injected with red glue, and unravelled.

Fig. 5. Vasa efferentia injected with coloured glue.

a, their lobes.

Fig. 6.

a, tubuli.

b, rete.

c, vasa efferentia terminating in the epididymis.

d, a little sac upon the vasa efferentia, often found.

e e, epididymis.

f, epididymis unravelled.

Fig. 7, epididymis.

a, caput.

b, the body.

c, cauda.

PLATE IV. *(continued.)*

Fig. 7. *(continued.)*

d, the vas deferens.

e, membranous bands at the lower arch.

f f, membrane at the upper arch.

g g g, ligaments supporting and dividing the lobes.

h, the testis.

Fig. 8. Shows the lobes of the epididymis.

its name is derived from its being placed upon this organ, as the testes were anciently called didymi.

It is of a crescentic form; its upper edge is rounded, its lower edge is thin. Its anterior and upper extremity is called its caput, the middle part its body, and the lower part its cauda. The caput and cauda have been called globus major and minor; but there is no enlargement entitled to the name of globus minor. The epididymis is covered by the tunica vaginalis reflexa. The tunica vaginalis testis is continued from the side of the testis towards the epididymis, and passes directly over its caput and cauda; but in the centre it passes under the body of the epididymis to the spermatic cord; then turns, and lines the inner side of the epididymis, and rises over its sharp edge, to cover the upper part of its body, being continued, to form the tunica vaginalis reflexa. The cauda it covers superficially. The caput it closely invests. Its form.

Thus each extremity of the epididymis is confined to the testis; but at its centre there is a hollow between the two, into which the point of the finger may be passed, and which is lined by the tunica vaginalis.

When the tunica vaginalis is raised from the epididymis, numerous cords and branches of blood-vessels, may be observed passing into it from the posterior to the anterior extremity, dividing it into lobes; and these cords are the insertions of the cremaster muscle into the epididymis. They also form bands, which prevent the convolutions of the tubes from being displaced.

OF THE CAPUT EPIDIDYMIS, OR GLOBUS MAJOR.

This part, although so called, is principally formed of the lobes of the vasa efferentia, named by some anatomists coni vasculosi, which are not situated in a single line, but some are placed behind others; so that the end of the epididymis is curved, and double. Caput Epididymis.

Between these lobes are formed tendinous cords, which separate and support them; and on the upper part of the vasa efferentia a

band of epididymis passes, which receives a vessel from each lobe of the vasa efferentia.

OF THE CAUDA EPIDIDYMIS.

Cauda.

Its cauda terminates in the vas deferens, the tube of which is larger and less convoluted than that of the epididymis; and this is their chief distinction. But in injecting the testicle, the quick-silver is with difficulty made to pass from the vas deferens into the epididymis, in consequence of the sudden turn the tube here makes, and from its being bound down by cords proceeding from the cremaster muscle.

OF THE BODY OF THE EPIDIDYMIS.

Body.

The body of the epydidymis is entirely composed of the convolutions of a single seminal tube thrown into lobes; and the convolutions pass in parallel lines from edge to edge.

This part is smaller than the head of the crescent. That it is composed of a single tube, is not only shewn by its being capable of being entirely unravelled after maceration; but to the learner it is easily demonstrated by unravelling it at any one part.

It is subject to some varieties. First, I have seen it naturally unravelled in its centre, to the extent of three-quarters of an inch; and, secondly, it very frequently sends forth an additional vas deferens, from one to three inches in length, along the spermatic cord; and I have a preparation of three of these in the same testicle, each terminating in a blind extremity.

OF THE VAS DEFERENS, OR DUCTUS SPERMATICUS.

Spermatic duct.

This duct begins from the cauda epididymis, and it terminates in the duct of the vesicula seminalis, the combined vessels opening at the veru montanum in the prostatic part of the urethra.

Its course.

At its beginning from the epididymis it is doubled upon that body,

and bound down, by the tendinous fibres and insertions of the cremaster. It is at its beginning very much convoluted, though less so than the epididymis; and it does not form any distinct lobes. It descends below the cauda of the epididymis at its commencement, and for the first inch its convolutions are numerous; in the second inch of its ascent they become less in number; and in the third inch, from its beginning, in a great degree disappear. It then ascends to the external ring, passes through the inguinal canal, emerges at the internal ring, there entering the abdomen.

It then quits the spermatic artery and vein, crosses the edge of the psoas muscle, and descends into the pelvis—first, by the side of the bladder; and, secondly, behind it, and between the vesiculæ seminales to the prostate gland.

The vas deferens is enclosed in a sheath, formed by the tendinous fibres of the cremaster, and is supported by ligaments of its own, which descend from the internal ring, which sheath may be readily found in the first three inches of the tube from the epididymis. The ligaments are intended to strengthen the connection of the testis to the body, to support the testis, and to preserve the convolutions of the vas deferens, for which its two lateral bands are particularly designed.

Its relative position, &c.

It is situated posteriorly in the spermatic cord; and there is a space of a quarter to half an inch between it and the spermatic artery and vein.

It is round and hard, and is thus easily distinguished from the other vessels.

Structure, &c.

It is distinctly muscular in the bull, and its fibres take a circular direction, as may be readily seen in that animal, by examining the enlarged part of the vas deferens, which is situated behind the bladder.

Where these vessels are placed between the vesiculæ seminales, they become enlarged, and their interna surfaces cellular, secreting a fluid which mixes with the semen.

The structure of the vas deferens near its termination bears a strong resemblance to that of the vesiculæ seminales.

OF THE SPERMATIC CORD.

Spermatic cord.

The parts which compose this cord are situated in the abdomen (although not there formed into a distinct cord), in the inguinal canal, and between the abdominal ring and testicle.

It consists of three arteries with their corresponding veins, of the vas deferens, of absorbents, and of nerves covered by fascia and by the cremaster muscle.

OF THE PARTS IN THE ABDOMEN.

Abdominal origin.

The spermatic arteries take their origin from the anterior and lateral parts of the aorta, between the superior and inferior mesenteric vessels; but much nearer the former than the latter, and a little below the renal arteries.

But their origin is liable to great varieties. Sometimes one or other springs from the renal artery, sometimes both from the superior mesenteric artery at its root; and although they generally arise opposite to each other, yet in this respect they sometimes vary.

They descend from their origin behind the peritoneum to the fore-part of the psoas muscles.

On the right side, the artery passes anteriorly to the inferior cava, and on each side before the ureters. They diverge as they descend, passing to the lower part of the abdomen, to midway between the anterior and superior spinous process of the ilium and the symphisis pubis, and from a quarter to half an inch upon the outer side of the epigastric, and before the external iliac artery.

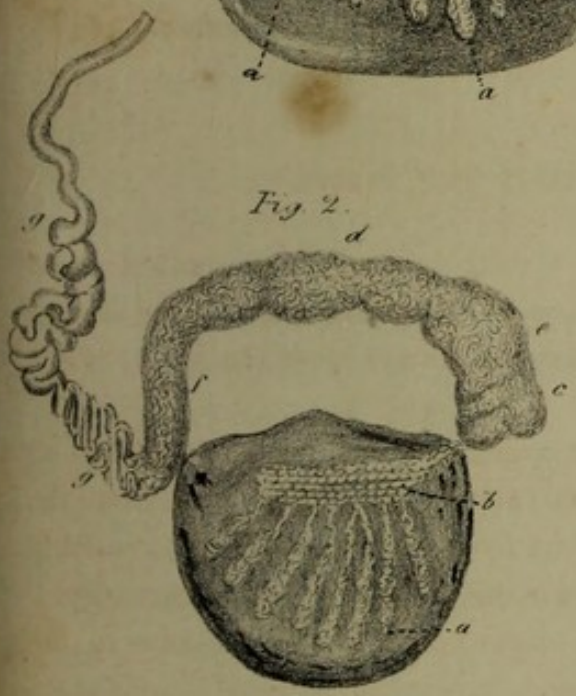
In its course in the abdomen it becomes serpentine; as it descends, it gives off small branches to the cellular covering of the lower part of the kidney, to the ureters, and to the peritoneum.

The spermatic arteries next enter the inguinal canal through the internal ring, and descend obliquely towards the external; from whence they emerge, and appear in the spermatic cord surrounded and enveloped by the spermatic veins.

PLATE V.

Fig. 1.

Fig. 2.



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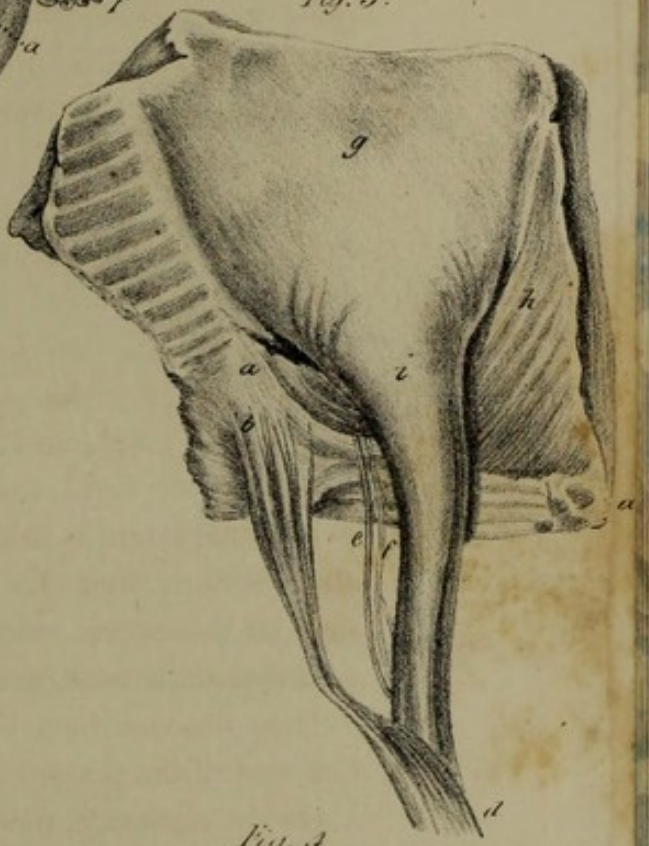

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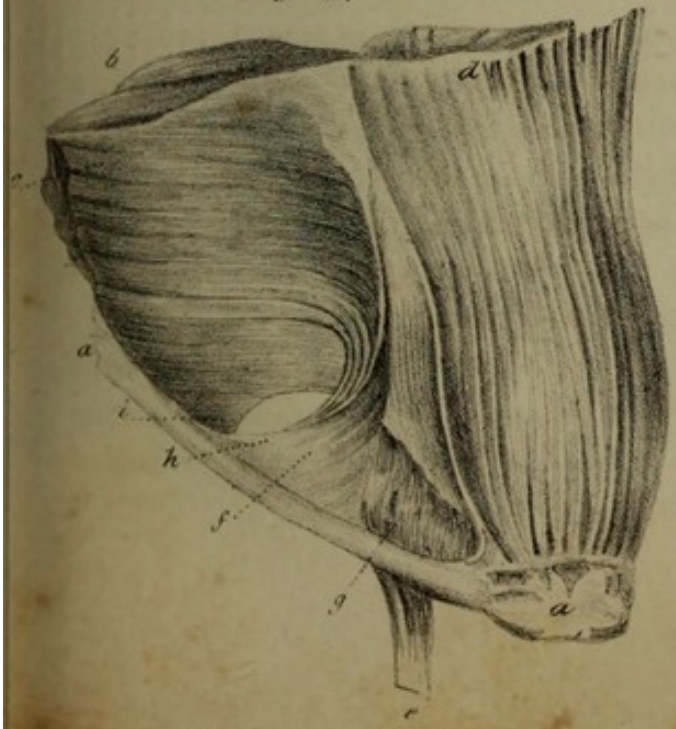

Fig. 4

PLATE V.—ANATOMY.

Fig. 1. Different views of the tubuli, spermatic cord and inguinal canal laid open.

a a a, tubuli.

b, rete.

c c, vasa efferentia.

d, caput epididymis.

e, cauda epididymis.

f, commencement of the vas deferens.

g, vas deferens.

Fig. 2. Shows the whole structure injected with mercury.

a, the tubuli.

b, the rete.

c c c, vasa efferentia.

d, the body of the epididymis.

e, the caput epididymis.

f, the cauda epididymis.

g g g, the vas deferens.

Fig. 3. Shows the fascia transversalis united to the spermatic cord in its passage.

a a, Poupart's ligament.

b, the cremaster arising from it.

c, the spermatic cord below the external ring.

d, the cremaster passing over the cord.

e, cremastic artery arising from the epigastric.

f, the vein.

g, the external portion of the fascia transversalis.

h, internal portion of the fascia transversalis, covered by muscular fibres from the transversalis.

i, the cord united by a thin layer to the fascia transversalis.

Fig. 4. Showing the inguinal canal laid open, and course of the spermatic cord.

a a, Poupart's ligament.

b b, the internal oblique muscle.

PLATE V. *(continued.)*

Fig. 4. *(continued.)*

c c, transversalis muscle arising from Poupart's ligament, and passing around the spermatic cord at the internal ring, so that the fibres of this muscle appear behind as well as before the spermatic cord, and thus the inguinal canal is rendered a muscular canal.

d, the cremaster muscle, arising from Poupart's ligament, between the internal oblique and transverse muscles, and receiving fibres from the transversalis behind the cord.

e e, rectus muscle.

f, its sheath from the internal oblique and transverse muscles.

g, the superficial fascia of the cord.

h h, spermatic cord.

i, internal ring.

k, external ring.

Fig. 5. Internal view of the inguinal canal.

a a, Poupart's ligament.

b, internal oblique muscle.

c, transversalis muscle.

d, rectus.

e, spermatic cord.

f, internal portion of the fascia transversalis with the transversalis muscle passing upon it, to be fixed in Poupart's ligament.

g, muscular fibres seen through the fascia.

h, fascia transversalis, and transversalis muscle, forming the inner portion of the inguinal canal, above which is seen the linea semilunaris.

i, the origin of the transversalis muscle from Poupart's ligament, and the manner in which it is twisted round upon the fascia transversalis, to be inserted into it, and into Poupart's ligament.

When the artery reaches from one to three inches from the epididymis, varying in different subjects, it divides into two branches, which descend to the testicle on its inner side, opposite to that on which the epididymis is placed; one passing on the anterior and upper, the other to the posterior and lower part of the testis.

From the anterior branch, the vessels of the epididymis arise: First, one passes to its caput; secondly, another to its body; and, thirdly, one to its cauda and the first convolutions of the vas deferens, communicating freely with the deferential artery.

The spermatic arteries, after giving off branches to the epididymis, enter the testis, by penetrating the outer layer of the tunica albuginea; and dividing upon its vascular layer, they form an arch by their junction at the lower part of the testis, from which numerous vessels pass upwards; and then descending, they supply the lobes of the tubuli seminiferi.

Beside this lower arch, there is another passing in the direction of the Rete, extremely convoluted in its course, and forming an anastomosis between the principal branches.

OF THE SPERMATIC VEINS.

Spermatic veins.

There are two veins at their terminations in *the abdomen;* for they may be said to begin at the extremities of the arteries in the testis, and to terminate in the abdomen. On the right side, the spermatic vein ends in the inferior cava, nearly opposite to the origin of the spermatic artery; and on the left side, in the renal or emulgent vein.

They enter the abdomen at the internal ring, and pass in contact with the arteries, near to the kidneys, before they quit them to terminate in the manner which I have stated.

Two or three veins often accompany each spermatic artery in the abdomen; and similar branches also cross upon the coats of the artery, and form several anastomoses; but they unite into one before they terminate.

In the inguinal canal they are placed with the spermatic artery;

but one divided into two, three, or more vessels, beside some small communicating branches.

When examined below the external ring, they will be found as follows :—

Three sets spring from the testis, one from the rete and tubuli, and another from the vascular layer of the tunica albuginea, and a third from the lower extremity of the vas deferens.

The veins of the testis pass in three courses into the beginning of the spermatic cord; two of these quit the back of the testis—one at its anterior and upper part, and a second at its centre; and these, after passing from two or three inches, become united into one. The other column accompanies the vas deferens. There is also a large vein just above the testis, which crosses to join the three columns.

The veins of the epididymis are, one from the caput, another from its body, one from its cauda, and another from its junction with the vas deferens, besides some small branches; they terminate in the veins of the spermatic cord.

The veins of the cord below the external ring divide into numerous branches, which are not only turned and twisted upon each other, but very frequently communicate; so that, although they have valves, like other veins, they may be injected contrary to the course of the blood, by the injection traversing from one to the other. These vessels have been absurdly called the vasa pampyniformia.

When we consider the length of the spermatic arteries and veins, and the numerous convolutions which they make, and remember that they are living tubes, whose directions are constantly changing, it must be obvious that nature has designed to make the circulation slow, the secretion elaborate, and that she has defended the tender structure of the testis from the danger of an impetuous current.

This tardiness of circulation is further secured by the number and great size of the spermatic veins, when compared with their accompanying arteries.

PLATE VI

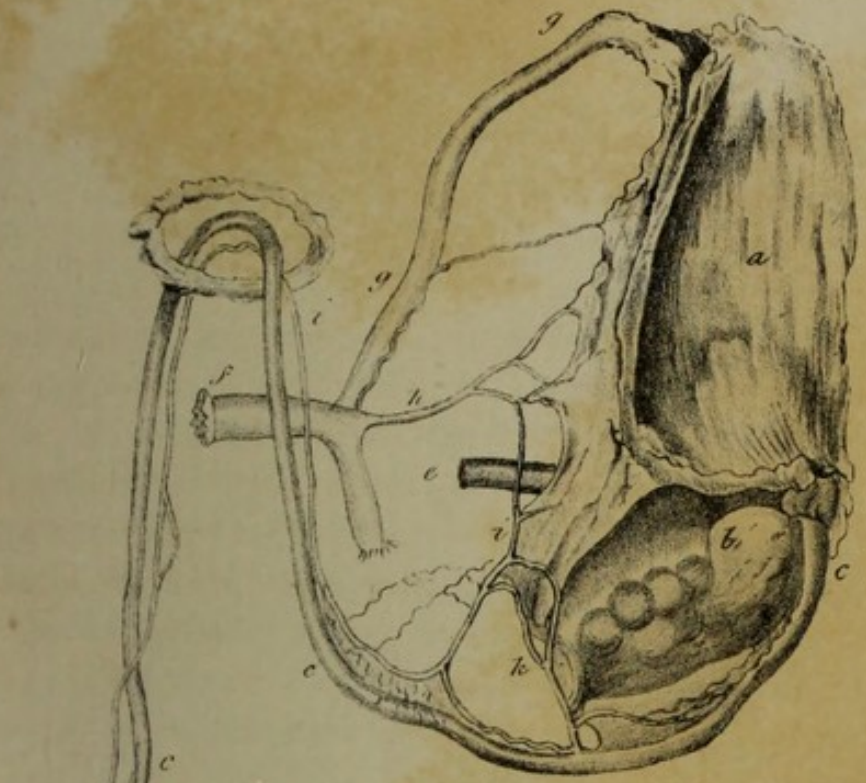

Fig. 1.

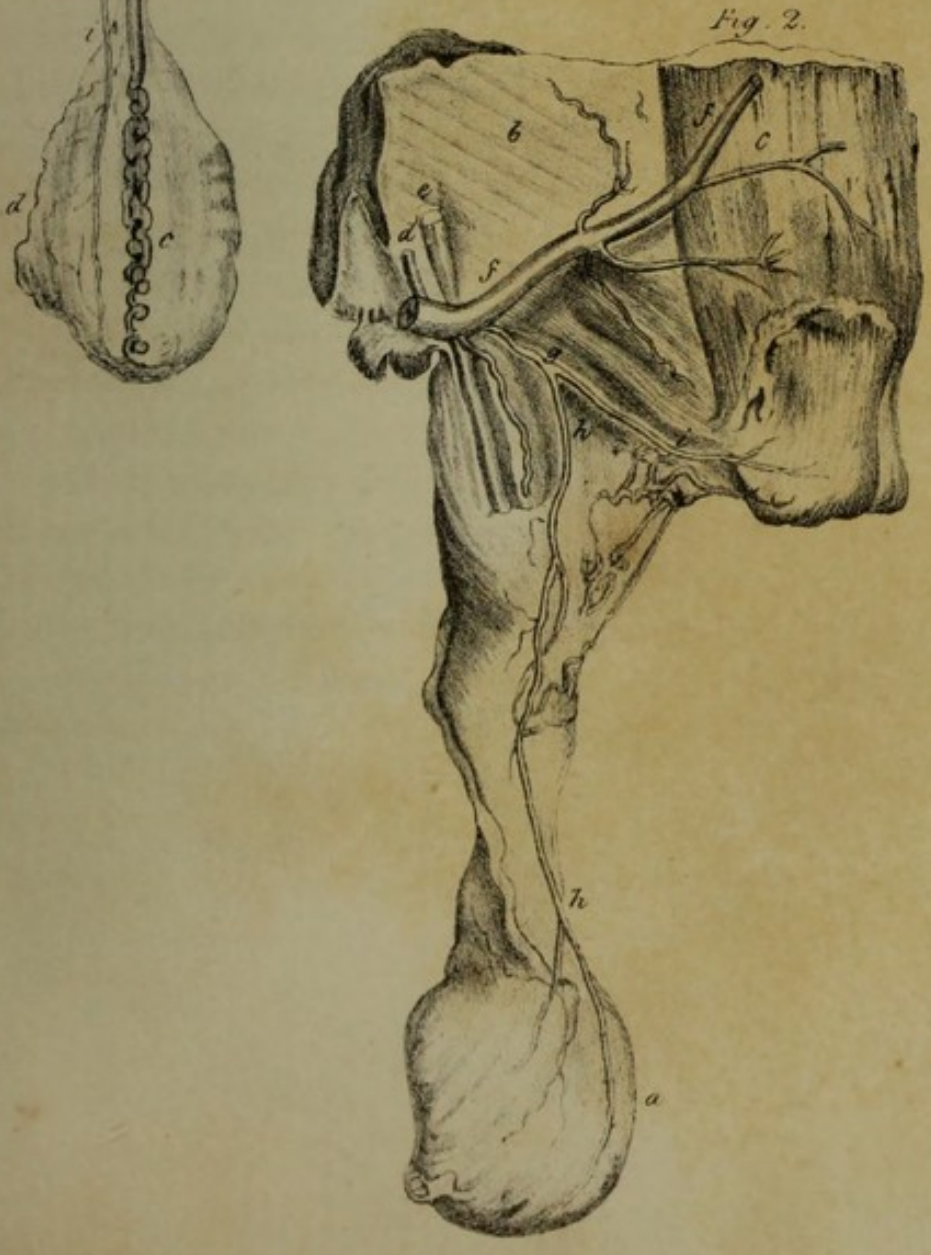

Fig. 2.

PLATE VI.—ANATOMY.

Fig. 1. Shows the deferential and cremasteric artery.

a, the bladder.

b, vesicula seminalis.

c c c c, vas deferens.

d, the testis.

e, the ureter.

f, hypogastric artery.

g g, remains of the umbilical artery.

h, vesical artery.

i i i, artery of the vas deferens, or deferential artery.

k, the descending branch of it to the vesicula seminalis.

Fig. 2. Cremasteric artery.

a, testis.

b, transversalis muscle.

c, rectus abdominis.

d, spermatic artery.

e, vas deferens.

f f, epigastric artery.

g, artery from the epigastric.

h h, cremasteric branch.

i, branch to the rectus and pyriformis muscles.

There is a *second artery* in the spermatic cord, which begins from one of the vesical arteries, a branch of the hypogastric, near the remains of the umbilical artery, where several vesical branches arise.

This *deferential* artery divides into two sets of branches, one set descending to the vesicula seminalis, and to the termination of the vas deferens; the other, ascending upon the vas deferens, runs in a serpentine direction upon the coat of that vessel, passing through the whole length of the spermatic cord; and when it reaches the cauda epididymis, it divides into two sets of branches—one advancing, to unite with the spermatic artery, to supply the testicle and epididymis—the other passing backwards to the tunica vaginalis and cremaster.

THE ABSORBENT VESSELS OF THE TESTICLE.

Absorbents.

These vessels arise both from the coats of the testicle and from its internal structure. They unite upon the cord, and form three or four trunks, which ascend upon the spermatic veins:— they pass through the inguinal canal, and when they enter the cavity of the abdomen, their numbers are diminished, but their size is increased;— they ascend with the spermatic vein, on the right side quit it to cross the vena cava, and terminates in three or four absorbent glands by the side of the aorta, near the origin of the spermatic artery. On the left side, they pass into glands in contact with the aorta, just below the renal artery.

The absorbents of the tunica vaginalis terminate in those of the testis.

OF THE DISSECTION OF THE INGUINAL CANAL.

Inguinal Canal.

This canal is bounded at the lower part by the external abdominal ring, formed by the tendon of the external oblique muscle; at its upper part by the internal ring, formed by the fascia transversalis.

In dissecting it, after removing the integuments, the superficial fascia of the tendon of the external oblique muscle is laid bare.

Dissection of the inguinal canal.

An incision is to be made through the tendon of the external oblique, beginning above the abdominal ring, and extending near to the anterior and superior spinous process of the ilium. The edges of the divided tendon being then turned down, the inguinal canal is brought into view.

At the lower part of the canal, just above the abdominal ring, the spermatic cord appears in the centre, the cremaster muscle between it and Poupart's ligament, above it the tendinous insertion of the internal oblique muscle, which passes behind the upper part of the abdominal ring, to the sheath of the rectus muscle.

At the upper part of the canal, in this first view, the internal oblique is seen arising from Poupart's ligament, and crossing over the cord and part of the cremaster muscles in the form of an arch; some of its muscular fibres blend with those of the cremaster.

Upon raising the lower edge of the internal oblique from Poupart's ligament, and turning it upwards, the transversalis abdominis appears. It arises from Poupart's ligament under the internal oblique, and also blends with some of the fibres of the cremaster.

It forms an arch over the spermatic cord, and is inserted, with the tendon of the internal oblique muscle, into the tendinous covering of the rectus. But the lower edge of the transversalis has a very peculiar insertion, which I have hinted at in my work on Hernia. It begins to be fixed in Poupart's ligament, almost immediately below the commencement of the internal ring, and it continues to be inserted behind the spermatic cord, into Poupart's ligament, as far as the attachment of the rectus.

Thus the inguinal canal is endowed with muscular contraction, which, under the action of the abdominal muscles, serves to close it, to lessen the propensity to hernia.

Sometimes a portion of muscle descends from the tendon of the transversalis in the course of the linea semilunaris, to be inserted into the fascia transversalis, behind the cord, and into Poupart's ligament. (see plate.)

It is this circular insertion of the transversalis which is the cause

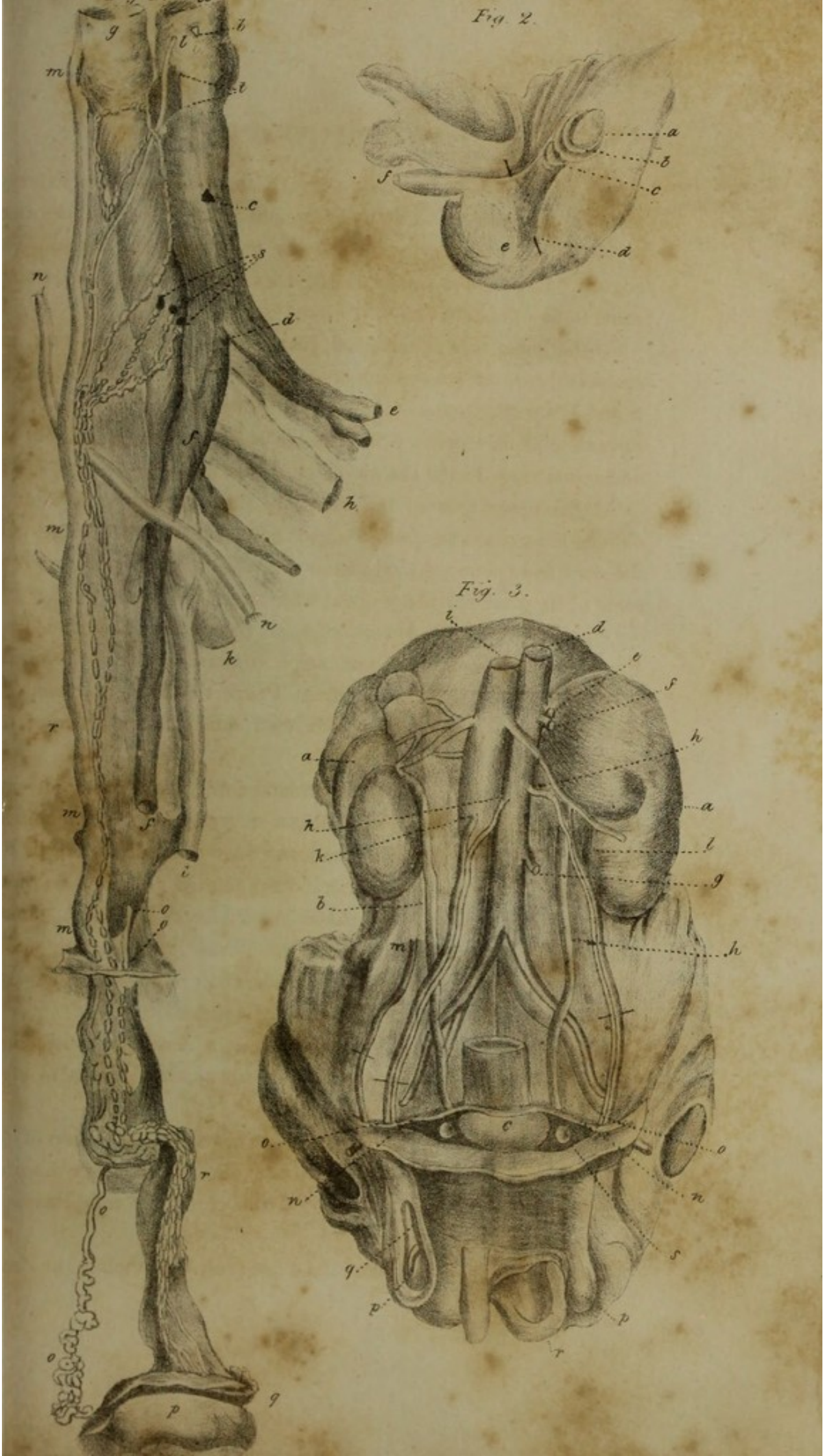
Fig. 2.
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Fig. 3.
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PLATE VII.—ANATOMY.

The first figure shows the course of the absorbent vessels of the testes accompanying the spermatic cord into the abdomen, and terminating in the absorbent glands of the loins, from which other absorbent vessels spring, to terminate in the thoracic duct.

a, aorta.
b, superior mesenteric artery.
c, inferior mesenteric artery.
d, bifurcation of the aorta.
e, external iliac artery.
f f, internal iliac artery.
g, inferior cava.
h, left iliac vein.
i, right external iliac vein.
k, internal iliac vein.
l, spermatic artery.
m m m m, spermatic vein.
n n, ureter crossing the bifurcation of the iliac vessels.
o o o, vas deferens.
o o, passing through the internal abdominal ring.
p, the testis.
q, the epididymis.
r r, absorbent vessels.
s, absorbents terminating in glands on the inferior cava.
t, an absorbent gland placed below the origin of the spermatic artery, receiving some large absorbent vessels: it is to these glands, *s* and *t*, that diseases of the testes extend.

Fig. 2. Shows the testes passing the inguinal canal.

a, the testis.
b, the epididymis.
c, the tunica vaginalis.
d, the gubernaculum attached to the scrotum.
e, the scrotum.
f, the penis.

PLATE VII. *(continued.)*

Fig. 3. View of the fœtal testis recently descended, the tunica vaginalis still remaining open.

a a, the kidneys.
b b, the ureters.
c, the bladder.
d, the aorta.
e, the cœliac artery.
f, the superior mesenteric.
g, inferior mesenteric artery.
h h, spermatic arteries.
i, inferior cava.
k, the right spermatic vein.
l, spermatic vein ending in the left emulgent vein.
m, external spermatic nerve.
n n, vasa deferentia.
o o, orifice of the tunica vaginalis.
p p, the testis.
q, the tunica vaginalis of the spermatic cord.
r, the scrotum.
s, the umbilical artery.

of stricture in inguinal hernia, in the course of the canal, and nearly at the upper ring. Dissection of the inguinal canal.

Behind this insertion of the transversalis, the internal portion of the fascia transversalis appears, adhering strongly to the tendon of that muscle at the back of the inguinal canal.

Thus the inguinal canal is, at its anterior part, formed by the tendon of the external oblique; on its posterior, by the tendon of the transversalis, and by its folded muscular fibres; behind which is the fascia transversalis, into which those fibres are also inserted. It contains the spermatic cord, and the internal oblique muscle.

Its lower part is bounded by the external abdominal ring, formed by the separation of the tendons of the external oblique muscle; and at its upper extremity are placed the two portions of the fascia transversalis, forming, with the tendon of the transversalis, the internal ring: the anterior, continued from the edge of Poupart's ligament to the outer side of the spermatic cord; the posterior, or internal, descending behind Poupart's ligament, to form the crural sheath, and ascending behind the spermatic cord, and tendon of the transversalis.

Between the two layers passes the spermatic cord. From the edge of the two portions of the fascia, a layer of membrane extends, in a funnel shape, uniting itself with the spermatic cord: thus the cord becomes united to each aperture through which it passes—at the external ring, by the fascia superficialis; at the upper part of the canal, by membranous processes from the fascia transversalis, which descend upon and envelope the spermatic cord.

The epigastric artery, arising from the external iliac at Poupart's ligament, curves inwards and upwards, behind the inguinal canal, to the rectus muscle, giving an artery to the cremaster in its course.

OF THE SPERMATIC CORD BELOW THE EXTERNAL RING.

The cord is covered by a superficial fascia, which is situated immediately beneath the integuments. It is loosely attached to the tendon of the external oblique muscle, and adheres strongly to the Spermatic cord, &c.

Spermatic cord described.

edges of the external abdominal ring, and unites the cord to them, so as to conceal the opening until the fascia be removed. It descends upon the outer surface of the cremaster, adhering to it by a loose texture; and externally it blends with the cellular tissue of the scrotum. The fascia descends to the lower part of the testis, still adhering to the cremaster, and surrounding it.

The use of this fascia is to give support to the testis and its coverings; and by its loose connection with it and with the cord, still permits the free motion of the testis, and its power of eluding pressure or violence.

The second covering of the cord is the cremaster muscle.

Its origin is from Poupart's ligament in the inguinal canal, between the internal oblique and transversalis muscles. It there blends with some of the fibres of both of those muscles:—below the origin of the fibres of the internal oblique, it arises from Poupart's ligament nearly to the external ring; behind the spermatic cord it receives muscular fibres from the transversalis. It is also attached, to the inner side of the abdominal ring, to the lower part of the sheath of the rectus muscle.

From these attachments it descends upon the spermatic cord in loops, as Cloquet, the excellent French anatomist, has shown.

It envelopes the vessels and nerves of the cord in its descent, and forms numerous tendons, which resemble, in their first appearance, nervous filaments. Its insertions are as follows:—

Three insertions.

First, it forms a tendinous sling, which envelopes the lower part of the tunica vaginalis.

Secondly, it sends tendinous fibres into the inferior part of the testis and epididymis, and into the tunica vaginalis.

And, thirdly, it blends with some cords which surround and enclose the lower part of the vas deferens, and which may be traced to the upper orifice of the inguinal canal, and pass down upon the spermatic vessels.

The cremaster muscle has an artery to supply it with blood, which is the *third artery* of the spermatic cord.

The *cremaster* artery arises from the epigastric, near the internal

opening of the inguinal canal. It passes inwards towards the lower part of the rectus and pyriformis muscles, nearly in the line of Poupart's ligament internally, and then divides into two branches: the first passes to the rectus and pyriformis muscles; the second descends upon the cremaster muscle, to which it gives vessels in its course. (see plate.)

The vein accompanying this artery terminates in the epigastric vein, and a branch of a nerve attends them.

The use of the cremaster muscle is to draw up the testis in coition; for it presses the testis against the pubis and abdominal ring, and thus aids the passage of the semen as it is secreted.

When examined in a full-grown fœtus, it appears that the testis has been drawn down into it, as into a purse; and if the testis has not long descended, and its adhesions to it are slight, it can be easily drawn from the cord and testis, excepting at its lower part, where it firmly adheres to the tunica vaginalis reflexa, and to the remains of the gubernaculum, epididymis, testis, and vas deferens.

The course and distribution of the blood-vessels, absorbents, and nerves of the cord, I have already described.

ON THE DESCENT OF THE TESTIS.

Descent of the testis.

As the length of the spermatic artery seems to be necessary for its elaborate secretion, and its length is increased by the serpentine course of the vessel, nature has provided that the testis should have been originally placed near the origin of its vessels, rather than the vessel should be formed through so long a space, and be from that cause in danger of imperfection; and that this is her design, is shewn by the ovaria being placed in the fœtus, nearly in the same situation as the testes in the male.

The testes, therefore, in the first seven or eight months of the fœtal existence, are found situated upon the loins. They are said to be placed immediately below the kidneys, but this is correct only as regards the fœtus in the earliest months; but they are placed upon the lower part of the psoæ muscles in a fœtus of five to six months.

Descent of the testis.

The testis is circumstanced as the other abdominal viscera, being covered by the peritoneum upon its fore-part and sides, but not posteriorly; and this portion of the peritoneum is the tunica vaginalis testis of the adult extended over the tunica albuginea.

From the lower end of the testis and epididymis the gubernaculum proceeds, behind the peritoneum, but covered with it on its fore-part and sides. It is composed of several strong ligamentous fibres, which proceed through the inguinal canal to the cellular membrane of the scrotum, in which it is lost.

The peritoneum of the lower part of the abdomen passes down upon, and adheres to the gubernaculum, so as to form a small pouch in the inguinal canal, to which the cremaster muscle is attached.

Above the testis, and behind the peritoneum, the spermatic artery passes from the aorta a little below the renal artery, and enters the posterior edge of the testis, which is not covered by the peritoneum.

The spermatic vein passes from the posterior edge of the testis behind the peritoneum—on the left side, to the emulgent vein, and on the right, to the inferior cava.

The vas deferens descends behind the peritoneum, from the lower end of the epididymis, passing posteriorly to the gubernaculum over the psoas muscle and iliac vessels, to the duct of the vesicula seminalis behind the bladder.

The bladder, and even the vesiculæ seminales, in the fœtal state, are so little buried in the pelvis, that even the latter can be brought into view without dissection.

The vas deferens is accompanied by the deferential artery, which springs from one of the vesical arteries of the hypogastric, and terminates in the epididymis and tunica vaginalis.

The cremaster muscle, as far as I can distinguish it in the fœtus, passes upon the gubernaculum to the epididymis and testis, and is attached to the process of peritoneum which descends with the testis as a pouch, to the lower part of the inguinal canal; and the testis descends into this muscle as into a purse, as it is directed down by the gubernaculum, and hence the loops which it forms.

If any one will be at the trouble to examine a fœtus at the eighth or ninth month, soon after the testis has descended, he will find that the cremaster may be readily turned from the spermatic vessels and vas deferens, so as to leave them free from it; and it can be separated from the epididymis and testis, excepting at the lower extremity of each of those bodies, and the lower end of the vas deferens, into which it is inserted, so that it forms a purse to the testis and cord, after their descent. Descent of the testis.

In animals, in whom the testis remains in the abdomen, the cremaster still exists. I do not believe that it is the cause of the ascent of the testis, nor that it is designed as a suspendor, but as a compressor of the testis.

I will merely put it as a query—if the descent of the testis may not be assisted by the pressure of the fluid, provided in the abdomen of the fœtus to allow of the growth of parts, upon the pouch of the peritoneum, which adheres to the gubernaculum, and which assists in forming the tunica vaginalis reflexa?

If the testis has not descended at birth, it is often afterwards forced down either by a congenital hydrocele, or by a hernia congenita.

The descent of the testis begins at the very earliest period of its formation; for it approaches the groin more in the fourth than the third month, more at the fifth than the fourth, and so proceeds.

It reaches the scrotum about the eighth month, but varies greatly in point of time.

The peritoneum, which is attached to the gubernaculum, and the loose peritoneum, which lines the lower part of the abdomen, descend with the testis between the eighth and ninth months; for it is to be understood that the testis is not drawn into the pouch, but the testis, pouch, and loose peritoneum of the lower part of the abdomen descend together.

The peritoneum attached to the gubernaculum becomes the tunica vaginalis reflexa of the adult. That portion of it which covered the testis in the abdomen, is the tunica vaginalis testis of man; and that

Descent of the testis.

which it draws after it from the abdomen to the testis, is the tunica vaginalis of the cord.

Very soon after the descent of the testes, the peritoneum becomes closed by the process of adhesion; and it closes first towards the abdomen, then gradually lower down, but the exact time of its being shut is uncertain. At the ninth month I have often found both open, and I have often seen one open, and the other closed.

The peritoneum becomes shut from the abdomen nearly to the testis; and thus it forms it into a bag, which is the tunica vaginalis, from which a vaporific secretion proceeds in its natural state, which becomes serous when the secretion is too abundant, producing hydrocele of the tunica vaginalis.

The time at which the testis descends, varies greatly in different persons.

They generally reach the scrotum before the birth of the infant; but it often happens that one is placed in the scrotum, and the other remains in the abdomen, or in the inguinal canal, just above the external ring, or sometimes it just emerges from the ring. It is in these situations exposed to injury and violence; and if it remain in these unnatural places, it is rather prone to disease of a malignant character.

I have many times seen the testis descending from thirteen to seventeen years, viz.: about the age of puberty, probably from some new excitement at that period; and the descent is in some cases not accomplished until the age of twenty-one.

When the testis remains in the abdomen, it makes a strong impression upon the patient's mind, as a suspicion arises that his virility is lessened or destroyed. In a case of this kind I have known the unfortunate subject of it commit suicide.

Yet the testis in this case, and in others which I have examined, was nearly of the same size as a healthy testis when deprived of its tunica vaginalis; and the seminiferous tubes were full of semen.

It often happens that when a testis remains in the inguinal canal, there are severe spasms of the cremaster, or muscles of that canal,

PLATE. VIII.

Fig. 1.

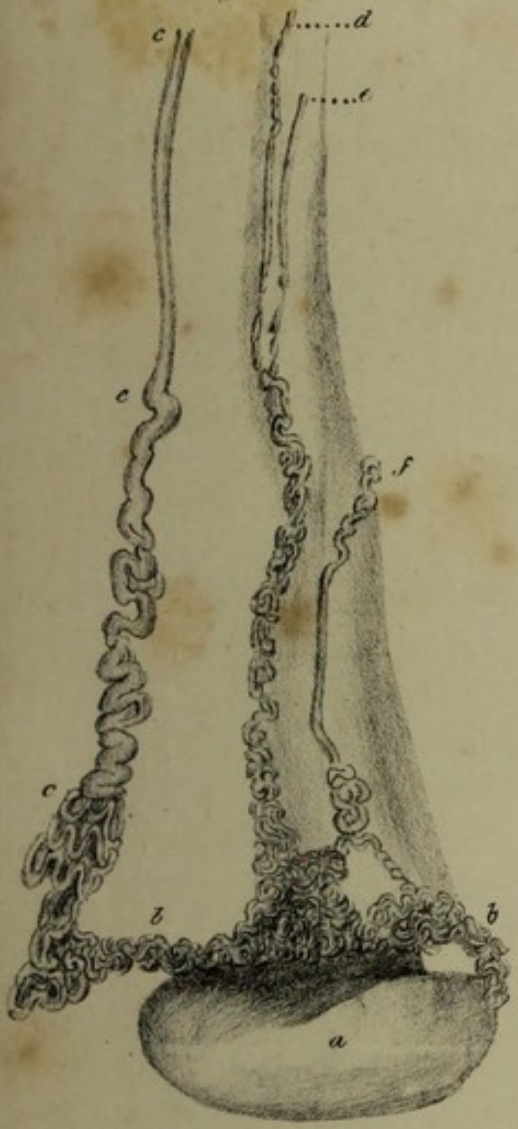


Fig. 2.

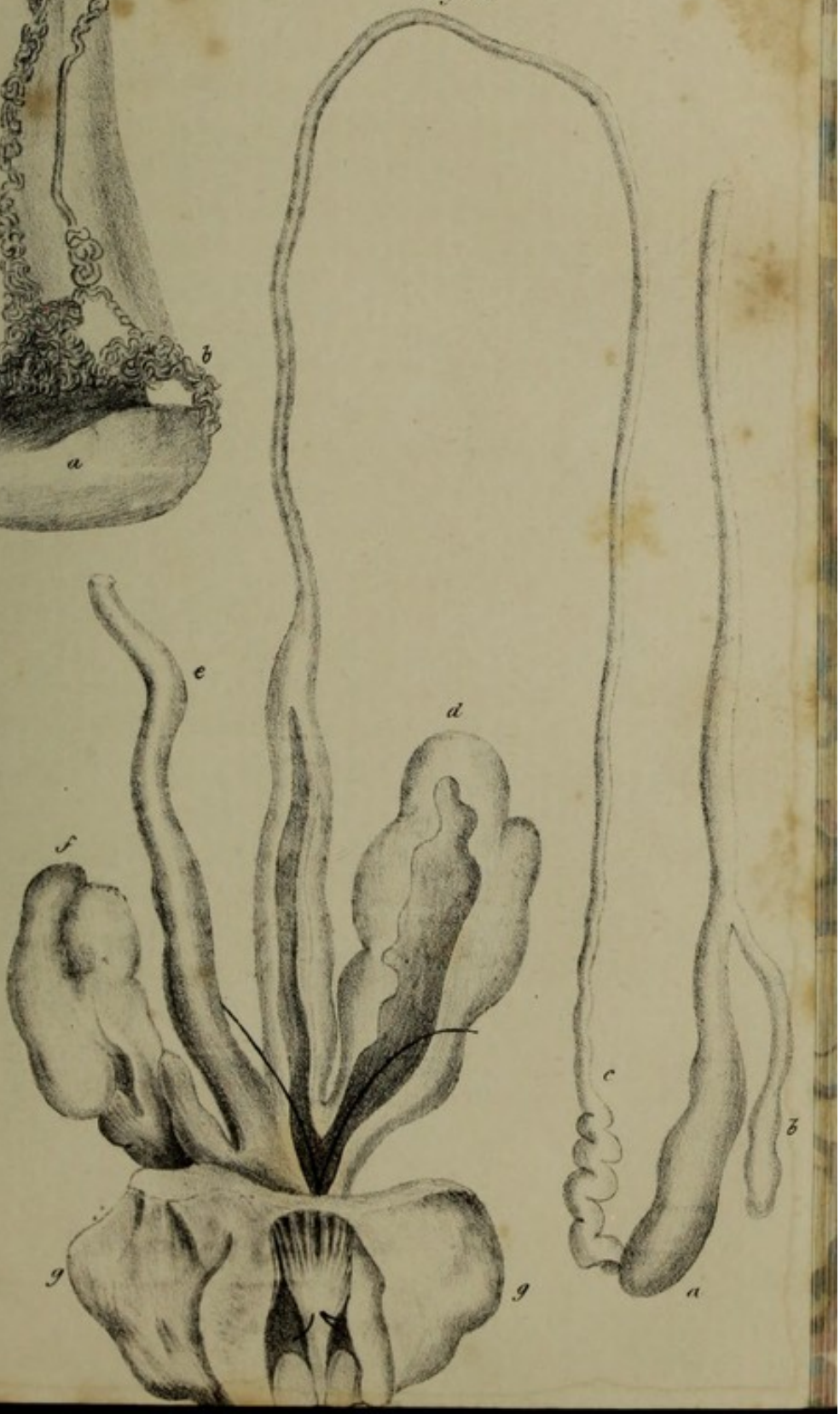


PLATE VIII.—ANATOMY.

Fig. 1. Shows three vasa deferentia cæca, beside the usual vas deferens.

a, the testis.

b b, the epididymis.

c c c, vas deferens.

d, *e*, *f*, the three anorimal vasa deferentia.

Fig. 2. Exhibits a wasted testis in the adult.

a, testis.

b, epididymis.

c, vas deferens.

d, vesicula seminalis.

e, right vas deferens.

f, right vesicula seminalis.

g g, prostate gland.

h, veru montanum, with its two openings—two bristles being in the one, and one in the other.

accompanied with violent pain, and only relieved by the hot bath and by fomentation.

The tunica vaginalis is generally closed at birth; but it often is open on one side and sometimes on both.

This opening is sometimes so small as to admit serum only to descend into it, and then a congenital hydrocele is produced.

A truss applied in infancy, by closing the canal, cures the disease; the water being absorbed when the tunica vaginalis is closed.

The opening of the tunica vaginalis is sometimes partially closed, and produces hydrocele of the spermatic cord; but it is also the result of serous cysts forming in the cord, more especially just above the testis.

The opening of the tunica vaginalis in some instances remains small until the adult age, and it then becomes suddenly dilated by a protrusion of intestine, producing hernia congenita; and when the surgeon in the operation discovers its nature, the patient assures him he never had hernia until a few days before. This I have several times known. (See Plate.)

More frequently the tunica vaginalis, when unclosed, admits protrusion of the intestine in childhood, in contact with the testis, producing hernia congenita.

In those cases in which the testicle has not descended at birth, it often happens that a hernia becomes the means of its descent; and such hernia should remain without a truss being applied, until it has brought down the testis into the scrotum. A testis late in its descent, and produced by hernia, is often lessened in its bulk; but the testis on the other side, with this diminished organ, is sufficient for the procreation of children.

The tunica vaginalis is sometimes closed by a film of adhesion; which, becoming elongated by intestinal protrusion, forms a sac, in the mouth of which the intestine has been strangulated; and the patient dies, if unrelieved by an operation.

OF THE NERVES OF THE TESTIS AND SPERMATIC CORD, AND PARTS ADJACENT.

Nerves of the testis.

Three sets of nerves supply the testis and neighbouring parts: the first are those in the vicinity of the external ring; the second, the external spermatic nerves distributed to the cord; and the third, the spermatic plexus, which is derived from the grand sympathetic.

The first nerve is derived from a muscular branch, which may be traced to the upper part of the lumbar plexus, arising from the first and second lumbar nerves. It passes downwards over the quadratus lumborum, to ramify between the abdominal muscles, and to terminate in cutaneous nerves The principal branch of this nerve is found piercing the internal oblique, on the inner side of the spinous process of the ilium, and just over Poupart's ligament. It then runs between the internal oblique and tendon of the external oblique muscle, towards the external ring, through which it passes in conjunction with the spermatic cord; and, immediately dividing into a number of filaments, is finally distributed to the skin of the groin, the upper part of the scrotum, and root of the penis.

Sometimes, instead of one, there are two branches passing through the ring; and occasionally one nerve is formed by the junction of two or more filaments, which pierce the fibres of the internal oblique separately, and unite before they emerge with the cord.

Secondly, the external spermatic nerve is derived from the second lumbar nerve, and pierces the upper part of the psoas muscle. It then descends towards Poupart's ligament, lying on the psoas, or rather upon its fascial covering, and divides into two branches. One of these, the smaller inner, or cremasteric branch, is closely connected with, and partly covered by, the spermatic vessels, in company with which it passes through the internal ring, and immediately enters the fibres of the cremaster; here it divides into a number of filaments, most of which are distributed in that

muscle before it leaves the inguinal canal. Two long and delicate branches may, however, be traced through the external ring, descending one on the fore, the other on the back part of the cord, until they are lost in the coverings of the testicle: this nerve is distributed in the course of the cremasteric artery, at the epigastric. The second branch of the external spermatic is a cutaneous nerve, which passes under Poupart's ligament over the iliac artery, and divides into twigs, which supply the skin at the groin, and descend upon the fore-part of the thigh. Some of these branches become sub-cutaneous at the cremastic margin, and on the fascia lata itself lower down. This nerve is larger or smaller in proportion to the size of the external cutaneous of the lumbar plexus, and sometimes supplies a considerable portion of the skin of the thigh usually allotted to the latter nerve. Nerves of the testis.

Thirdly, the spermatic plexus*, which may be considered as consisting of two portions; the one descending with the spermatic vessels, the other coming from the interior of the pelvis, in close connection with the artery of the vas deferens. They meet at the internal ring.

The *first portion* is derived from branches of the superior mesenteric, renal, and aortic plexus. Three or four branches pass down from the nerves which surround the root of the superior mesenteric artery, some of which become attached to the spermatic artery where it arises from the aorta, while others join two or three small ganglia on the inferior cava, and which receive several filaments from the aortic plexus.

From these ganglia small twigs are given off, which also become connected with the spermatic artery; and when the latter has passed over the cava, and joined the spermatic vein, two or three considerable branches are received from the renal or emulgent plexus. The plexus thus formed, receiving two or three filaments from the aortic plexus, ascends with the spermatic artery, closely

* This description is of the nerve at the right side.

Nerves of the testis.

adhering to, and interlaced with, the vessels of the spermatic cord, and with them descending to the testis.

The *second portion* of nerves going to the cord is derived from the hypogastric plexus, which sends some branches of nerves ascending with the deferential artery, and entering the cord at the internal ring, adhering in their course to the peritoneum of the side of the bladder and at the internal ring. The nerves then descend in the inguinal canal, and below the abdominal ring, on the coat of the vessels with which they are united, and almost incorporated.

In tracing the nerves of the spermatic cord and testis below the ring, it is very difficult to distinguish them from the numerous tendons of the cremaster muscle, and from some cords which accompany the vas deferens and spermatic artery.

If the peritoneum at the internal ring be examined, it will be found firmly united by tendinous cords to the fascia transversalis. These cords, descending with the vas deferens, form a sheath to it, and, passing from one convolution to the other, preserve it in its convoluted state, and terminate in being fixed in the cauda epididymis, and lower extremity of the testis, blending there with the cremaster. In the same manner, cords pass down with the spermatic artery, and form a sheath, by which it is enveloped, to preserve its convolutions.

It is only necessary to dissect closely on the coats of the vas deferens and spermatic artery, to at once discover these cords, especially below the external ring.

The testis in youth is capable of being injected. At two years the vas deferens, epididymis, vasa efferentia, and rete exist; but the tubuli are imperfect, or are too small to receive injection.

In advanced age the testis becomes reduced and relaxed, from the diminished size of the seminiferous tubes, and from the smaller quantity of fluid which they contain.

It is common, in advanced age, to find the corpus epididymis

diseased; several of the lobes of the vasa efferentia being converted into a yellowish brown solid structure.

In age the seminiferous tubes become small; they appear yellow instead of red, from their having less arterial blood; and it often happens that a considerable number of them become cords instead of tubes, assuming a ligamentous appearance. A varicose state of the less testis is frequent in age. Seminiferous tubes.

The testis does not in general become absorbed, if it be partially diseased, although its functions may be interrupted, even to complete obstruction of semen.

In 1823, I made the following experiment on a dog. I divided the vas deferens upon one side, and the spermatic artery and vein on the other. Experiments.

The testis upon that side on which the artery and vein were divided, gangrened, and sloughed away.

The testis on the side upon which the duct was divided, became somewhat larger than natural. I kept the dog for six years; during that time he was twice seen *in coitu*, but the female did not produce. This was in 1827.

In 1829, I killed him, and found the vas deferens below the division excessively enlarged and full of semen, and entirely stopped, with some separation of its extremities; but it was open from the place of division to the urethra. (see Plate.)

The testis sometimes becomes wasted, of which I have given a Plate; and in confirmation of Mr. Hunter's opinion of the use of the vesicula seminalis, the vesicula on that side was certainly as large as on the other. (see Plate.)

The wasting of one testis at an early period does not prevent the person in after-life having children.

Mr. H——, a gentleman in the neighbourhood of Lynn, in Norfolk, consulted me of a disease in his bladder; and upon examining him, I found his left testis absorbed, so that nothing remained but a small body not larger than a horse-bean. His testis wasted at 23 years, from absorption succeeding inflammation. He Case.

has been twice married:—by his first wife he had one child; by the second he had five children.

The loss of a testicle.

The removal of one testis does not seriously diminish the virile powers. A Gentleman had his testis removed in 1821, for an enlargement and great hardness. He recovered in three weeks. His wife, by whom he had already one child, nursed him during his confinement. In the month of March she proved pregnant, about nine weeks after the performance of the operation.

Mr. Headington, surgeon of the London Hospital, informed me that he knew a man who had lost one testis by an operation, and who had afterwards several children.

Case.

A man, whose testis had been absorbed for fourteen years, by wearing a truss for hernia congenita, has since married, and has now a child not quite a year old.

The abstraction of both.

It has twice fallen to my lot to remove the testis of persons who had already lost one.

The first operation was performed upon a man of the name of Wallis, who had one of his testes removed in 1799, by Mr. Cooper, my predecessor at Guy's Hospital.

Case.

The second operation was performed by myself in Guy's Hospital, in June 1801, for a chronic abscess in the testis. On visiting him four days after the operation, he informed me that he had, during the last night, an emission, which appeared upon his linen; and, struck with the curiosity of this circumstance, I requested my then apprentice, Mr. Travers, to occasionally visit him after his recovery, and he had quitted the Hospital; and I have myself, during the twenty-nine years which have since elapsed, repeatedly seen him. He had been married prior to the loss of one testis.

For nearly the first twelve months, he stated that he had emissions *in coitu*, or that he had the sensations of emission. That then he had erections and coitus at distant intervals, but without the sensation of emission. After two years he had erections very rarely and very imperfectly, and they generally immediately ceased under an attempt at coitus.

Ten years after the operation, he said he had during the past year been once connected.

In 1829, he visited me, because he was a severe sufferer from piles. He then stated that for years he had seldom any erection, and then that it was imperfect; that he had no emissions from the first year of the operation; that he had for many years only a few times attempted coitus, but unsuccessfully; that he had once or twice dreams of desire, and a sensation of emission, but without the slightest appearance of it. The penis is shrivelled and wasted. He shaves once a week, and sometimes twice, his voice, naturally rather feeble, remains as at the time of the operation.

Eunuchs.

From this man's declarations, I believe that the history of eunuchs, if perfectly castrated, has been very much misrepresented; for it would seem that, after a few months, he lost all seminal emission, but that the erectile power remained for a few months more; and then, excepting at very distant periods, and but imperfectly, even that power ceased, and the penis became shrivelled and diminished.

Case.

The second case in which I removed the testis, was in a lad in Guy's Hospital, aged 16 years, who had previously the other testis extirpated. The disease each time was a scrofulous abscess, with subsequent ulceration. The lad had not reached puberty, and he was very weakly and emaciated. Five years afterwards, as I was stepping out of my carriage at a patient's door, a fat sleek-looking young person said, "How do you do, sir?" I said, "very well, but I do not know you." "Have you forgotten removing my testicle in Guy's Hospital, five years ago?" "Oh yes, I recollect you; you look very well," "Yes, but I am very unhappy;" and he immediately burst into tears. "Why, what do you lament?" "Oh sir, that I am not as other men—I often wish that I were dead." Desirous to cheer him, I said—"You are a lucky fellow, for you are saved from many evils." He shook his head, and I left him sorrowful.

In describing the different parts which compose the testis, I have mentioned the uses of each; and it was not my original intention to enter more largely into the physiology of this organ. The structure of the testis being understood, the veriest tyro will readily comprehend the course of the semen. It is secreted in the tubuli, and is conveyed into the rete; from the rete into the vasa efferentia. It next passes through the epididymis to the vas deferens, which opens, in common with the duct of the vesicula seminalis, at the veru montanum, in the prostatic part of the urethra.

LECTURE XXVI.

ON THE DISEASES OF THE TESTICLE.

That change to which the testicle is sometimes, but not very frequently subject, viz. the formation of a number of cysts or hydatids within its substance, is the disease which I shall first describe.

OF THE HYDATID OR ENCYSTED TESTICLE.

Age at which it occurs.

This change in the testicle is usually observed in the earlier periods of life, generally from eighteen to thirty-five years, although I have seen it occur at forty-nine years. It has been said to begin in an enlargement at the end of the epididymis; but of the part in which it commences I am by no means certain, whether in the testis or in the epididymis; for the enlargement is so gradual and imperceptible, that it is usually discovered by accident. The

Symptoms.

disease is generally unattended with pain, nor does the patient complain of any tenderness in the part when it is handled. It does not seem to be produced by or attended with any constitutional disease, for the appearance of the person is sometimes that of robust health. There is no redness of the scrotum, but the veins of the spermatic cord are, in some instances, very much distended

PLATE.IX.

Fig. 1.

Fig. 2.

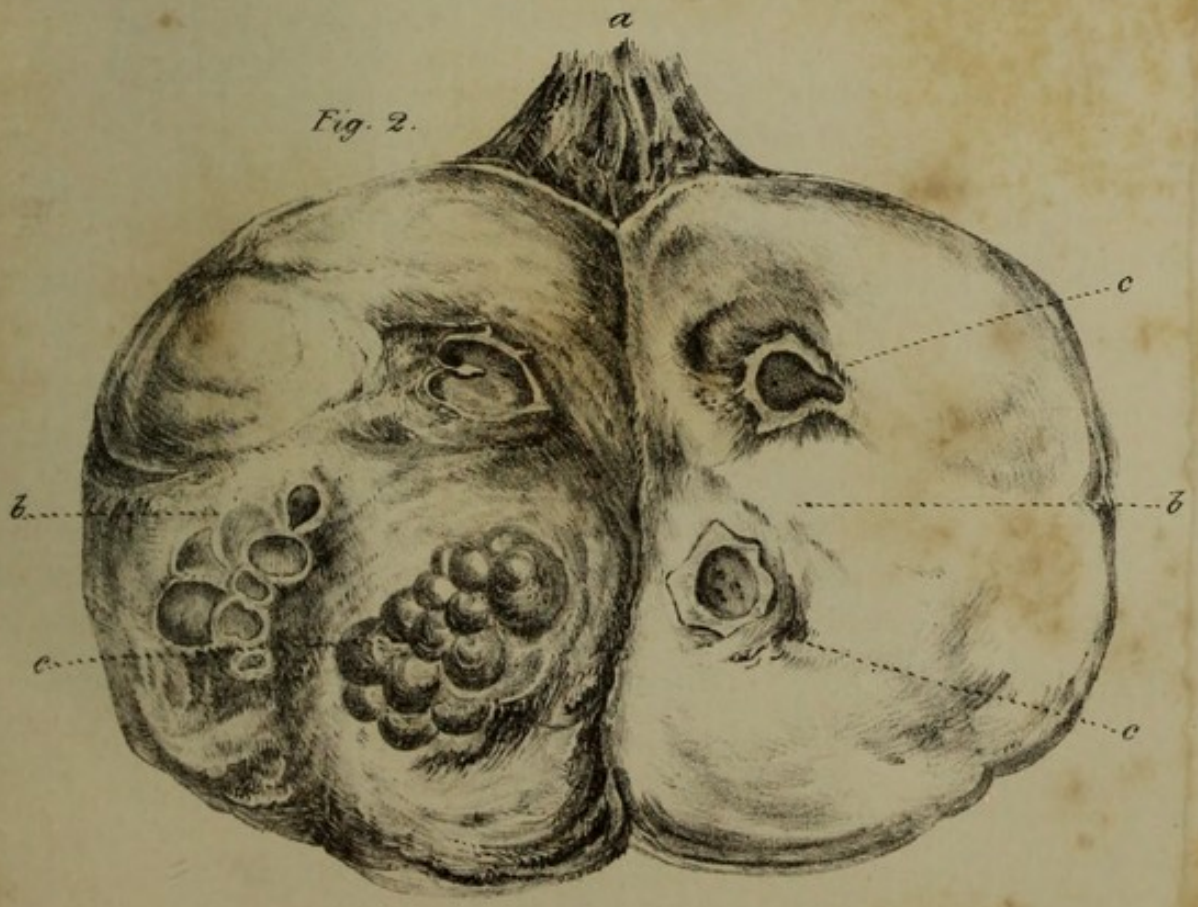


PLATE IX.—MORBID ANATOMY.

Views of hydatid testis.

Fig. 1. This is a most excellent drawing of hydatid testis, as it appears immediately after its removal from the living body, shewing its excessive vascularity; its numerous cysts, containing serum or fibrine, according to the degree of increased action accompanying the disease. The epididymis is similarly diseased.

a, spermatic cord.

b b, testis and epididymis in one mass.

Fig. 2. A section of a testis less affected than the former with the same disease.

a, spermatic cord.

b, testis partially drawn.

c, hydatids.

The upper hydatid on the right side contained mucus, which is in part drawn out.

with blood, so as to be varicose. The form of the swelling is that of the testicle, rounded upon its fore part, and flattened upon its sides, rather than pyriform like hydrocele. The epididymis, under the greatest enlargement, can be distinguished in its swelling from the testis by a line of separation between them. The disease is attended with obscure fluctuation, but it is rather a yielding at the part compressed with the finger, than an extensive fluctuation from one extremity of the swelling to the other. If the diseased part be firmly compressed, it gives the sensation of squeezing the testis; it gradually increases until it acquires great size, and then its weight becomes very inconvenient, and the disease produces considerable uneasiness in the loins, from the testicle stretching the nerve of the spermatic plexus. On these accounts, viz. the size it acquires, and the pain which its weight produces, the patient becomes anxious for its removal.

I have never seen this disease affect the spermatic cord to the abdomen, or extend its influence beyond the testicle and epididymis.

ON THE DISSECTION OF THIS DISEASE.

On cutting into the part after its removal, the tunica vaginalis is found to be a little thicker, and the tunica albuginea is much denser than natural. The testis in its interior, is filled with numerous cysts of various sizes, some small as the heads of pins, others of the size of peas, and the largest about an inch in diameter: as they vary in size, so the fluid which they contain differs in appearance—the smallest contain a watery fluid, transparent, and without colour; the larger appear to be filled with serum; and the largest, when opened, discharge mucus with some pus, as they have undergone a partial suppuration. I have seen in these cysts a true hydatid contained in the fluid, like that which is frequently found in the liver. The cysts are highly vascular, and their appearance is very beautiful when the serum is seen through a highly vascular cyst. The glandular structure of the testis seems to be in a great measure destroyed. The appearances in the epididymis are of a similar kind, only that the cysts do not acquire the same magnitude.

Numerous cysts.

Contain different fluids.

Cysts vascular

Mistaken for hydrocele.

This disease is often mistaken for hydrocele; and it must be confessed, that they are with great difficulty distinguished from each other. I do not believe that there is any surgeon who is candid, and who has had such opportunities as the surgeons of the large Hospitals possess of witnessing disease, who will not confess he has mistaken this disease in the testicle for hydrocele, and plunged a lancet into it, and has been surprised to find, that a little water and blood only have followed.

Marks of distinction

The marks of distinction are a less extensive fluctuation, a much heavier swelling, rounded upon the fore part, and flattened upon the sides; the entire absence of transparency; the sensation of the testis being squeezed under pressure; the varicose state of the vessels of the cord and dilated veins of the scrotum; a division of the swelling into two, viz. testis and epididymis. Testis not felt as in hydrocele.

Case.

Charles Demby, aged forty-nine, was admitted into Guy's Hospital, 23rd of May, 1804, with enlargement of the testis. It began two years before in a diminution of the left testis, accompanied by a sense of weakness on the left side; it afterwards gradually became larger than the other; and he applied, three quarters of a year after discovering this increase, to a surgeon of the first talent and respectability in the neighbourhood of London, who introduced a trocar into the testis, and a little water was observed to issue, but the quantity was very small. He immediately pronounced it a case of hydatid testicle: as it still continued to increase, the patient applied for admission into Guy's Hospital. On the 29th of May I removed the testis, and upon cutting into it I found a purulent fluid in some of the cysts, and the appearances which I have described in others. The wound quickly healed, and he was discharged on the 16th of June, having thus early entirely recovered.

Case.

Mr. Davie, surgeon, brought me a testis from a subject in the dissecting-room, in which one of the globular hydatids was lodged. It was enclosed in a distinct cyst, produced by adhesive inflammation; the hydatid itself exactly resembled that which is so frequently met with in cysts of the liver.

Bartholomew Lupre, aged thirty, an Italian sailor, was admitted into Guy's Hospital in April, 1809, with an enlarged testis, which he reported began four or five months previously; the cause was unknown, but he supposed that it arose from a cold, produced by his wearing wet clothes; the veins of the scrotum were much loaded with blood, and those of the spermatic cord were very varicose. This man suffered considerable pain in his loins from the weight of the swelling. I performed the operation of removing the testicle, and found it, upon dissection, full of cysts of various magnitude. Case.

A young medical man called upon me with enlargement of the testis, unattended with pain: its increase was gradual, its weight was considerable, its fluctuation obscure; the general health was good. Mr. Guthrie removed the testis, which I examined, and found to be of the hydatid or encysted kind: he gradually recovered. Case.

The cause of this disease is unknown, and I shall not indulge in speculation, which would probably be unsatisfactory for want of proof, and useless in preventing the occurrence of the disease, if clearly developed. Cause

The operation for the hydatid disease is required from the inconvenience resulting from its size, and from the pain in the loins produced by its weight. A quantity of blood should be taken from the arm; the patient briskly purged for a few days, and animal food refused for a week before the operation. I have never known a patient do otherwise than well under the removal of the testicle for this disease.

You may confidently also assure your patient, that there is no remote danger of returning disease; for in no instance has there, within my knowledge, been any extension of the complaint to the abdomen by the absorbent vessels. No danger of return, if removed.

It is right to state, however, that I once saw in Mr. Moorhouse; a medical gentleman who died of a fungous testicle, which extended into the abdomen; in some parts of the testicle numerous hydatid cysts mixed with the morbid fungus or medullary structure: so it seems that the two diseases may be combined in the same individual.

OF THE MALIGNANT DISEASES OF THE TESTIS.

The testicle is subject to two diseases of a malignant character: viz. the fungous and the scirrhus disease: of which the former is by far the most frequent.

OF THE FUNGOUS, MEDULLARY, OR PULPY DISEASE OF THE TESTIS.

Under these various names has this disease been described—fungous, because when it ulcerates, a large fungous projection forms it; medullary, because it has somewhat the appearance of the brain in a putrid state; pulpy, because it is soft, and easily breaks down to pressure. It has been often also called the soft cancer, on account of some resemblance it bears to cancerous affections, although its texture is of a much softer consistence.

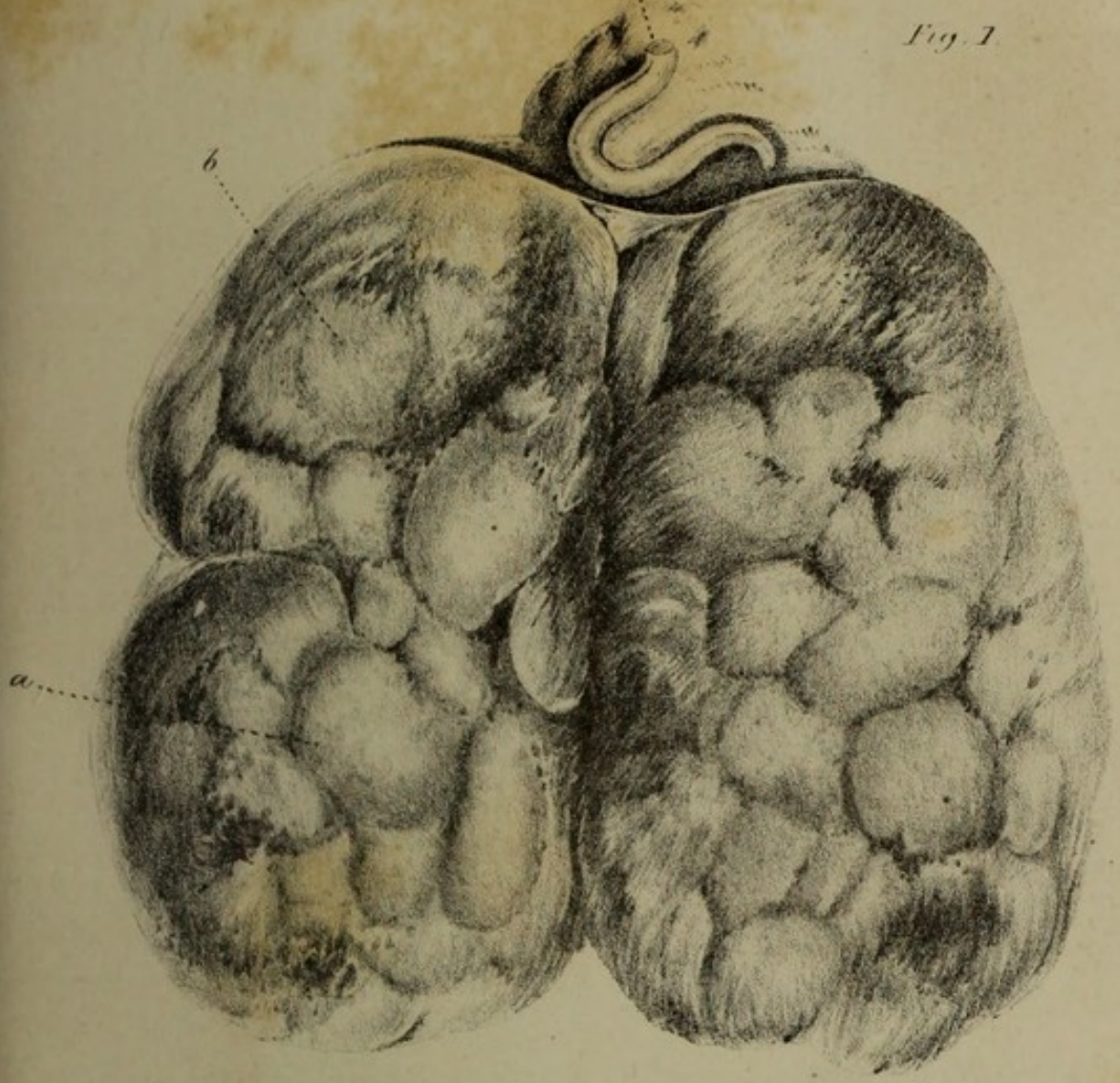
Symptoms.

The symptoms of this complaint are as follow: It begins in an enlargement in the body of the testicle, which is, at first, accompanied with great hardness, and the form of the swelling is more globular than that of the testis in its natural state. The epididymis becomes soon affected after the disease has shewn itself in the testis; the enlargement proceeds generally rapidly, although, in some cases it varies in that respect. The pain which attends it, is at first only occasional, and not severe. Slight causes, as a catarrh, or more than usual exertion increase its size; but by rest, the enlargement subsides nearly to its former state: it soon becomes of the size of a small orange and of its globular shape: it feels very hard, but is free from tenderness when pressed; it at length forms adhesions to the surrounding parts, so that the scrotum, after a time, is only moveable over it at some points. It is, at first, regular on its surface; after a time, the cord enlarges above the abdominal ring, and at length it contracts adhesions to the pubis. At first the scrotum is not inflamed, although the vessels are somewhat larger.

Extension of the disease.

A gland or glands become enlarged in the groin, unattended with pain after the testis has adhered to the scrotum, and which gradually

Fig. 1



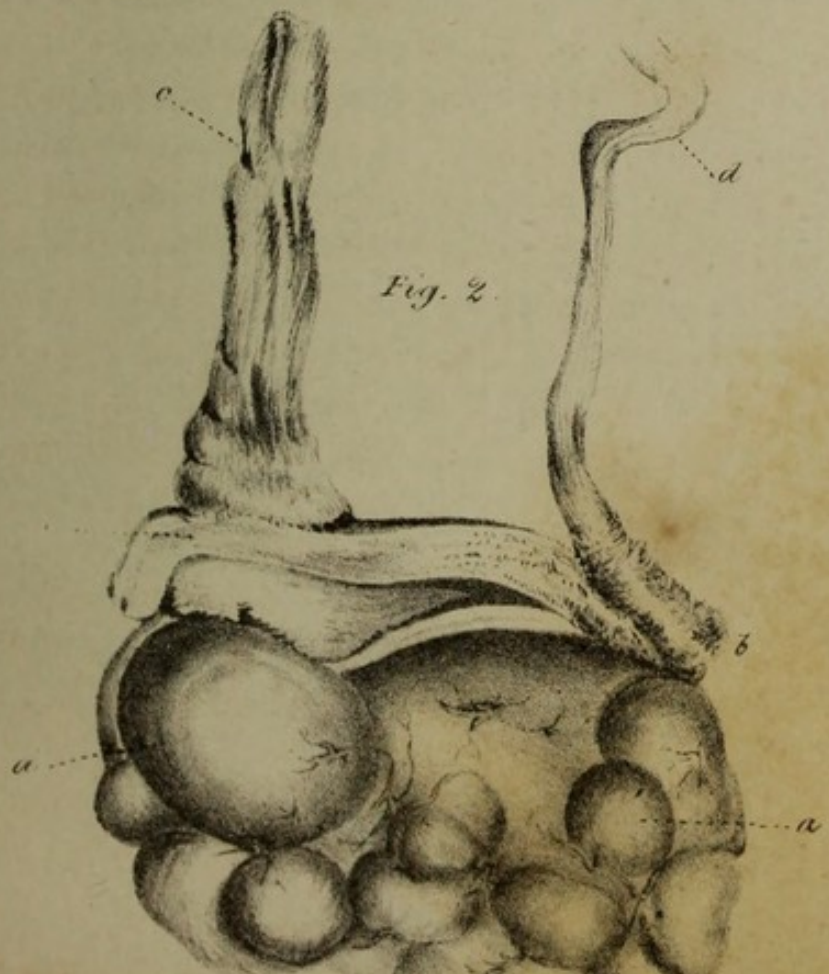


Fig. 2

PLATE X. A.—MORBID ANATOMY.

Fig. 1. An excellent specimen of fungoid disease, which has been injected, and drawn soon after its removal. It shows the great enlargement of the spermatic artery—the soft fibrine, which is effused in these cases, admitting the blood vessels very unequally—the substance easily broke down by the finger—the epididymis also affected.

a, testis.

b, spermatic cord.

c, spermatic cord and artery.

Fig. 2. The internal surface of a fungoid disease of the testis, exposed by removing the tunica albuginea, showing its tuberculated appearance.

a a, tubuli of the testis in a diseased state.

b, the epididymis.

c, the spermatic cord.

d, vas deferens enlarged.

Fig. 1.

Fig. 2.

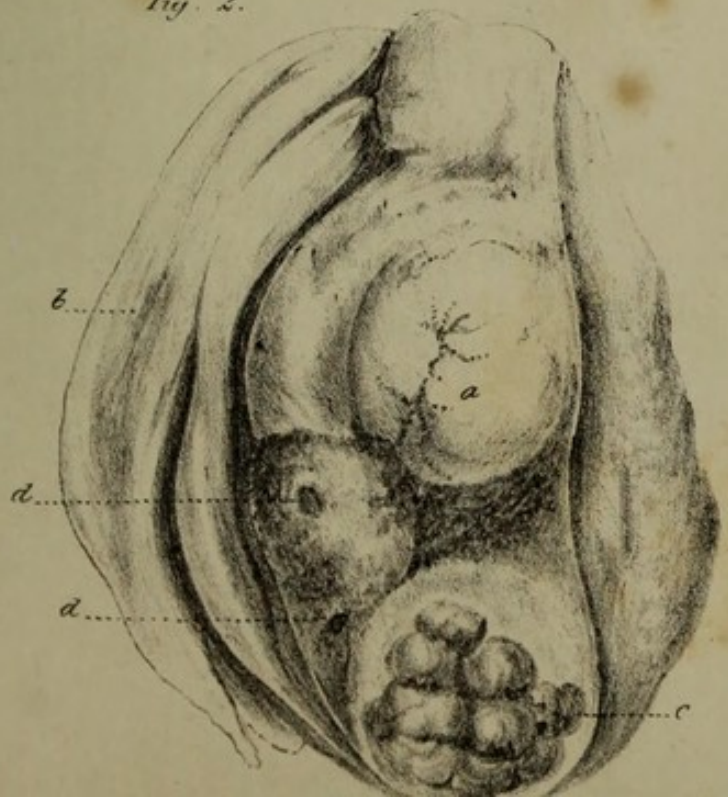


PLATE X. B.—MORBID ANATOMY.

Shows fungoid testis.

Fig. 1.

a a, testis diseased.

b b, scrotum, tunica vaginalis and albuginea in a diseased state.

c c, large ulcerated opening of the tunica albuginea.

d d, fungoid excrescence projecting through the scrotum.

Fig. 2. Shows the progress of fungoid disease.

a, testis filled with a fungous secretion.

b, tunica vaginalis.

c, bloody fungus, from the bursting of vessels, and from extravasation.

The gentleman from whom this testis was removed, was a surgeon in Whitechapel. He died ultimately of the disease.

increase. An absorbent gland also generally enlarges on the opposite side to that in which the disease begins. The disease extends by absorption into the abdomen, before the testis adheres to the tunica vaginalis and scrotum, and produces a cord which may be traced upon the psoas muscle by deep pressure to the region of the kidney, where it produces, just below the emulgent artery, a tumour, readily felt by pressure, when the abdominal muscles are relaxed by bending the body in the recumbent posture.

Constitutional affection.

At first the constitution does not suffer, although the countenance of these persons is generally sallow at the very dawn of the disease, shewing that the general health is in some degree defective. There is, sometimes, uneasiness in the loins, and sharp pricking pains in the thighs and legs; and as the disease advances, the leg, thigh, and foot, on the diseased side, become œdematous, and feel weak. For some time before death the patient loses his appetite, and gets but little sleep: he has profuse perspiration; the bowels are generally very irregular, as the tumour on the abdomen increases, though prior to that time they are regular, and there is sometimes an irritability of the bladder, and frequent inclination to make water. The iliac glands are also enlarged above Poupart's ligament.

Period in which it proves destructive.

I have known the disease very rapid in its progress, terminating the patient's existence in a few months; but I have also known it two years in one case, five years in another, and fourteen in a third. The fact is, that a simple chronic disease in the testicle will remain stationary for a length of time, if the constitution be tolerably good; but if it become deranged, a malignant action is produced, and the disease assumes the character of the complaint I am describing.

The testis in this disease has often a disposition to ulcerate; the scrotum adheres to the tunica vaginalis, and assumes a livid hue. A sense of fluctuation is produced, so that it might be supposed to contain a fluid; ulceration begins in the scrotum, and through the opening a fungous substance projects, which discharges a very large quantity of a watery fluid; bleedings occasionally ensue from this fungus. If the testicle be pressed, a quantity of matter which looks like putrid brain insues; the fungus sloughs, then the part

discharges profusely, bleeds, and again sloughs, until the patient is exhausted by irritation and discharge. Towards the close of life, the pain is often excessively severe in the part, in the abdomen it is occasional only; and the patient has vomiting, and frequent attacks of diarrhœa. I have known a person just before death have the following symptoms,—vomiting, hiccough, violent pain in the abdomen, swelling of the legs and thighs, tumour in the abdomen, and pain with tenderness on pressure over the abdominal muscles.

DISSECTION.

The testicle in these cases varies in its appearance according to the stage of the disease. A secretion of soft pulpy matter, looking something like brain, is found deposited in the midst of the seminiferous tubes in its early stages; and as the disease advances, and the testicle becomes enlarged, the seminiferous tubes are absorbed, and the peculiar secretion of this disease occupies their natural situation. I have injected several of these diseases, and we have beautiful specimens of them in the collection. The secreted solid substance is very partially vascular; in some parts the vessels are very numerous, in others they do not enter the disease; those which do, are so tender in their coats, that they readily give way to very slight force; when ulcerated, the fungus is found very vascular, other parts of the tumour appear broken down, so as to have lost their organization, and resemble cream; portions of the substance are solid like brain, but in separate masses; some have often also a woolly or flocculent appearance.

The true nature of the disease.

The true history of the disease appears to consist in the part secreting, not common fibrous or adhesive matter, but a material of much softer consistence scarcely supporting vessels in some parts, whilst in others there is a rapid growth of the blood vessels: in one case, therefore, it falls readily into disorganization; in another, produces a projecting fungus so soon as ulceration allows the vessels a less limited growth; but more of this hereafter. In some parts

PLATE XI.

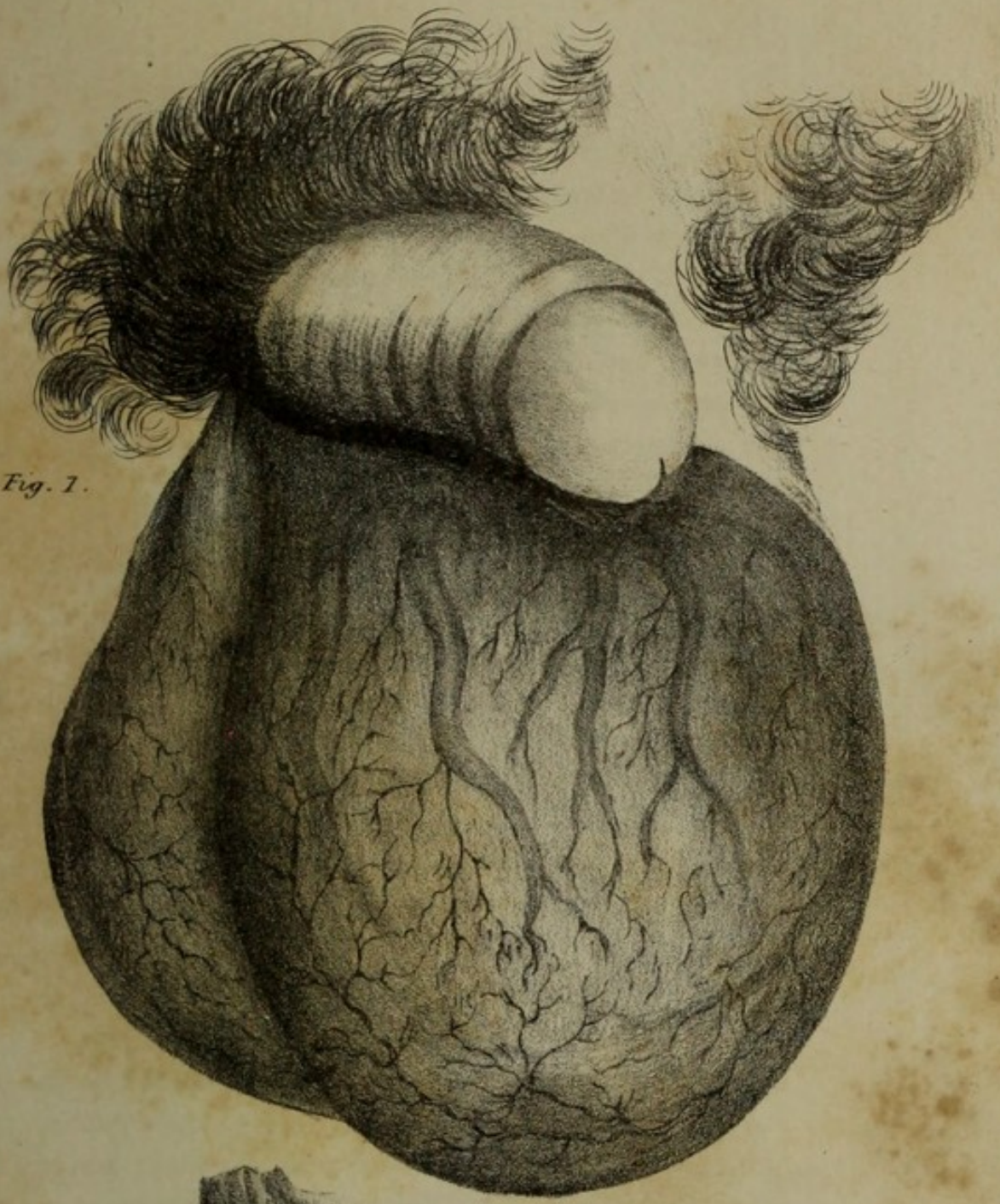


Fig. 1.

Fig. 2.

PLATE XI. A.—MORBID ANATOMY.

Views of fungoid disease of the testis.

Fig. 1. Shows the high vascularity of the scrotum in the advanced stages of the disease, as well as a degree of retraction of the testis and of the penis.

Fig. 2. Shows the testis of a patient of Dr. Blackman, of Ramsbury, Wilts, which Sir Astley removed.

The whole of the testis was not diseased, yet the complaint returned in the abdomen.

we find coagulated blood mixed with the matter effused, and in others small collections of serum.

In the dissection of the body, the spermatic cord is tuberculated with fungous tumours, which contain a soft white pulpy mass; and similar swellings adhere to the peritoneum within the abdomen. A tumour is found on the loins, reaching from thence upwards, behind the intestines, to the kidney. It covers the aorta and vena cava, and the kidney adheres to it: when cut into, there issues from the tumour a considerable quantity of matter which looks like thick cream, mixed with a small quantity of the colouring parts of the blood. The mesenteric glands are enlarged; the liver has tubercles in it; the thoracic duct is sometimes obstructed by a fungus or medullary secretion on it; the duodenum passes over, adheres to the tumour, and is narrowed by it, and the aorta and cava also adhere to it posteriorly. The coats of the aorta and vena cava become diseased. Disease in the spermatic cord

OF THE DIAGNOSIS OF THIS DISEASE.

This is a difficult task. From hydrocele, the want of transparency; the more globular form of swelling; the pain which occasionally attends it; its yielding, rather than extensively fluctuating, and the appearance of want of general health, become the means of distinguishing it. Difference from hydrocele.

But from the hydatid testicle, when this disease arrives at the pulpy state, the distinction is much more difficult, and the most experienced are liable to err. Pain in the part occurring at distant intervals; a sallow complexion, and the appearance of deficient general health are the criteria, but still I have known the best surgeons mistaken. I really am decidedly of opinion, that in hydrocele, hydatid, or fungous testis, no objection exists to introducing a lancet to discover the real nature of the disease. If it be hydrocele, the rush of water directly proves its nature. If it be the hydatid swelling, a little water, mucus, and blood escape; and if medullary, blood only; sometimes a little brain-like substance appears upon From hydatid testicle.

the lancet, which immediately informs the surgeon of the true form of the complaint. It does no mischief in the cases which it cannot relieve, and without it the surgeon's reputation is endangered, if he gives a rash opinion upon the nature of the disease.

OF THE CAUSE OF THIS DISEASE.

Deranged state of constitution.

This disease arises from a defective state of the constitution: it generally occurs in persons naturally feeble, and in those who are irritable, both in body and mind. They are subject to slight feverish attacks, to irregular secretions, to defective digestion; the former producing new and disordered actions; the latter leading to an unhealthy state of blood in which the quantity of serum is large, and the fibrous part of the blood small in quantity, and loose in texture. But independent of the state of constitution, there is also an altered local action: if the parts inflamed from this disease are cut into, a fungous structure will be produced from the wound; but if the contaminated parts are entirely removed, the wound heals as any other wound in the body without any such morbid appearance.

OF THE TREATMENT OF THIS DISEASE.

Medicines of no service.

No medicine has been yet discovered which has any influence over this disease, when it has been once formed. The common remedies used for the preservation of the general health may, by improving the constitution, lessen or prevent the tendency to the disease; but no medicine has any influence upon it when the local disease has once appeared. The pil: hydr: submuriatis composita given at night, and infus: cascarillæ, soda, rhubarb, and ammonia, given bis die, or hyd. ē creta, soda, and rhubarb, are the best medicines to improve the constitution; yet we ought to look further, to try to discover, amidst the numerous new articles which chemistry and the extension of botanical knowledge have given, if some specific remedy cannot be discovered for this disease. The local remedies

hitherto employed have been equally inefficacious. Leeches and evaporating lotions, upon general principles, retard the progress of the disease, but nothing has any specific power in changing the action of the part; when ulcerated, solutions of alum, of sulphate of zinc and of copper, and dilute nitric and sulphuric acids are of some use. All, then, that is left to the surgeon is to improve the constitution first, next to effect the removal of the disease by the knife; and when this has been done, to give such medicines, and rules of living, as shall, by improving and preserving the health, change the constitution, and lessen the disposition to the return of this disease.

Operation uncertain.

The removal of this disease by operation is very often unsuccessful, as the disease is very apt to return in the part, or in some distant organ of the body, if a constitutional treatment is not previously and even afterwards pursued. I removed from a patient of Mr. Sterry's, in Bermondsey, a fungous ulcer from the shoulder, and the disease soon afterwards shewed itself in the eye, of which the patient died. I removed, from a Mr. Bernard, an eye affected with this disease, and in less than twelve months the disease reappeared in a very large swelling above the groin. In the removal of this disease in the testicle, the complaint frequently returns in the loins and in the spermatic cord. It is quite necessary that the operation should be performed in an early state of the disease. If therefore, a patient applies with this disease, and I put him under a course of mercury, and treat him as I shall describe I do a simple chronic inflammation of the testicle, and if it do not yield, I advise its removal; for if the spermatic cord in the least participates in the disease, the operation does not succeed: so soon as the wound be healed, and sooner if the wound be slow to heal, I give constitutional remedies to improve the general health, and to lessen the disposition to a return of the disease.

OF THE TRUE SCIRRHUS OF THE TESTICLE.

A very rare disease.

This is an extremely rare disease; that which I have previously described being the most frequent;—indeed, for a length of time I

doubted if the testicle was subject to the disease to which the breast is so prone, viz. the scirrhus, which in its progress, produces cancer.

I have seen few examples of that hard swelling in the testis which resembles scirrhus, and I have never seen but one instance in which that hardened testis ulcerated and destroyed the part, resembling in its progress the cancerous ulcer of the breast. Old persons are most liable to this disease; in the few examples in which I thought the disease might be scirrhus, the age has been between fifty and seventy years.

Symptoms. The symptoms have been, a slow increase of the testicle, a hardness which rendered the part almost impenetrable to pressure, occasional severe pain in the part extending towards the loins, the disease beginning in the testis; at length extending to the epididymis; extremely slow in its progress; the surface of the testicle feeling tuberculated, irregular, knotted, and excessively hard; the spermatic cord becoming gradually thickened; the body bent forward, or the thigh advanced; the leg and thigh, upon the affected side, swollen and œdematous; some water effused into the tunica vaginalis, so that the testis is felt through an hydrocele, a tumour at last forms in the loins, but never acquires the magnitude of that in the medullary disease, nor does the testis become so large in scirrhus as in the complaint before described. The patient sinks from impaired digestion, violent pain in the abdomen, and irregular state of the bowels.

DISSECTION.

When the testicle is cut open, the tunica vaginalis and tunica albuginea are thickened; and, instead of the tubes which form the secreting structure of the testicle, a hard white mass is found, in lobes or tubercles, which are harder than the other parts, and in which cartilaginous and sometimes ossific matter are deposited. The epididymis has the same appearance, and some tubercles are found in the cord.

Fig 1.

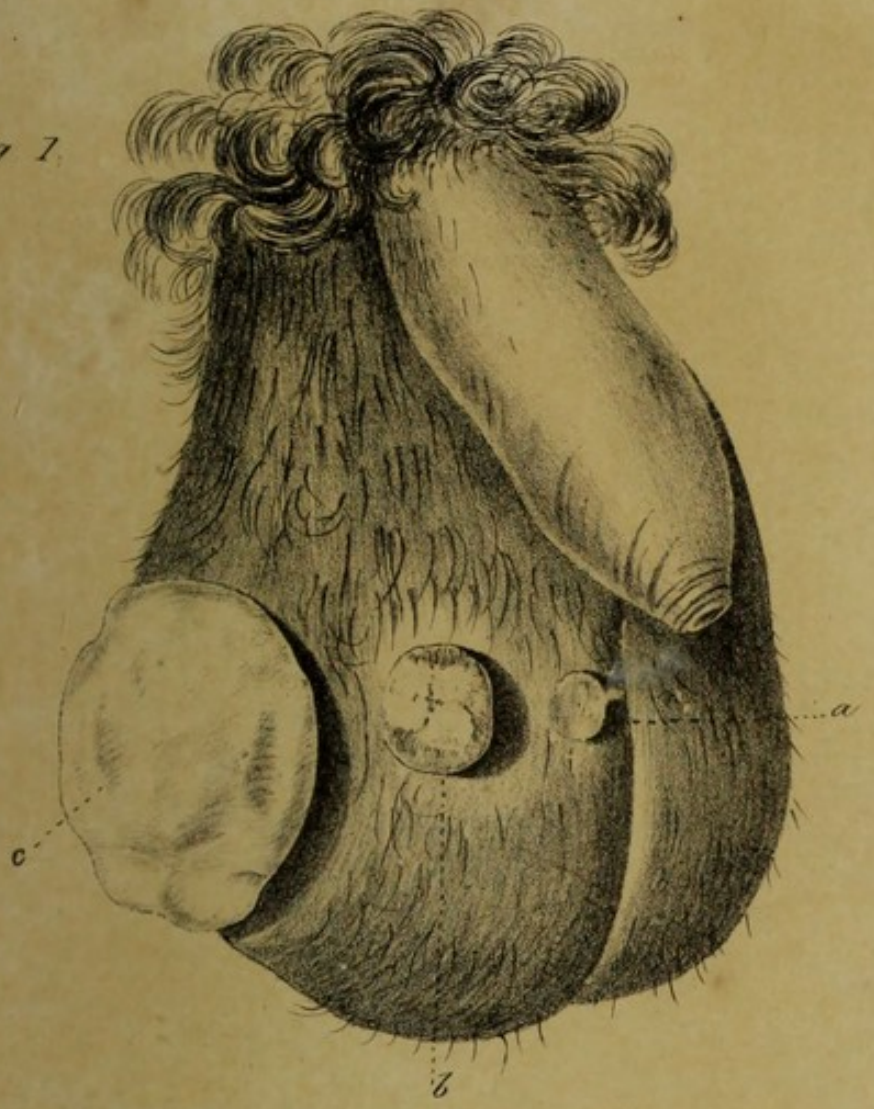


Fig. 2.

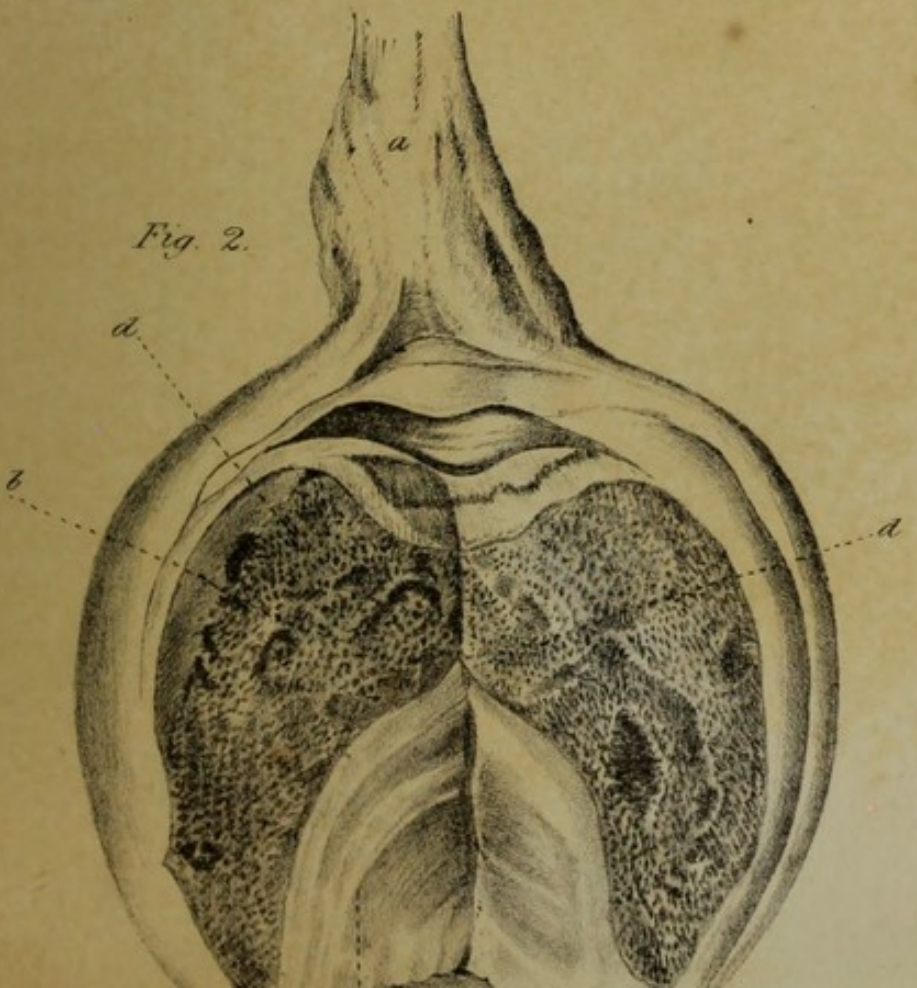


PLATE XI. B.—MORBID ANATOMY.

Fig. 1. Shows the progress of chimney-sweepers' cancer.

a, small wart,

b, encrusted wart.

c, ulcer with everted edges.

Fig. 2. Shows hæmatocele of long standing.

a, spermatic cord.

b, testis.

c, tunica vaginalis excessively thickened.

d d, coagulated blood in the tunica vaginalis.

testicle very hard and considerably enlarged, and the cord at least three times its natural size. I said to the students, "It will be of no use to operate in this case, for the disease has extended beyond the reach of the knife." One of the students, who thought himself wiser than the rest of the world, told the man, if he would place himself under his care, he would take a lodging for him, and remove the part. The man consented, and this young man removed the testicle, tracing the cord, as I was informed, very much towards the abdomen. Peritoneal inflammation succeeded, and the man died in a few days, prematurely for the patient, usefully probably for the rest of life to this foolish and presumptuous student.

Constitutional treatment.

This disease will require the same constitutional treatment as that which I before described, after the operation has been performed, to prevent the return of the complaint.

LECTURE XXVII.

OF THE SIMPLE CHRONIC ENLARGEMENT OF THE TESTIS.

This is an extremely frequent disease, and one which has been mistaken for a malignant complaint of the part.

Commencement of the disease.

This disease begins in hardness and swelling of the epididymis, at first unattended with pain. It gradually increases, without pain, until the testicle becomes involved in the disease; the testis is quite smooth; the epididymis may be traced separately from the testis, the line of separation being more distinct than in the natural state. The patient's health appears generally but little affected, and the part is so indolent, that the patient handles it with a degree of roughness, which surprises the surgeon. Both testicles not unfrequently become affected at the same time; and sometimes, when the enlargement is subdued in the one, the other becomes diseased in a similar manner. The surface of the testicles and epididymis remain quite smooth, even under great increase of the part.

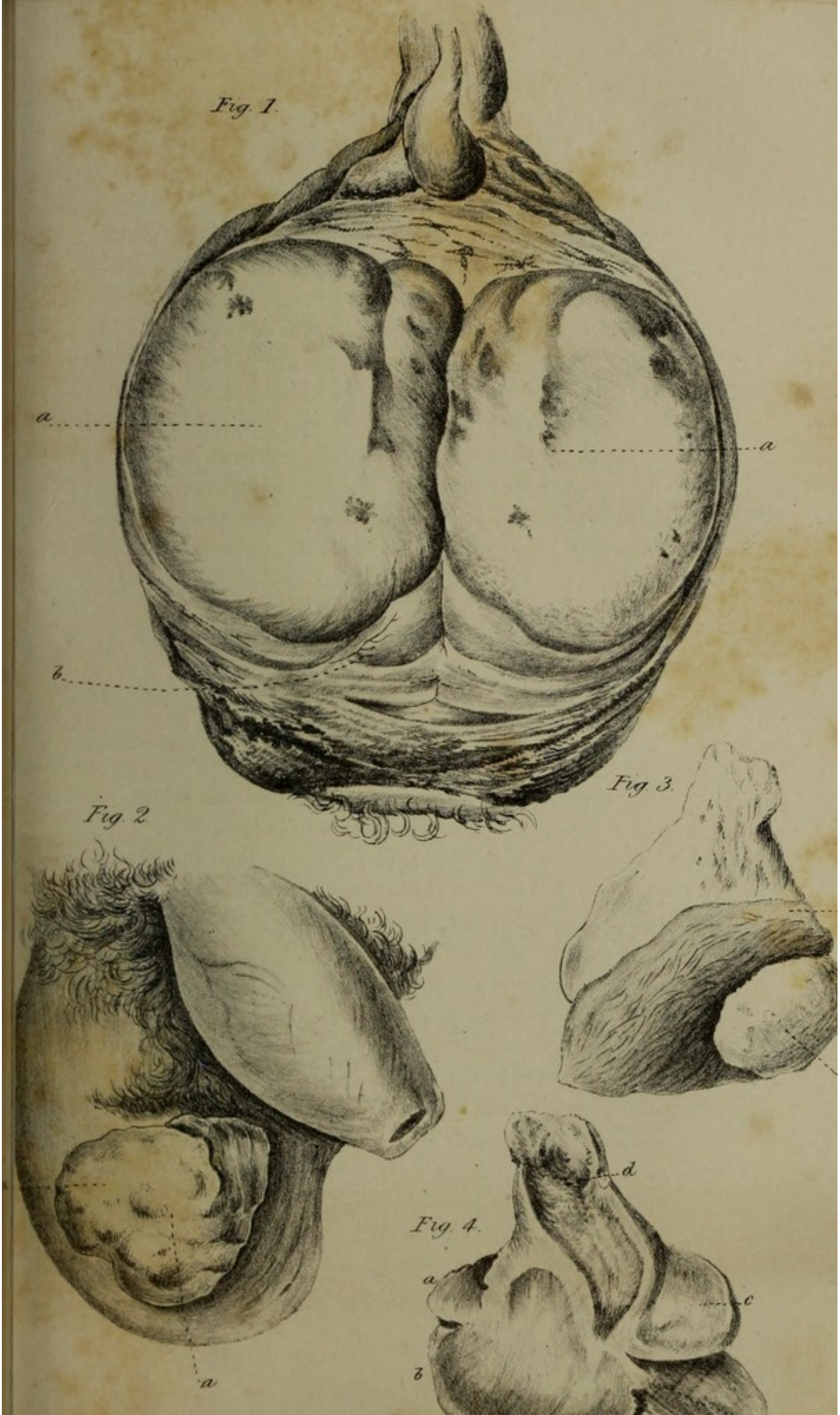


Fig. 1.
a
a
b
Fig. 2
a
Fig. 3.
d
Fig. 4.
a
c
b

PLATE XII.—MORBID ANATOMY.

Different views of the chronic enlargement of the testis.

Fig. 1. Testis of a German gentleman who had a chronic enlargement of the testis, with scarcely any pain.

a a, testis.

b, cauda epididymis.

c, spermatic cord. The yellow and solid effusion poured out not only into the tubuli, but also in the membrane between them.

Fig. 2. Shows the granular swelling which frequently succeeds the chronic abscess. This disease is free from all malignant disposition.

a a, granular swelling.

Fig. 3. A testis removed for a granular swelling.

a, granular swelling.

b, the skin.

Fig 4. Section of a granular swelling.

a a, skin.

b b, granular swelling.

c, epididymis.

d, spermatic cord.

In the state which I have described the testicle remains for weeks, and sometimes for months; and then under severe catarrh or violent exercise, especially on horseback, it becomes very painful, with uneasiness of the loins and redness of the scrotum, which will be relieved by the means which are to be hereafter described; but soon the symptoms return, and at length a suppurative inflammation ensues, which usually happens at the extremity of the epididymis: a sinus follows, which discharges seminal fluid, stiffening the linen as semen is wont to do. From this sinus granulations spring, and produce an exuberant growth, forming a prominent granular swelling upon the scrotum. This still continues for an indefinite time, unless something be done by surgery for its relief. Its further progress.

DISSECTION.

Before this disease was understood, I have several times known the testicle removed for it, and the appearances upon dissection I have preserved in the collection.

In the adhesive stage, a uniform yellowish white adhesive matter loads the tissue of the part; the seminiferous tubes remain, but are separated by the effusion which I have described. Adhesive stage.

In the suppurative stage, upon cutting into the epididymis, and sometimes into the body of the testicle itself, a small abscess is found, containing pus, mixed with adhesive or fibrous matter; and this state of the testicle will sometimes render its removal necessary. When it forms a granular swelling, it is found, upon dissection, that a small opening is formed in the covering of the epididymis, through which the granulations spring and expand; and sometimes the testicle itself forms the granulation from the abscess which it contains, and which passes through an opening in the tunica albuginea. These abscesses will sometimes, after discharging for months and even for years, absorb the testicle, and leave the patient with little more than the tunica vaginalis and the tunica albuginea remaining; and if both testes have been affected, impotence is the result. Suppurative stage.

OF THE CAUSE OF THE SIMPLE CHRONIC DISEASE.

Morbid state of the urethra.

This complaint is often depending for its production upon a morbid state of the urethra, which produces a sympathetic influence upon the testicle. Sometimes it is simple irritation only of the urethra which produces it; sometimes a stricture in the membranous part; now and then an irritation in the prostate gland, or in the prostatic part of the urethra. But still it is wrong to view it as having merely a local origin; for there is, in most of these cases, a state of constitution which predisposes it, and without constitutional alterative means you will not succeed in curing it. I

Syphilis.

have often seen this disease follow syphilis; frequently observed it accompanied with an eruption, which many would conceive of a syphilitic character; often known it to follow a mercurial course in delicate persons, who have, during the time, been exposed to vicissitudes of temperature, and to catching cold from being frequently wet in inclement weather.

OF THE TREATMENT OF THIS CHRONIC INFLAMMATION.

This complaint, for which the testicle is frequently removed, under a mistaken idea of its malignant tendency, generally yields to the treatment which I shall now advise you to adopt.

When you are consulted respecting the complaint in its adhesive stage, you will say to your patient, "Now, if you choose to be cured, there is no difficulty in effecting it; but I fear you will not submit."—"Oh," he says, "I will submit to any thing to prevent the loss of my testicle." Well, the plan then is as follows:

Position.

First, Observe the recumbent posture for a month. It is not sitting with your legs raised which will suffice, but to be absolutely recumbent is necessary.

Medicine.

Secondly, take two or three grains of submurias hydrargyri and a grain of opium night and morning, until the mouth be sore; and

Fig. 1.

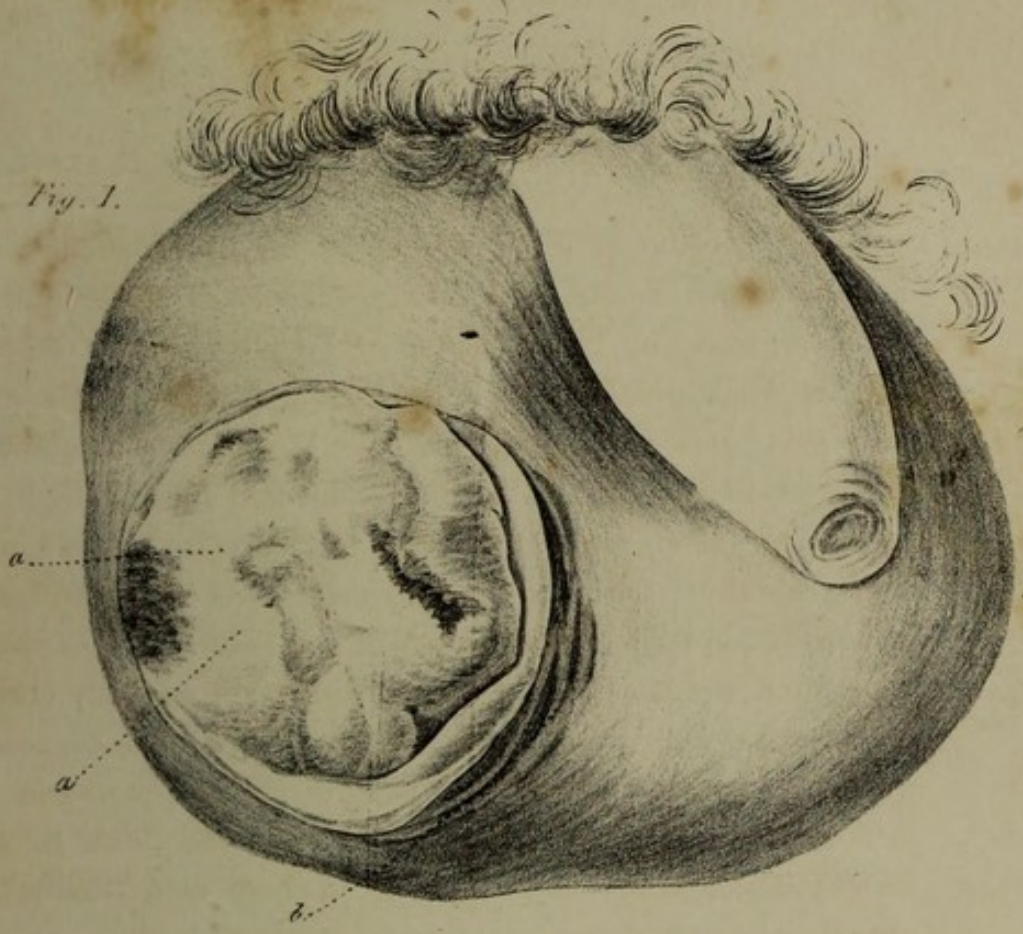


Fig. 2.

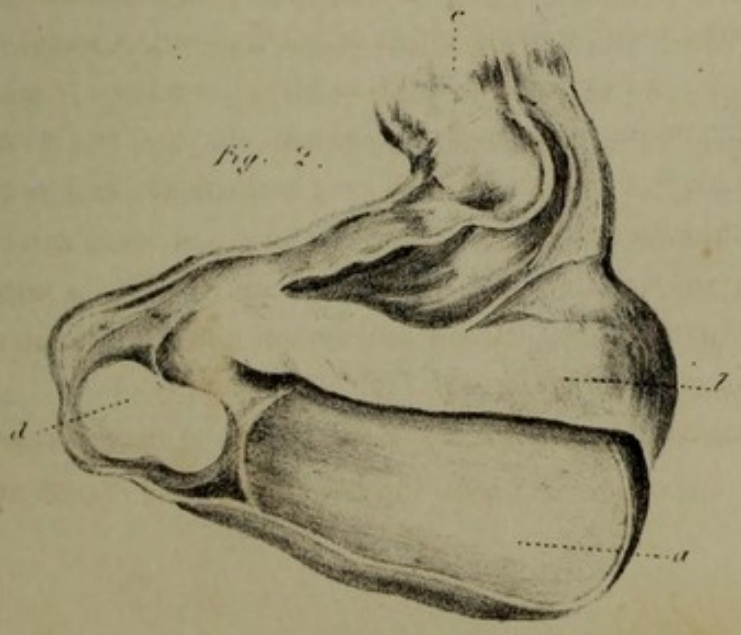


PLATE XIII.—MORBID ANATOMY.

Views of chronic and scrophulous inflammation of the testis.

Fig. 1. A granular swelling following a chronic abscess in the testis, the granulations protruding through an aperture in the tunica albuginea.

a, granular swelling.

b, circle of skin at its root.

Fig. 2. Earthy matter effused in the epididymis by chronic inflammation.

a, testis.

b, epididymis.

c, cord.

d, earthy deposit.

then such a quantity as shall preserve that tenderness of the gums for a month.

Thirdly, apply leeches twice in the week, or let the patient stand before his surgeon and have the veins of the scrotum opened by a lancet. Local bleeding.

Fourthly, apply upon the scrotum equal parts of camphorated mixture and vinegar. Applications.

Fifthly, about every fourth morning give an active dose of infusion of senna, with sulphate of magnesia and tincture of senna.

In about three weeks, in this way, you will reduce the size of the part; and then, if the urethra has been diseased and the complaint be sympathetic, you may introduce daily a silver sound, to remove any obstruction in the urethra, whilst the patient is still recumbent and living low; when the disease will, at the end of the month, or five weeks, be cured. Period required for the cure.

In the practice which I have had an opportunity of witnessing, it will be readily supposed I have seen a great number of such cases, and I can therefore speak with confidence of the result of the above treatment; but the following is an excellent example.

An officer of the British army, of considerable rank, some years ago, was seized with inflammation in his testicle, for which he applied to a surgeon; who, after various attempts to reduce it, told him that it was a malignant disease, and that it must be removed. He submitted to the operation and quickly recovered. Some months afterwards the remaining testicle began to swell, and the symptoms were so exactly similar to those of the former disease, that he became excessively alarmed, and placed himself under the care of Mr. Rose, who requested a consultation with Sir Everard Home and myself. We found the testicle hard, swollen, and but little painful: his general health had suffered from a warm climate and exertions disproportioned to his strength. He was put upon the plan which I have recommended above, and in a very few weeks was perfectly well. Case.

A fair inference may therefore be drawn, that the testicle which had been removed might have been saved.

Many testicles condemned for removal I have thus known preserved.

Sometimes requires removal.

When the disease has proceeded so far as to produce an abscess in the testicle, it will sometimes require to be removed.

Case.

One of our students, who afterwards became a surgeon in the cavalry, had an inflammation and chronic enlargement of the testicle, which had been repeatedly relieved by means similar to those which I have recommended; yet each time he returned to exertion, the inflammation and swelling were reproduced: tired by repeated disappointments, and unable to pursue his profession as he wished, he begged me to remove the part, which I did: and upon examination of it, after the operation, I found a chronic abscess in its centre.

Granular swelling.

When the abscess is followed by a large swelling, produced by an exuberant growth of granulations (a granular swelling,) the treatment which is to be pursued is to be as follows:

Treatment.

Pressure.

First. Try pressure with adhesive plasters; and if this does not succeed,

Caustic.

Secondly. Sprinkle the surface with powdered sulphate of copper, or nitrate of silver, which gradually reduces it. I once knew arsenic applied freely upon the granulations, and it destroyed life.

Removal.

Thirdly. It may be removed by excision. An elliptical incision is made into the skin on each side of the projecting granulations, and then the knife is to be carried horizontally under the root of the swelling, where it projects from the opening in the tunica albuginea; and thus it is removed. The edges of the skin are then brought together by suture, and healed.

Fourthly. But when the epididymis and testicle are much involved in the disease, and there is much loss of substance in the scrotum, it is necessary to remove the testicle.

OF THE IRRITABLE TESTIS.

Symptoms.

This disease is known by the following symptoms:—the patient has an uneasy sensation in a part of the testicle; it is tender to pressure, tender also in exercise, and unusually sensitive at all times.

PLATE XIV.

Fig. 1.

Fig. 2.

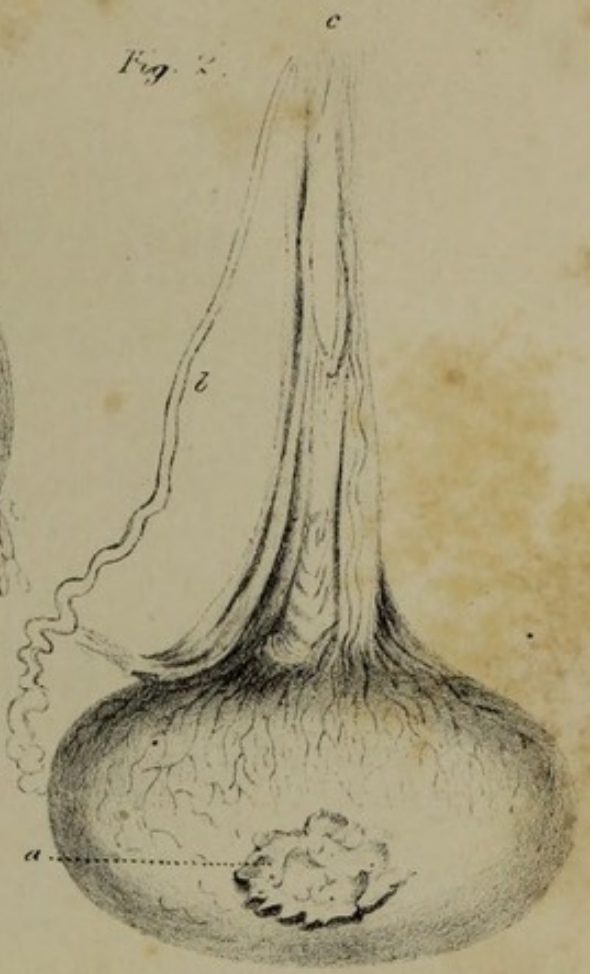


Fig. 3.

Fig. 4.

PLATE XIV.—MORBID ANATOMY.

Fig. 1. Shows cartilaginous bodies growing from the caput epididymis.

a a, cartilaginous bodies.

b, cartilaginous and ossific bodies between the tunica vaginalis and tunica albuginea.

Fig. 2.

a, ossific body growing between the tunica vaginalis and tunica albuginea.

b, vas deferens.

c, spermatic cord.

Fig. 3. Hydrocele of the spermatic cord.

a, testis (*vide* p. 260.)

b, tunica vaginalis, showing where it ceases to cover the testis.

c, vas deferens.

d d, hydrocele cyst adhering to the spermatic cord.

Fig. 4. Hydatid testis dissected; and as it appears to me, showing that this disease is an altered secretion into tubes and bags formed by obstructions of the tubuli seminiferi, at least in some instances; and this is probably the reason that it does not extend further than the testis and epididymis (*vide* p. 296 and 320.)

a, spermatic cord.

b b b, numerous bags of fluid.

The sensibility of the part becomes occasionally so much increased, that the slightest touch is exquisitely painful; pain is felt in the back and groin; the motion of the part and slight pressure of the clothes in walking produce so much pain as to almost forbid exercise, and the patient finds no comfort but by reposing continually upon a sofa, or by remaining in bed. The testicle is little swollen, and the whole of the part is not equally tender. The spermatic cord sometimes partakes of this exquisite sensibility. If the part be not supported the pain is scarcely tolerable. The patient is obliged to place himself in bed upon the opposite side to the disease, or he does not rest. He has pain in the thigh on the same side,—the testis appears full and loaded. Motion in most cases produces not only pain at the time, but additional uneasiness afterwards. The stomach is rendered extremely irritable, and vomiting is sometimes produced.

The disease frequently continues many weeks, sometimes exists for months, and with others endures for years. When the patient thinks himself much better, a little more exercise than usual renews all the symptoms.

The complaint produces, in some instances, so much distress of mind, so high a degree of bodily suffering, and so completely incapacitates the sufferer from amusement, and the pursuit of a profession or business, that he seeks relief from an operation, which I was thrice compelled by the patients to perform, rather than recommended it upon my own judgment.

The following is a statement by a medical man of the symptoms of the disease, which rendered his life burdensome to him.

Case. "I think I can trace back the origin of my complaint to the Spring of 1817, about eight or nine months before I married. I lived too well: got very corpulent and bloated, and had excessive venereal excitement, which I did not gratify, and felt the testicles and vessels of the cord ready to burst; but when I rose and walked, the uneasy sensations subsided.

"Soon after I married, I began to feel the uneasiness in the testicle I have since suffered from. I felt pain in coitu so great, as to lead me to go to London for advice. The testis is a little fuller:

extremely tender to the slightest touch of the fingers: coitus always irritates it, so that the swelling and tenderness increase from it: the soreness is felt in the upper and outer part of the testis, and in the vessels of the cord. With regard to the nature of the disease, I have been a long time convinced it is seated in the nerves of the spermatic cord; the pain is a benumbed sensation,—at some times, a pricking feel;—at others, such as would proceed from a compressed or irritated nerve. It is uniformly increased by whatever disturbs the position of the testis, or presses upon the ring, or course of the cord. I can bear the erect position for a few minutes, provided the part be properly adjusted. When I lie on the left side, the pain is of a dragging kind, and feels as if it extended from the region of the cœcum; and when on the right it is more sharp, and feels as if the parts, which are tender, were pressed upon by those in the neighbourhood: I feel most easy on my back. There is considerable fulness on the side of the pubes, which is always increased, and extends higher in the direction of the cord, when the pain in the testis has been greater than usual.

"After aperient medicine has produced two or three motions, I usually suffer more pain for a day, and the passage of flatus through the cœcum produces the same effect.

"The cord appears, as far as its tender state will bear examination, to be free from organic change; and the testis, excepting that it is occasionally full, seems unchanged in size or structure.

"My general health is good, and every other function is natural:—yet I have now been confined to a horizontal posture for a year.

"It has always happened, that however severe the pain has been on the side and right limb, or region, it has given way to cold applied to the abdominal ring; and comparative if not perfect ease has been enjoyed for an hour afterwards.

"The means which I before used, but most ineffectually as to my cure, have been, leeches; a solution of nitre, in a bladder, to the part; belladonna and the cold hip bath; sea bathing; regularly aperient medicines, and all the means which the best advice in this country could suggest.

"I consider my symptoms might have originated in an injury I received upon the cord, some time before the symptoms began."

Case. Master H. aged 14, has a teazing and aching pain in the testis. Exertion brings on the pain; leaning forward increases it. He cannot walk one hundred yards but he has pain in the groins, loins, thigh, and leg, to the foot, on that side; the testicle is tender to the touch. The recumbent posture relieves him, unless he has catarrh, and then he has the pain even in bed.

DISSECTION.

I have removed the morbid part in three instances; and I thought, in the first case, the centre of the epididymis was diminished, and that the disease might be produced by an accumulation of semen behind it, and that the obstruction might produce the pain; but I am inclined to believe that the disease is in the nerve, as in the other two cases there was no marked disorganization.

It seems to me to be a species of tic douloureux, supported by the constant functional changes to which the part is liable; for if it arose from organic change, it would not, as it does, cease for a considerable time, and then relapse.

OF THE TREATMENT OF THIS DISEASE.

Medicines. The remedies I have seen most useful have been small doses of the oxymurias hydrargyri with the compound decoction of sarsaparilla, given twice per diem, and continued for a length of time. The application of a belladonna plaster to the part, and opening a blister at the groin, and dressing it with ung: cetacei et opii. A Change of climate. sea voyage to a warm climate, I have known improve the patient, from the rest and change of constitution it has produced. It will be right to try arsenic, which has considerable power over tic douloureux; to give Quinine, as bark relieves it; also to try steel, as it has been recommended by Mr. Hutchinson, of Southwell; but at the same time to deplete the part by leeches, and lessen the nervous Local bleeding.

irritation by the application of a solution of nitrate of potash and muriate of ammonia, in a bladder. Bougies do not relieve it; but the ung: lyttæ, used to produce a slight discharge from the beginning of the urethra, I have known of service.

The following are the three cases in which I have operated for the removal of the testis on account of this affection.

Case. Mr. G—— contracted a gonorrhœa at Paris, in October 1815, and in consequence had inflammation of the right testicle, for which he applied fomentations and took aperient medicines: the testicle continued swelled and painful until June 1816, when the employment of strengthening plasters removed all inconvenience; a slight degree of pain returned at intervals until June 1817, when he was again relieved by plasters, and thought himself sufficiently well to join his regiment. The exercise, which his duty obliged him to take, soon occasioned so much pain, that during the winter of 1817 and spring of 1818, he scarcely had a moment's respite, but only used a blister, which he thought increased the tenderness. In May 1818, he returned to England, and bathed in the sea till September, at which time the pain was nearly removed, but he was unable to walk or ride. Since, he has not employed any remedy but nine weeks' sea-bathing at Brighton, which produced no amelioration: he was unable to walk ten yards without experiencing considerable pain; the only thing which appeared to relieve him was violent motion in a rough carriage.

On account of the continued pain, confinement, consequent depression of sprits, and loss of health, he determined on having the testicle extracted, which I removed on the 1st of March 1819. The wound healed slowly, and one or two small abscesses formed in the scrotum, but he ultimately did extremely well.

Case. Captain P. had an irritable state of the left testis, which commenced in March 1818. The vein of the spermatic cord felt distended; the part was exquisitely tender to the touch, and exercise produced pain, which was intolerable if the part was not supported: he could not rest on the left side, or bear the slightest pressure on the testis; he had increased pain in coitu, and after it the part

felt full and loaded. He was somewhat, but only for a time, relieved by the hot bath, or fomentations. He tried blistering at five different times: applied two hundred leeches, at separate times, to the affected part: employed also various lotions, opium, and belladonna, with every medicine which seemed likely to be useful in lessening the irritability; but all without benefit.

I removed the testicle for him in 1823: he quickly recovered from the operation, and felt very grateful for his restoration to society.

This case is drawn up by the gentleman himself, who came from America to consult me; he also saw Mr. Abernethy and Mr. Pearson. Having tried every variety of medicine and local treatment without advantage, and determined not to return to America with the disease, at his request I removed the part, and have since heard that he remains perfectly well. He says, Case.

"For several years past my left testicle has been larger than my right; at times considerably so, especially when I have taken cold. Early last summer I began to be uneasy about it, but neglected to take advice. In August, I lost two children by the yellow fever, and in my anxiety I exposed myself to unusual fatigue; and in a few days after their death, the last week in August, I had for the first time pain in the left thigh and groin, also in the testicle, which was much enlarged. I then applied to one of our best surgeons, who made an incision into it, and let out a large quantity of water; this was about the 10th of September: he then desired me to suspend it, as I do now, and to use a lotion of the extract of lead and opium. In a few days after, the part again became painful, for which I applied tepid poultices of bread and milk, and bathed it in warm water. The pain continued, and in about six weeks after, the operation was repeated; but very little water was drawn off: no injection was used. For some time previous, and for about six weeks after the second incision, I took mercurial pills, two or three each day, and occasionally used mercurial friction on the thigh and testicle, keeping up a soreness in the mouth, but not producing much salivation. With some intermissions, this course

was continued for about four months. I laid in an horizontal position, except occasionally for a few minutes at a time, and drank only toast and water; lately I have taken Madeira and water, or one or two glasses of Madeira, at dinner. In December, a blister was applied to the scrotum, which produced a copious discharge. I think all these remedies gradually reduced the size of the testicle; but the pain continued; sometimes a sharp shooting pain in the groin; but generally a heavy, dull, constant pain.

"In March, I procured some leeches from New York, and applied seven; bathing with tepid water, by which I got away a considerable quantity of blood, producing great debility. In April, I again applied three leeches; since which I used the lotion of lead and opium.

"At present the part is about the same size as it has been for two months past; but the pain is constant, and I cannot stand for ten minutes without increasing it considerably: there is great sensibility in the part; the slightest touch is painful.

"My general health is as good as it has been for years past; I am subject to head-ache, and other dyspeptic symptoms: a long residence in warm climates has injured my constitution."

OPERATION OF CASTRATION.

Mode of performance.

I shall conclude the lecture with describing to you the operation of castration. The patient being placed upon his back, upon a table of convenient height, with his legs hanging over its end, and the hair of the pubis being removed, the surgeon begins his incision at the upper part of the external abdominal ring and extends it to the bottom of the scrotum. The lower part of the scrotum should be divided, or a bag of matter afterwards forms in it. The next incision is made upon the spermatic cord, just below the abdominal ring, so as to lay it distinctly bare, and to enable the surgeon to raise it. In this second incision, the external pudendal artery is divided, and affords a bleeding, which leads the surgeon to request it may be compressed by an assistant, until the testis be removed.

The next step of the operation consists in raising the spermatic cord, and in passing a curved needle, armed with a ligature, nearly through its centre, just below the abdominal ring; the ligature is then to be held by an assistant, which prevents the retraction of the cord into the ring, by the contraction of the cremaster muscle. The cord is then completely divided, and the surgeon drawing by it the testicle towards him, separates the cellular tissue between it and the scrotum, and thus detaches it from the surrounding parts.

Sometimes, from inflammation, the testicle adheres to the scrotum, in which case it is best to remove a portion of the latter, rather than to make a tedious and painful dissection in separating these parts. When the testicle is removed, the spermatic artery is sought for in the anterior part of the cord, and, when found, is to be secured by a ligature; next, an artery which accompanies the vas deferens, is in like manner to be tied, taking care to exclude the vas deferens from the ligature; after this, the thread which had been passed through the cord, to prevent its retraction, is withdrawn. Any vessels in the scrotum which bleed must be taken up. The coagulated blood is then removed from the scrotum, and two sutures are then put into it to bring the edges of the wound together; one just over the end of the cord, and the other midway between it and the bottom of the incision; lint is to be laid over the wound, and it is best at first not to apply any plaster. The part is to be supported by a handkerchief, or T bandage.

The ligatures separate in about eight days, and in three weeks the wound will probably be healed. The cruel practice of tying the whole cord with a broad ligature is now properly abandoned by every good surgeon.

LECTURE XXVIII.

ON DISEASES OF THE BREAST.

THE diseases of this organ have been too much considered as being of a malignant nature; and females who have had the misfortune to have tumours in their bosoms, have been often very unnecessarily submitted to an operation, under the idea of the complaint being cancerous. I shall therefore proceed to state what I have been able to learn of the various diseases of this organ, to discriminate the malignant from the more benign complaints, and to point out the cases which really require removal, in distinction from those in which operations are entirely unnecessary.

OF THE HYDATID OR ENCYSTED TUMOUR.

Symptoms.

This disease begins in a swelling, which is unattended with pain, and which has the character rather of a chronic inflammation, in a part of the breast, than as bearing a resemblance to a scirrhous tubercle; for it has neither its mobility, its excessive hardness, nor its general circumscribed or distinct limits, but it incorporates itself with the surrounding parts of the breast.

The skin over the mammary gland is undiscoloured, and the part is scarcely tender to pressure. The general health is unaltered, even when the swelling becomes of the most formidable magnitude.

Becomes in part fluid.

As it increases, a change in the nature of the swelling is produced: at first it was uniformly solid, but is afterwards distinctly divided into a solid and a fluid part; the latter fluctuating, so as at once to inform the surgeon of the existence of a fluid. If this part be punctured, a liquid, having the usual character of serum, is discharged; the cyst sinks, but soon becomes again distended, and the swelling continues to grow. At length, the tumour acquires enormous magnitude, and some of the largest swellings in this

organ are of the hydatid kind. I have twice seen swellings not of this description, rather than the hydatid; but generally the largest in the breast are of this kind.

One, which I removed, with Mr. Cline, from Lady Hewett, weighed nine pounds.

From Mrs. King, at Charing Cross, I removed one which weighed thirteen pounds; but frequently they are removed when still small, under a supposition that they are scirrhous tubercles.

These swellings are pendulous, and the whole breast is very moveable even when large; they are generally unattended with pain, although to this rule there are exceptions, and the constitution is but little disordered. The absorbent glands, in the most aggravated form of this complaint, are undiseased, so that it does not extend by absorption.

Inflammation sometimes takes place in one of the cysts; and, when the cyst ulcerates, serum mixed with mucus, and occasionally with a little matter, is discharged; the wound then heals, and the cavity seems obliterated; but the disease again ulcerates in other parts, and passes through the same process. Inflammation of the cysts.

It is a complaint I have seen at all ages after twenty, but more frequently in advanced age than in youth.

DISSECTION.

Upon dissection, the breast is found to be consolidated by the adhesive inflammation, so as to form a very firm swelling in some parts, but in others it contains cysts distended with serum. The cysts vary in size; some of them contain mucus mixed with pus. The cysts which I have seen in the breasts have been of three kinds. First, the globular hydatid, like that which is found in the liver, contained within a vascular cyst. A second species, composed of numerous membranes, which may be peeled from each other, like the concentric lamellæ of the crystalline humour. But tumours of the breast are sometimes composed of simple bags, which contain and secrete the serum, or watery fluid, within them.

Case. Mrs. King, of Charing Cross, aged 58, had an enormous enlargement of her left breast; she discovered it fourteen years ago, and supposed it arose from a blow. When first observed, it was as large as a marble only, hard, and entirely unattended with pain.

It seemed to be buried in the breast, and was not very moveable in the glandular structure.

It gradually grew until two years ago, when it had acquired the size of a melon. At that period it seemed suddenly to grow faster than before; but was still unattended with pain, and her general health appeared to be good.

Last Christmas it also acquired a very sudden increase; but was still free from any painful sensations, excepting that sometimes, when she had a cold, she felt a slight uneasiness in the part.

On the 30th of September, 1822, I was consulted; the tumour then measured thirty-five inches in circumference, was solid, and felt cartilaginous in some parts; but in others was soft and fluctuating, and one bag evidently contained a large quantity of fluid. The solid tumour was placed above, the fluid occupied the lower part of the swelling. Her general health was good, and the swelling was free from pain; but she suffered much from its weight drawing down the skin and pectoral muscle, and putting the nerves exceedingly on the stretch.

On the following day it was removed, in the presence of Mr. Key, a surgeon of Guy's Hospital, and Mr. Laviss, a practitioner in Westminster.

The large vessels, divided in the operation, were immediately secured, or pressed upon, so as to prevent any considerable loss of blood.

The wound, when dressed on the seventh day appeared healthy; her constitution suffered but little, and she recovered without any untoward circumstance, and is now living at the same residence.

Upon inspection, the greater part of the swelling appeared like boiled udder; within which, at various parts, cysts were contained, and when these were opened, hydatids, composed of numerous lamellæ,were found: serum was effused around them.

June, 1818.—Lady Hewett, aged 60, tall, and of strong consti- Case.
tution, dates the origin of the swelling in her breast from a blow she received, November, 1815, in her axilla, by falling against a chair; although she had previously felt some evanescent pains in her right bosom. Nine weeks after the blow, she felt uneasiness in the right breast, which extended into the axilla. In the beginning of 1816 she discovered a swelling in her right breast, which was about the size of a nutmeg, situated below the nipple. In May, 1816, it had acquired the size of a melon, and she consulted Dr. Sharp, of Thrapston, who ordered her what medicines he thought most appropriate to her situation, and sent her to Harrowgate; but, as the swelling increased, she applied leeches every day for two months, and afterwards every other day, till September, without advantage.

She then determined to try the influence of pressure, which she continued several months, by adhesive plaster, and afterwards by an instrument, contrived for the purpose, which was worn during four months, but without any advantage, as the swelling still continued to increase.

She therefore determined to leave the case to nature, and she did so until November, 1817, when the swelling began to undergo a change. It increased quickly, and became soft at its upper part, appearing inclined to suppurate:—fomentations and poultices were applied, calomel and opium given, but matter did not form. This treatment was continued until the May following, when she discontinued all the means.

In June, 1818, she made up her mind to submit to an operation, which I performed on the 10th day of June, 1818, in the presence of Mr. Cline, Mr. Lowdell, and my nephew, Mr. Bransby Cooper.

The swelling was of great size, weighing nine pounds. It was in part solid, in some parts evidently contained a fluid, and over the fluid part there was a slight blue tint. The swelling was very moveable, and reached down upon the upper part of the abdomen. Lady H.'s general health was good. The first steps of the operation consisted in making a puncture into the tumour at its most

prominent part, and discharging a quantity of serum from it, by which it was at once clear the disease was of the hydatid kind, and the magnitude of the swelling was lessened. An incision was then made across the tumour, a little above its middle, and the flap of integument being raised, the upper part of the swelling was detached from the pectoral muscle; and with the handle of the knife the swelling was further separated, and a flap of skin being left below to meet that at the upper part, the operation was thus concluded. The removal was borne with great fortitude. Two arteries, of considerable size, required to be secured. The integuments were brought together by a single suture, and by adhesive plaster. On the 16th of June the wound was first dressed, and on the 30th Lady H. was quite well.

Case. The wife of Dr. W., aged 45, twenty-six years ago, fell in getting into a carriage, and received a blow upon the breast, which immediately became black and uneasy; she applied leeches upon it, but a small lump remained. Three years ago the swelling began to increase, and, from a rounded form, became oblong, but was free from pain; its increase was so gradual, that little alteration was produced in twelve months. At this time the veins began to enlarge, and the skin to be discoloured; yet still it was free from pain. At the end of two years she applied to me, and I ordered leeches, which emptied the veins, but did not diminish the swelling, for it continued to increase, and several blue spots appeared upon it; but it preserved a globular form: spirituous lotions were applied upon it to check its growth by evaporation.

Two months before the operation, the tumour underwent a sudden increase, and was supposed to weigh about five pounds. She was free from pain during the whole progress of the disease; her spirits were good; her activity undiminished, and her constitution was unaffected until the last two months, when she said she felt nervous; and head-aches, which she had always experienced occasionally, increased in the progress of the disease: the original lump was for a time distinct in the tumour, but at length blended itself with the general mass.

In June, 1818, in the presence of Mr. Cline, I removed this tumour, by making two flaps, as in the last operation, and I tied the arteries, which I divided as I proceeded. Little constitutional irritation followed, and in six weeks Mrs. W. was well. The appearances in this breast were similar to those in Lady Hewett's.

Case. Mrs. Styles, aged 28, had a tumour in the breast which had existed three years, and which was sometimes painful from changes of temperature, and sometimes from the approach of menstruation; but the pain was inconsiderable.

It began in a swelling of the size of a filbert, which was hard and moveable; but it gradually became larger, until it was about two inches in diameter: her menstruation and bowels were regular, but rather inclined to costiveness; her general health was good.

My nephew, Mr. Bransby Cooper, removed this swelling before me; and when he cut into the tumour, a bladder of water was opened.

The cyst, in which the water was contained, appeared very vascular; it was then removed: the wound healed in a fortnight; but an abscess afterwards formed and discharged for six weeks, and then closed. This was, therefore, a simple cyst, formed in the cellular membrane, containing a considerable quantity of a serous secretion.

We have, in the collection at St. Thomas's Hospital, a large globular hydatid, which Mr. Cline informed me was discharged from the breast.

It appears then, as I have stated, that there are three kinds of hydatid or encysted tumours in the breast. One, in which the production is a globular hydatid, like that which is considered to be a distinct animal, and which is now and then met with in different parts of the human body; the second, a cyst composed of numerous lamellæ like the crystalline humour; and the other, a bag containing serum, and probably produced by an adhesive process shutting the communication between the cells of the cellular tissue, in which secretion proceeds.

DIAGNOSIS.

The marks of distinction in this disease are—1st, the health remaining perfect; 2ndly, the almost entire absence of pain, unless there is a suppurative tendency in the cysts, when I have known the disease painful; 3rdly, the swelling being firm, smooth, and not tender to the touch; 4thly, when a fluid forms, the fluctuation being very distinct, and a slight blue tinge being observable when it approaches the skin; 5thly, the fluid, when evacuated, having the transparency of water, with a very slight yellow tinge, and this is sometimes succeeded by a discharge of mucus.

TREATMENT OF THIS DISEASE.

When the tumour becomes of great magnitude, there is no other mode of relief but by removing it; and, although the complaint be very formidable in point of size, yet the operation is attended with very little danger; and if the arteries have become large, the only care which is required is to secure them during the operation, as they are divided.

When removed by operation, it does not return.

No remote danger exists, for I have never known this disease return after any operation in which the swelling was clearly removed; although I have (but not in the breast) when a small part of the swelling remained. But the disease does not contaminate the absorbent vessels or their glands, but is to be considered as entirely local.

When a single cyst exists, the swelling does not require removal.

Case.

A young woman was sent into Guy's Hospital, many yesrs ago, by Mr. Saumarez and Mr. Dixon, who had a tumour in her breast, which at first felt hard, and was about two and a half inches in diameter. Seeing her general health was perfectly good, I applied a plaster, and did no more: the swelling underwent but little change, and she quitted the hospital. Many months after she

PLATE XV.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

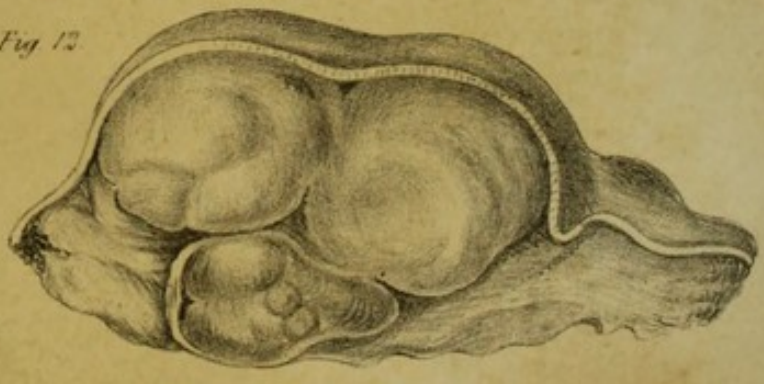


PLATE XV.—MORBID ANATOMY OF THE BREAST.

The first three figures represent the hydatid state of the breast, (*from Mrs. King's Case.*)

Fig. 1. A cyst in which the hydatids had been contained, exhibiting its great vascularity.

Fig. 2. A section of the fibrine, exhibiting its great vascularity, which also contains numerous hydatids (*vide* p. 320.)

Fig. 3. A cluster of hydatids, with the stalk upon which they grew, cut through.

The next three figures, 4, 5, and 6, exhibit the progress of the disease as it advances, combining a scirrhous structure with hydatids.

Fig. 4. Shows hydatids imbedded in scirrhous structure.

Fig. 5. View of a globular hydatid.

Fig. 6. Exhibits an immense number of small hydatids in a portion of the breast which I removed from Mrs. Hewlet, the largest not bigger than a pea.

The remaining six figures exhibit the different stages of the irritable tumour.

Fig. 7. An irritable tumour cut open, its internal surface compact and smooth.

Fig. 8. Seems to be a compound of the chronic mammary tumour with the irritable.

Fig. 9. An irritable tumour, which frequently remains stationary.

PLATE XV. *(continued.)*

Fig. 10. This figure best represents the internal character of these swellings, viz. semitransparent, circumscribed, texture close, resembling somewhat a nervous ganglion, but differing in its fibrous arrangement.

Fig. 11. Section of a scrofulous tumour of the breast, showing its yellow appearance, and unequal vascularity.

Fig. 12. Cartilaginous and ossific tumour of the breast; the skin extended over it: two large portions of cartilage in the breast, below the skin; and beneath these a large patch of ossific matter is deposited.

applied again for admission, because the swelling was much increased, and I then ordered her into the operating theatre, to remove it; but upon examining it with great attention, I felt a fluctuation, and, turning to the students, I said, "I shall put a lancet into this swelling, to ascertain its contents;" which I did, and serum only was discharged. I introduced a small piece of lint into the orifice, brought on an adhesive inflammation, the sides of the cyst adhered, and the patient did well, having no return of the complaint.

ON THE SCIRRHOUS TUBERCLE.

This disease is of extremely frequent occurrence.

The symptoms with which it is accompanied are as follow:

Symptoms.

The swelling is generally discovered after it has acquired considerable magnitude, and it must have been the growth of several weeks. It is said to be discovered by accident: but if the patient distinctly traces her feelings, she will have observed some uneasy sensation, which led her to feel the part. Sometimes the attention is first attracted to the bosom by a drop of bloody serum having stained the linen opposite the nipple, it having flowed from one of the lactiferous tubes. Sometimes a distinct and sharp pricking pain leads to the discovery of the swelling.

Situation.

It feels extremely hard. It is evidently seated in the gland of the breast. It is moveable, but more so in the breast than in itself. It is usually distinctly circumscribed, so that the surgeon thinks he is able to decide upon its limits, yet it generally happens that portions of it branch out into the gland, and connect it with parts of the breast at a distance.

Sometimes not tubercular.

In some instances, it is rather a scirrhous inflammation in the breast than a distinct tumour, which hardens and swells the bosom throughout its whole extent. In this state I have seen it cross through the cellular tissue to the other breast, and gradually extend in a similar manner through it. At first the scirrhous

tubercle is not painful, but subsequently becomes so; but then the pain is occasional only, occurring at distant intervals.

Pain acute.

The pain is exessively severe, commonly as a stab in the part; sometimes a burning heat; now a pricking sensation; then a sense of tearing, as if the nerves of the breast were torn out, or the breast itself tearing off. In other cases, the pain is more obscure, like the aching of rheumatism. It generally extends to the shoulder on the same side, and often affects the nerves of the arm.

Intermittent pains.

The painful sensations in the breast recur about once in ten days or a fortnight, when the swelling begins to be painful; but more frequently, as the disease advances; and I believe there is an occasional determination of blood to the part, and that the disease increases, particularly when this painful period recurs.

More severe prior to menstruation.

Prior to menstruation, (about four days,) the breast feels fuller, heavier, and much more painful; and although, from the last-mentioned period it may have been tranquil, it scarcely ever fails to have painful sensations at the return of the menstruations; but more so just prior to it, than at the exact moment; for it is relieved as soon as the evacuation begins, and is always much lessened after its cessation.

Gradual increase of the disease.

The swelling gradually grows from the size of a marble, when it is first observed, until it acquires a magnitude of two or three inches in diameter; for it rarely happens that the true scirrhous tubercle increases to a very considerable bulk, and this circumstance is one of its criteria.

Retraction of the nipple.

The next change is a retraction of the nipple, and this occurs from the lactiferous tubes being drawn out of their course by the swelling, and consequently they draw in the nipple, in which they terminate; frequently also the nipple becomes red, inflamed, excoriated, and sometimes ulcerated.

Puckering of the skin.

A change is also produced in the appearance of the skin, it is puckered so as to resemble a cicatrix, and this arises from its adhesion to the surface of the tubercle. Frequently the follicles of the skin are filled with black sebaceous matter around the nipple, in the areola, and in the skin on the surface of the breast.

The cellular membrane becomes inflamed and hardened, and little tubercles form in the absorbent vessels under the integuments. Absorbents become affected.

At this period, or sometimes prior to it, the glands in the axilla become enlarged, and many of these are often affected. But if the disease be on the sternal side of the nipple, the gland just above the clavicle at the lower part of the neck, is felt hardened and increased; for then the irritation is extended by the absorbents through the intercostal muscles to the internal mammary absorbent vessels and glands. The glands in the axilla enlarge.

When the glands in the axilla have been many of them enlarged and obstructed, I have seen the scirrhous irritation proceed by the absorbents from the axilla to the back of the shoulder, on the scapula, and extend from thence to the glands above and behind the clavicle. Extends to the clavicular glands.

Months and sometimes years roll on, and the disease continues in its adhesive stage, and it even often destroys without further change occurring; but frequently it proceeds to a suppurative inflammation: then the skin appears of a livid redness; the pain becomes even more severe; a slight sense of fluctuation, or rather of yielding, is perceived in this part, which gradually ulcerates and discharges only a bloody serum; for true pus is not generated. Pus is attempted to be produced; but it is not formed upon the truly malignant surfaces, but only upon the surrounding parts, if they be ulcerated. I have, however, sometimes seen an approach to suppuration. Exists for years without destroying life. Becomes ulcerated.

The surface of the sore feels hard, like the original tumour, and is remarkably insensible to pressure: and you therefore will observe the patient wipe it and handle it with a degree of roughness and want of gentleness, which surprises those who are unaware of its little sensibility. The granulations which spring from the sore are imperfectly formed; in some parts rising considerably, in others scarcely any are produced: they differ from common healthy granulations in their hardness, in their insensibility and in their secretion; which is, as I have stated, generally a bloody-coloured serum. Character of the sore.

The ulcer frequently bleeds.

Bleedings from the sore are frequent; they occur spontaneously, and relieve the patient's sufferings; and the observation of this may have led to the use of leeches in the treatment of the first stages of the disease: they also arise from removing the adhering dressings, or from wiping the surface of the sore; and the flow of blood does not easily stop, as the vessels have little power of contraction; pressure, however, succeeds in checking the hæmorrhage.

Constitutional suffering.

The edges of the sore become everted, the ulceration gradually proceeds until a large ulcer is formed, and often a very deep excavation is produced, so as to expose and even ulcerate the pectoral muscle. At this period, and often before ulceration has commenced, the patient complains of rheumatic feelings in different parts of the body, but particularly in the loins and in the thighs; but I have also known other parts, as the spine, become painful: violent pain and tenderness have been felt in the sternum and ribs, and the patient describes the pain to be that of animals gnawing the parts. I attended Lady M. who, for many weeks before her death, described herself to suffer daily the pains of the rack, arising from cancerous rheumatism.

Case.

The appearances produced by this disease in the bones, I shall presently describe.

Great dyspnœa is also attendant upon this complaint, and the patient cannot lie down in bed, or can only rest upon the diseased side; she is also frequently teazed with a cough, unattended by expectoration.

Frequently violent spasms are felt, which are referred to the region of the stomach, and they are often attended with vomiting; but, I believe, they arise from a tuberculated state of the liver. The complexion is sallow, with now and then a slight flush upon the cheek.

Extension of the disease.

After some time the arm, upon the diseased side, begins to swell above the elbow, then the fore arm enlarges; at length the swelling extends to the axilla. Its feel is brawny; it does not pit so easily as common œdema; the swelling seems to arise from the loss of the power of absorption produced by the destruction of the texture of the

absorbent glands, and from compression upon the veins of the axilla, from glandular enlargement. The constitution becomes excessively irritated by the swelling, by the pain which attends it, and by the augmented disease in the breast, and thus gradually the patient sinks under her sufferings. Destruction of life.

OF THE DISSECTION OF PERSONS DYING WITH SCIRRHOUS TUBERCLE, OR CANCER.

The tumour in the breast is a solid mass, approaching to the firmness of cartilage, waved upon its surface, composed of fibrous matter within, and the lactiferous tubes may be seen in white lines, taking their course through it.* If macerated for a time in the same water, the scirrhous matter softens and leaves the cellular texture, in which it has been deposited, with its fibres thickened and unnaturally strong. Processes extend from the swelling into the surrounding parts of the breast, which must be carefully felt for in the living subject, if an operation be performed. The blood-vessels at the edge of the tumour are more numerous than its substance, unless it be ulcerated, and then around the ulcerated part a great many are seen. Morbid appearances in the breast itself.

It seldom happens, when a tumour of this kind exists in the breast, that only one is found, for there are generally several smaller in different parts of the glandular structure. The skin often adheres to the surface of the swelling, and the absorbent vessels of the skin have frequently little tubercles in their coats.

If the swelling adheres to the pectoral muscle, scirrhous matter is deposited in the direction of its fibres, and it is converted into a hard and white substance; the glands in the axilla are changed in their internal appearance from the deposit of a scirrhous secretion resembling that in the breast, but more vascular and more quickly ulcerating, and then they become spongy. The glands above the Of the glands.

* It sometimes happens, that earthy matter is secreted into the lactiferous tubes within the swelling; but this is by no means a constant appearance.

clavicle are in the same state; and those on the left side, when enlarged, press upon the end of the thoracic duct, and disturb its functions, producing excessive pain for some time after taking food.

The glands behind the cartilage of the ribs, when the disease is placed upon the sternal side of the nipple, are generally diseased. It often happens that the axillary glands upon the opposite side to the diseased breast are also enlarged and hardened.

Of the lungs. When the chest is opened, the lung on the diseased side, and sometimes on both sides, is inflamed, and partially adheres to the pleura costalis. Serum is found in the cavity of the pleura, on the diseased side, from which I have known death produced in a few days, after an operation of removing a scirrhous tubercle. When the finger is passed over the internal surface of the pleura costalis, little scirrhous tubercles are felt upon it, and the pleura on the surface of the lungs has similar, but larger, scirrhous swellings.

Of the liver. The liver has frequently scirrhous tubercles on it, more especially when the disease in the breast is seated on the right side.

Of the uterus. The uterus is rarely free from disease; one, or sometimes several scirrhous tubercles are formed in it, and this produces the pain in the loins, of which the patient so frequently complains.

Of the ovaria. I have also seen the ovaria enlarged, hardened, and tuberculated.

Of the bones. The bones have frequently scirrhous deposits on the cancellated structure.

We have the sternum, taken from Mrs. Edge, preserved in the collection at St. Thomas's, with scirrhous secretion in it. We have the thigh bone of the same lady, which broke merely in her rising from bed. We have a fractured thigh bone in the collection, taken from another patient, which broke by her turning in bed.

We have also two most curious specimens of diseased spine, in which much of the bone has become absorbed, and scirrhous tubercles deposited in the spaces left by absorption.

Age at which this disease appears. With respect to the age at which the disease appears, I have frequently seen it at all periods between thirty and seventy years. I do not recollect more than two cases, in which the nature of the tumour was decidedly scirrhous, under thirty years. I have seen

one case at ninety-three years, another case at eighty-six, and have removed one at seventy-three, ulcerated, and the patient did well. It most frequently occurs about fifty years of age. In ninety-seven cases, which I remarked, twelve were of that age.

Often confounded with chronic disease.

The tumours which are found in women under thirty years of age, and which are usually called scirrhous, are really only simple chronic enlargements, and are not disposed to malignant action, and do not absolutely require removal.

Does not always shorten life.

When the disease occurs in very old persons, it does not in general shorten life; but the patient lives as long with it as probably she would have done if such tumour had not existed, and dies of some other disease. I saw a lady at eighty-six, who consulted me upon the propriety of an operation for this disease, and whom I advised not to submit to it; and, after several years, she died of another complaint.

Occurring at the cessation of menstruation.

The disease is supposed to occur more particularly at the cessation of menstruation, and which is really the fact, for it is frequently sympathetic with the uterus; but still the exceptions to this rule are very frequent. The symptoms are augmented by the approach of menstruation, and decline as the period is passing.

More frequent in unmarried women.

The disease occurs more frequently in unmarried women than in others, and in women who, being married, have had no children, probably because the breast has not undergone that change for which nature had designed it, in being the fountain of nourishment to offspring; but yet pregnancy and nursing do not prevent the tendency to disease in some persons; for I have known a woman die of the complaint who had been pregnant seventeen times, and had ten living children.

If a tumour exists in the breast previous to the cessation of menstruation, a malignant action will occur in it at the period of its cessation, or soon after it.

Many persons in a family affected.

There are sometimes several persons in the same family who will be affected with this disease. A physician had three relatives, sisters, the first of whom had a scirrhous tubercle of the breast, of which she died. A second had the disease, which was removed by

Mr. Lucas, sen.; the disease returned, and she died. The third has applied to me, from a very painful swelling in the breast: they were unmarried. Therefore, in a family in which one is affected, the first dawn of complaint should be carefully watched, and the general health be well attended to in others.

Progress of the disease slow.

The progress of this disease to its termination is always slow; but in some more so than in others; and it is well that patients, who must fall victims to the disease, should know that it often remains stationary, and that I have seen it in one instance seventeen years; one twenty-two years; in the last case the thigh bone was broken by a very slight accident; and, after several months, appeared to be united, and then again became broken, in an effort to remove her from bed. As I was examining the thigh bone, I observed her breast ulcerated, and asked her how long the disease had existed, and she said twenty-two years. The breast on the left side was absorbed, and a scirrhous swelling, with some enlargement, existed over a large portion of the skin, covering the pectoral muscle. Dr. Babington informed me, that he knew a lady, who had symptoms of the disease twenty-four years.

Cause of scirrhus.

The cause of this disease is supposed to be some accidental blow, or the pressure of a part of the dress; but although a blow may produce a swelling on the bosom, yet that swelling will not be of a scirrhous nature, unless some defective state of the constitution disposes to malignant action. If the constitution be good, the effects of a blow are speedily dissipated; but if the constitution be faulty, the swelling grows into a formidable disease. The complaint is, in part, constitutional, in part local. It is constitutional in so far as the disposition to malignant action is produced by the state of the habit. It is local also, because the action in the part is peculiar, and the result is a specific effusion different to that of common inflammation. A wound, therefore, made into the parts will produce, on scirrhous disease, a cancerous ulcer; but a wound made in removing the swelling, heals like one in any other part of the body. So with respect to the constitution, unless it be changed by a medical treatment, the disease will return as the disposition to malignant action which continues will reproduce it.

Anxiety of mind, tending to the presence of slow fever and suppressed secretions, are the predisposing causes of the complaint. A mother watching with anxiety a near and dear relative in sickness; deprived of her natural rest, and inattentive to the deviation from health in her own person, is often afterwards affected with this disease. A person, the prey of disappointment from reduced circumstances, and struggling against poverty, when her prospects begin to brighten, finds a malignant tumour in her breast; costive state of bowels, a dry skin, a paucity of other secretions have attended this anxious state of mind, and laid the foundation of that destruction which awaits her. Influence of the mind in predisposing to scirrhus.

DISSECTION.

In the examination of persons who have died from this disease, besides the affection of the neighbouring glands, scirrhous tubercles are found in many other parts of the body, but more particularly in the thoracic and abdominal viscera.

In addition to the scirrhous deposit in the sternum of Mrs. Edge (already mentioned,) scirrhous tubercles were found in the following situations: Case.

In the integument covering each breast; in the glandular structure of the breast itself, and in the neighbouring absorbent glands; also in the substance of the pectoral and intercostal muscles.

Thorax—On the pleura of each side, and on the pericardium, the cavities of which contained water; also in the substance of each lung.

Abdomen—In the liver, pancreas, mesenteric glands, and uterus.

In the dissection of another patient, who died with an ulcerated cancer on the right breast, scirrhous tubercles had formed in the direction of the internal mammary artery on each side, but more particularly on the right; also in the intercostal muscles. The surface of each pleura, and the substance of each lung, exhibited numerous similar tumours. The bronchial glands were also enlarged from the same cause. Case.

Three species of scirrhus.

There seem to be three species of scirrhous inflammation.

First, That producing a tubercle, which gradually grows to the size I have described.

Secondly, That which gives origin to a number of small scirrhous tubercles in several parts of the breast, affecting both breasts, and producing similar tubercles in various parts of the cellular membrane, in the lungs, and in the liver.

Thirdly, A scirrhous inflammation of the breast, which seems to involve the whole of the glandular structure, hardens the whole breast, which becomes attached firmly to the pectoral muscle, and to the skin, and often extends over to the opposite bosom.

LECTURE XXIX.

OF THE TREATMENT OF SCIRRHOUS TUBERCLE.

No specific remedy having been yet discovered for this disease, all that the surgeon can do is, to employ the constitutional treatment best calculated to keep the disease in check, by lessening inflammatory action.

Constitutional remedies.

The same attention is required to the due support of the secretions, as in other complaints of an inflammatory kind; and the pill: hyd: subm; comp: in the quantity of from three to five grains at night, with compound infusion of gentian, soda, and rhubarb, form an excellent medicine in that point of view.

Steel has been recommended; but although it is useful in another form of disease of the breast, in this it often occasions a feverish heat; therefore it should not be employed unless in cases in which the uterine secretion is defective, and then the Plummer's pill and the following draught twice per diem may be beneficial:

R. Vini ferri ʒj.
Ammoniæ carbonat: gr. vij.
Aq: menth: virid: ʒj.
Tinct: card: comp: ʒss.
M. ft. Haustus bis die sumendus.

Medicine must also be given to relieve the severity of suffering, and to subdue the agonizing pains with which the disease is often accompanied. The tincture of opium, the liquor opii sedativus, the black drop, are given in succession, as either form is losing its effect, combined with the camphor mixture, and a little of the spiritus ætheris comp: which is the best mode of administering them. A patient of mine, in Guy's Hospital, was much relieved by the stramonium, and this medicine may be given in the following form: Opiates.

R. Ext: stramonii gr. ½.
Camp: gr. 2.
M. ft. pilula bis terve die sumenda.

Very small doses of belladonna sometimes succeed in diminishing the pain, and I have known bark also mitigate the severity of the symptoms.

As no specific has yet been discovered for this disease (for it would be infamous quackery to say, that any such remedy is known for it) medical men, instead of going over again and again trials of the same means, should endeavour to discover, amidst the numerous new articles of medicine with which chemistry has of late years furnished them, some remedy for this complaint.

When there is cough, attended with dyspnœa and pain in the side, a small quantity of blood, *viz.* six or eight ounces, should be taken from the arm, and then the blood is usually covered with an inflammatory coat.

Climate has been supposed to be likely to influence the progress of this disease; but so far as I have been able to learn, it has no favourable effect. A lady consulted me, with a scirrhous tumour in her breast, which was removed: soon afterwards her husband's mercantile affairs obliged him to go to the island of Trinidad, and the wife accompanied him. She suffered greatly from sea-sickness in her voyage, and it might have been expected that this would have produced some change of action in the constitution. From the extreme warmth of the climate, some favourable change might Effects of climate.

have been expected to have arisen; yet, in a few months, the disease returned in the breast; and, finding that it was making considerable progress, she determined to return to England. I saw her soon after her return; but the change from a warm to a cold climate had produced no more favourable change than her visit to the warm temperature of Trinidad. The glands in the axilla were enlarged; the breast was ulcerated; her lungs had become affected; her body was emaciated; and it was evident she had but a short time to live. I also lately knew an English lady visit the south of Europe, when labouring under this disease, and there she died of it.

Vegetable diet.

It is supposed that a vegetable diet, and food affording little nourishment, is conducive to recovery. There is no greater mistake. Whatever weakens leads to an increase of the disease, and to a more rapid termination of the existence. Low living renders the person irritable, quickens the pulse, and makes the constitution feel the disease more strongly. Vegetable diet has not the least beneficial influence over this complaint. Wine and fermented liquors, given so as to produce a quicker pulse, or heat of skin, are equally improper, as a feverish state is equally pernicious with the nervous irritability which low living produces. In short, diet has no specific influence, and that which has agreed best with the patient at other times is the most appropriate under this disease. Meat once per diem, and weak wine and water, as a drink at dinner, agrees best. The other meals, morning and evening, to be as usual.

Local treatment.

The local treatment of the complaint consists in subduing inflammatory action; by perspiration, by wearing oiled silk; soap cerate, or a poultice of bread and poppy water; wearing a piece of fur upon the part, or a portion of hareskin, is found to tranquillize the disease.

Leeches.

As the pain is occasionally severe, and the disease seems to grow by occasional determinations of blood, it is right at these times to apply leeches; four or six of them may be used, but it is wrong to weaken the patient by their application; and therefore great numbers of them, or a frequent repetition of their application,

is wrong. When the pain is excessively severe, it is right to apply the extract of belladonna with the soap cerate.

Cerat. saponis ʒj.
Ext. belladonna ʒj.
Ol. lavendulæ gtt. v.
M.

If there be a disposition to suppurative inflammation in the tumour, it is right to use fomentations and poultices. Poultices.

When the part is ulcerated and is granulating, the bismuth ointment is a good application; as it also is to an appearance of erysipelatous inflammation on the surrounding skin. The unguentum zinci oxydi, under similar circumstances, may be of service. Chalk and opium I have seen applied with advantage.

When the sore is excessively painful, the following powder should be rubbed upon the parts twice in the day:

Pulv. cinchonæ ʒj.
—— opii ʒj.
Misce.

If the surface of the sore manifests a disposition to slough, it is right to use a carrot poultice, or the nitric acid lotion.

When the arm swells, as it does on the diseased side towards the close of the complaint, it is necessary to apply a roller from the hand to the axilla, and to keep the arm from the side, to allow of as much freedom as possible to circulation and absorption, which are impeded in the axilla, if the arm approximates the side.

OF THE OPERATION OF REMOVING A SCIRRHOUS TUBERCLE.

Before the patient be submitted to the operation of having the disease in the breast removed, she will naturally inquire what danger it produces to life, and what prospect it affords of preventing a return. To the first of these the surgeon may confidently answer, that the danger of the operation is very slight; for, in the immense number of cases in which I have performed it, I have Operation not dangerous.

lost but five patients: two of erysipelatous fever and inflammation; one from hydrothorax, which was found upon dissection to be connected with the exterior of the disease into the chest, affecting the lungs and pleura; one, a woman of great bulk, in whom the breast was very large; and one from great age.

To the second question the reply is made with more difficulty. A large proportion of cases return; but fewer than formerly, if the patient, immediately after recovering from the operation, undergoes an alterative course of medicine.

The only mode of relief.

It may be truly said, in the present state of our knowledge, the operation furnishes the only hope of preventing the disease from proving destructive, with the exception of very advanced age, in which it makes little inroad on the constitution, and little progress in the parts.

Although the patient may not ultimately survive, yet it may be said, that in cases in which the disease does return, the patient is generally preserved from a most painful and offensive state by the operation preventing ulceration.

On these accounts, I recommend the patient to submit to it. Hope is revived, and the only chance for life is given.

Parts to be removed.

If the nipple be drawn in, it should be removed with the tumour: if any cords or roots can be felt proceeding from it, they ought to be removed; and if the skin adheres to the tumour, or be in the least inflamed on its surface, it ought to be removed.

It is not sufficient to remove the tumour, but the gland from the nipple to the tumour must be removed; and the surrounding parts, to some extent, must be taken away: for the disease does not consist in the tubercle only, but there are roots proceeding from it into the lobes of the breast in its vicinity. It will be sometimes necessary to remove the whole breast, where much is apparently contaminated; for there is more generally diseased than is perceived, and it is best not to leave any small portions of it, as tubercles reappear in them.

Mode of operating.

The operation consists in making two semicircular incisions, nearly perpendicularly, which meet at their points; one on the

axillary side of the swelling, and the other on the sternal: the portion of skin over the disease should be removed. Each incision should reach the pectoralis muscle, which should be distinctly seen, and clearly exposed in the operation. As the arteries are divided, an assistant should apply his finger upon them, until the whole of the parts to be extirpated have been removed.

Removal of axillary glands.

If a gland in the axilla be enlarged, it should be removed, and with it all the intervening cellular substance, as the absorbent vessels between the swelling and the gland are contaminated; for it is wrong, after removing a swelling from the breast, to make a separate incision to extirpate a gland; but it should be an extension of the first incision from the tumour to the gland.

If several glands in the axilla be enlarged, their removal does not succeed in preventing the return of the disease; some being still seated beyond the reach of the knife. I once saw the axillary vein opened in the operation of removing several of these glands; the gush of blood was considerable, but it was evidently of the venous character; and a dossil of lint, placed in the axilla, stopped the hæmorrhage, and the bleeding did not return.

Vessels carefully secured.

So soon as the operation is performed, the divided vessels are to be secured. From faintness and sickness the bleeding stops; but, as soon as action and warmth return, the vessels again bleed. It is therefore necessary to put a ligature upon each artery, for nothing is more annoying to a patient, or alarming to her friends, than after-hæmorrhages: the wound is obliged to be opened; the patient becomes faint; the bleeding stops, and the vessels concealed in coagula are difficult to find. Much time, pain, fatigue, and alarm are saved the patient, by attention in securing the vessels at the conclusion of the operation.

Use of a suture.

In dressing the wound, put a suture through its centre, for it produces adaptation, and preserves it better than adhesive plaster. I used to object to a suture, but experience has shown me its utility. The emplastrum thuris compositum and emplastrum saponis p. æq. is the best which can be applied, being less apt to produce erysipelas than the common adhesive plaster.

If erysipelas arise in the surrounding skin, apply flour or starch to the surface.

Arm to be supported.

The arm should be supported in a sling. The ligatures may be drawn away in seven or eight days.

In those cases in which there is a general scirrhous inflammation of the breast, I never now perform the operation, because I never knew it succeed. In others, in which a number of tubercles form in the breast, the whole mamma must be removed.

After-treatment.

So soon as the patient has recovered from the operation, a medical alterative treatment should be pursued, to change the constitution, and prevent the disposition to a relapse into the former disease.

ON THE FUNGOUS OR MEDULLARY TUBERCLE.

Differs from scirrhous.

This disease differs in many respects from the scirrhous tubercle.

Occurs at all periods after puberty.

First, It occurs at all periods of life after the age of puberty, although still more frequently after thirty years of age than earlier. One of the worst cases I have seen of the complaint appeared at the age of twelve years, and destroyed life at sixteen. It began at the period of the evolution of the breast. It was removed by an operation when of large size: a small tubercle reappeared, and it was also subjected to operation; but the disease again grew, and destroyed life.

Difference of feel.

Secondly, this disease is not so hard as the true scirrhus, but has more the feeling of chronic inflammation at its early stages; and as it increases it becomes softer, yields to the impression of the finger, but immediately again fills as the pressure is removed. At this period the skin is of the natural colour, and it so continues whilst the tubercle is in its adhesive stage; but, after a few months, the skin becomes livid, and then a distinct fluctuation may be perceived from a fluid being found, which is contained in a cyst. The veins of the surrounding skin become extremely enlarged and varicose, and the surface assumes an inflammatory appearance, of a darker colour than common inflammation. The cyst next ulcerates; or, if opened, in either case, discharges a fluid, which has the character of bile, composed

of serum with red particles, somewhat changed in their colour: the fluid leaves a yellowish red stain upon paper, and readily coagulates, as serum does, by exposure to heat. The appearance of the fluid differs so entirely from that which is contained in the hydatid cyst, that any one acquainted with the two diseases readily distinguishes the one from the other by it.

After the cyst has been opened, a fungus sprouts forth, which occasionally bleeds profusely, but the bleeding is easily stopped by pressure; the discharge is excessive, wetting a handkerchief through in half an hour, and of a faint and most sickening odour; the edges become everted; a sloughing disposition manifests itself in some parts of the tumour, and occasionally in the whole of the swelling; and I have known the entire disease slough away. I remember, during my apprenticeship at this hospital (St Thomas's), Mr. Cline had a case in which the tumour sloughed away, and the wound healed, after which the woman was discharged from the hospital apparently cured; but I am not certain if the complaint did or did not return. In general, however, the profuse discharge, the repeated losses of blood, and the production of similar disease in other parts of the body, lead to the destruction of life. The patient falls a victim to this complaint much sooner than to the scirrhous tubercle, in the majority of cases dying in a few months from the first discovery of the disease.

Thirdly, This disease differs from the true scirrhus in being much less painful; in its earliest stages it is altogether free from pain; and I have known it acquire great magnitude with little diseased sensation: even in its most formidable state it is seldom very sensitive. Less painful.

Fourthly, The glands in the axilla are not generally inflamed in the same manner as in true scirrhus, by irritation or absorption; for I have known a person die of the disease, without the axillary glands being affected: but in some instances they do participate in the disease. The cervical and internal mammary glands are also rarely affected. Glands not affected.

Nipple not drawn in.

Fifthly, The nipple is not generally drawn in, nor is the skin puckered, having the appearance of cicatrix, as in true scirrhus.

Thus, this disease may be distinguished from scirrhus by a less circumscribed and more diffused inflammation; by less hardness; by the formation of a cyst; by the extreme varicose state of the veins; by the fungus which sprouts from it after ulceration; by profuse bleedings; by extensive sloughing; by less pain; by a quicker progress to destruction; by the absence of retraction of the nipple; by the want of puckering of the skin; and by the glands being less affected in the course of absorption.

Health at first unaffected.

The patient's constitution at first appears to suffer but little; but after a time, when the process of ulceration begins, she becomes sallow and emaciated; and from the frequent losses of blood has an extremely cadaverous appearance.

DISSECTION.

Adhesive stages.

The tumour, in its adhesive stage, appears lobulated like an adipose swelling; but the substance, which is effused by the inflammation, is more compact, and varies in colour; in some parts assuming the character of common adhesive matter, in others it is softer and

Cysts.

mixed with the red particles of blood. In its next stage it forms a cyst, which contains the fluid that I have described; and from its interior it is that the fungous growth proceeds, and this has the appearance, when cut through, of soft organized matter; in some parts extremely vascular, in others of the semblance of coagulated blood; other cysts are found containing bloody serum, and a semi-fluid mass, looking like putrid brain, or sometimes like cream tinged by the colouring particles of the blood.

Origin.

It adheres to tendinous structures more than others in its commencement; for example, to the aponeurosis of muscles, as that of the pectoral. I have seen tumours of this kind arise from the deltoid aponeurosis, from the sheath of the femoral vessels, and from the tunica sclerotica; but still the cellular structure, in each

part of the body, may become affected by it. In the dissection then of these cases we meet with the glands in the axilla sometimes slightly enlarged; and next, tumours, in various parts of the cellular tissue, in great numbers; the lungs I have seen loaded with them: the liver is generally tuberculated, and I have seen one kidney affected. The uterus has soft tumours on its surface, and sometimes a polypus growing from its interior, which has been called by that able accoucheur and excellent man, Mr. Clarke, the cauliflower excrescence, or polypus uteri. I have known almost every internal organ affected by it, even the brain itself.

CAUSE OF THE FUNGOID DISEASE.

Constitutional.

It is evident, in a disease which affects several different parts of the body, out of the line of absorption, that a constitutional cause must exist to produce it: yet it has also a local malignant action, so that a part shall become diseased whilst the surrounding parts still maintain their natural functions. Thus the disease is formed of a constitutional disposition to the complaint, with a local specific action. Upon removing these tumours, the surrounding surfaces generally heal rapidly, and without any malignant action being observed upon the wounded part. The incision, in removing these tumours, must, however, be extended into the healthy parts, at a considerable distance from the diseased; for if there be inflammation in the vicinity of the tumour, the malignant action will recur in it. I have known, in amputating a limb above the elbow, for this disease in the elbow joint, the skin inflamed between the elbow and shoulder, and the stump assumed the fungoid character. Carefully, therefore, avoid cutting near the diseased part, or the complaint will be certain to return.

Local specific action.

Predisposing causes.

The predisposition to this disease in the constitution is founded upon anxiety of mind, and on those circumstances which have a tendency to destroy the regular and natural functions of the body.

TREATMENT.

As the disease is founded in a constitutional change, and in specific local action, the objects in the treatment will be to correct the general health, and to destroy the local and specific action.

Alterative medicines.

The first is to be attempted by the alterative medicines already recommended, viz.

Pil. hyd. subm. comp.

and a bitter infusion with rhubarb and soda.

But we are at present entirely unacquainted with any constitutional means, or local application, which has influence over the disease when it has once been manifested.

Pressure.

Pressure has been used to produce a slough of the fungus, and it is proper to give it a trial; but it is acting only upon the effect, and will not prevent a fatal termination, as the cause will still remain. Aluminous applications are useful in preventing the growth of the fungus, and the sulphate of iron has a good effect in the same point of view; but I know of nothing which has a specific action upon the sore.

Its removal by operation.

It is therefore necessary to remove this disease by operation; and, upon the whole, it less frequently returns than the scirrhous tubercle, if care be taken to extend the operation properly into the sound parts.

The operation presents none of those difficulties which have been described; for it has been said that the vessels are large, and that they bleed so profusely as to occasion dangerous hæmorrhage. It is true, in the swelling they are large; but the arteries of the surrounding parts are but little augmented, and I have never seen any dangerous bleeding from their division. It is certain that the veins particularly, and the arteries of the part, if cut, bleed freely; but they ought not to be divided in the operation, which should be extended beyond its limits: they bleed not only from their size, but from the difference in their structure, having little contractile power.

After the operation, as in scirrhus, the constitution will require an alterative treatment, to prevent the disposition to returning disease.

OF THE SIMPLE CHRONIC TUMOUR OF THE BREAST.

This disease is not of a malignant nature, nor does it produce any dangerous consequences. It attacks the young and the apparently healthy, seldom beginning after the age of thirty years; and usually appearing from the age of puberty to that period.

Appearance of the swelling.

The character of this swelling is as follows:—it is very superficial, growing rather upon the surface of the breast than in its interior. At first it appears like one of the mammary lobes being enlarged; and then, as if several were combined in one swelling. As it increases, it becomes in some degree lost in the substance of the breast. It has not the hardness of the scirrhous tubercle, and it is not accompanied with the loss of health of the fungoid disease. It is an extremely moveable swelling. It is generally unaccompanied with pain, either in the part, or shoulder, or arm, although I have known exceptions to this rule. It grows very slowly and gradually, and does not generally acquire a great magnitude. I removed one which had existed five years, which was not larger than a walnut; and I have seen one which, after fifteen years, still remained but a small swelling.

Sometimes acquires a large size.

In a patient sent me to Guy's Hospital, by Mr. Lukyn, of Feversham, the swelling had grown to a great magnitude, but still felt as if composed of a simple enlargement of the different lobes of the mammary gland. I have also seen one case, in Guy's Hospital, in which the disease became excessively large, and it ulcerated and destroyed life. They will be sometimes painful at the period of menstruation: there is nothing malignant in their nature, and I have never known them change their action into the scirrhous or fungous disease, although, under changes of the constitution, such an event would be possible. The absorbent glands in the axilla are unaffected.

Diagnosis. The diagnosis of this disease consists in the youth of the patient; in the absence from pain; in the appearance of general health; in the slow growth of the swelling; in its superficial situation at first; in its extreme mobility; in its feel being that of the lobes of the breast enlarged, and therefore it is a conglomerate tumour; the glands in the axilla being free from disease.

Dissection of the tumour. Upon dissection, the swelling is found to be composed of a number of lobes connected together by a condensed cellular tissue, and which appear as enlargements of the lobes of the mammary gland. These lobes are composed of smaller, which, by maceration, may be separated. The appearance of the disease, when cut into, is that of sweet-bread, that is, lobulated in every part, or composed of large lobes, which are divisible into smaller.

Cause. The cause of the disease is unknown. I have heard it frequently attributed, by the patient, to the pressure of the bones in her stays, or that of some part of her dress.

Treatment. In the treatment of this disease, little is effected by medicine. I generally order the emplast: ammon: c. hydrargyro to be applied to the part, and give hydrarg: c. cretâ with soda and rhubarb, but the disease rarely disappears. The great gratification which the patient receives in this case, is from the assurance that the complaint is not of a malignant nature.

Removal by operation. If the disease increases, in spite of an alterative treatment, and the patient becomes anxious for its removal, there is very trifling risk from the operation, for I have frequently performed it at my own house, and the patients have returned home immediately afterwards. When, however, these swellings grow to a very large size, the vessels supplying them become extremely increased; and I remember seeing one removed from the left side, in which case the vessel that supplied the tumour was so large as to afford a gush of blood, which alarmed the surgeon, from the idea of there being some communication between the tumour and the interior of the chest. When they are small, as they usually remain, it is right to secure each vessel which continues to bleed, however slightly, or the wound will be obliged to be re-opened to secure it.

OF THE ADIPOSE TUMOUR.

In the breast a fatty swelling is sometimes formed. A Mrs. Smith, of Great Yarmouth, applied to me, with an enormous tumour in her bosom. As her general health was good, I advised its removal. It weighed fourteen pounds and ten ounces: the gland of the breast was placed before it. The preparation is in the Museum at St. Thomas's Hospital, and she recovered very quickly. The incision for its removal was thirty-two inches in circumference.

OF THE IRRITABLE TUMOUR.

Occurring in young persons

This disease generally occurs in young women from the age of fifteen to thirty; the swelling never acquires magnitude, and is distinguished from those which I have described by the following circumstances:

Diagnosis.

A lobe of the breast is slightly swollen; it is extremely tender to the touch, and, if handled, the pain sometimes continues for several hours. The uneasiness is not seated in the swelling only, but extends to the shoulder and axilla, down the arm to the elbow, and frequently to the wrist and fingers. It is very much increased prior to menstruation, is somewhat relieved during the period, and decreases after its cessation. The pain is sometimes so severe as to destroy rest; and even the weight of the breast in bed is sometimes intolerably painful.

Produces vomiting.

When the pain is most severe, the stomach sympathizes, and vomiting is produced. The skin is undiscoloured, and there is no external mark of inflammation. Sometimes only a small portion of the breast is affected; at others, the greater part of the bosom; and I have known it affect the breast on each side.

The constitution is highly irritable and sensitive, the hair of the patient is usually light, the complexion extremely delicate, and the temperament sanguineous.

Continues for a long period.

I have often known this disease continue for many months, sometimes for years; and once during twelve years.

Not malignant

It has not a malignant tendency, does not therefore produce any dangerous effect, and not only does not require an operation, but such a measure would be quite unjustifiable.

Very frequently this disease is accompanied with amenorrhœa, or with great paucity of menstruation, paleness of its colour, and frequently it is attended with profuse fluor albus.

Cause.

Its causes are irritability of constitution, generally a defect of uterine secretion, and often its immediate exciting cause is a blow.

Local treatment.

In the treatment, local irritability is to be diminished by the application of the belladonna in extract, or opium mixed with the ceratum cetacei; the extractum conii; or the recent conium in a poultice is beneficial. A plaster of soap cerate, to produce perspiration, or the application of hare skin, or some other fur, or the oiled silk applied with the same view, are found to be useful.

Leeches.

Leeches are sometimes employed when the pain is excessive, and the vessels of the breast are unusually full. If too frequently used, they produce debility, and add to the irritability of the system.

Constitutional treatment.

The constitutional treatment consists in diminishing constitutional irritability, by restoring defective secretion, in giving tone to the system, and in acting particularly on the uterine secretion.

Medicines.

The usual medicines are small doses of calomel and opium, combined with a mild aperient, but those which best agree are the mistura myrrhæ c. ferro, or the ferrum ammoniatum; under the continued use of which the disease gradually disappears. Rhubarb and soda, or these combined with columba, I have also seen very useful.

Conium, combined with rhubarb, I have known beneficial.

OF THE OSSIFIC TUMOUR OF THE BREAST.

Case.

The following is a case of this disease:—Mary Farmer, aged thirty-two, had a swelling in the breast for fourteen years, which had been painful during the latter seven.

The pain was very severe; the skin over it felt hot, and required

the constant application of evaporating lotions to keep it cool. The tumour was excessively hard, and very painful before menstruation, but greatly relieved after it.

Various applications, as poultices, fomentations, stimulating plasters, did not dispose it to suppurate; in short, all the means employed proved useless. When she consulted me, I thought, from the state of the health, the mobility of the tumour, and its peculiar feel, that it was not cancerous; but still I recommended its removal, to which she consented.

Upon examination of the swelling, after the operation, it was found to be composed in part of cartilage and in part of bone, the greater part of the former being ossified. Dissection.

OF THE LACTEAL TUMOUR.

Some time after delivery, a woman applies to a surgeon with a fluctuating tumour in the breast, of very considerable size, attended with painful distention, but without discolouration. The veins of the breast are very large. A lancet being put into the swelling, milk is discharged in large quantity, sometimes to the extent of several ounces; which, after it has stood for some time, separates a cream upon its surface. Symptoms.

The cause of this complaint is the obstruction of one of the lactiferous tubes near the nipple, or in it. Cause.

Its treatment consists in leaving the opening made by the lancet to discharge the milk which that part of the breast secretes. The swelling then gradually subsides as the milk in the breast disappears. Treatment.

I, in one case, saw great inflammation follow the opening; but still it is the only means of relief, unless when the opening be made the child be weaned, and the secretion of milk be arrested, and then the continuance of the opening will be unnecessary.

BREASTS LARGE AND PENDULOUS.

These glands sometimes grow to an enormous magnitude, about

the age of twenty years, so as to hang down upon the abdomen, not from relaxation but from real increase. I saw a case of this kind in a young woman, aged twenty-three, which began three years prior to my seeing her; tender to the touch, of a dark red colour. She was often costive, but regular in her menstruation.

Dr. Babington and myself witnessed the following case:

Case. Miss L., aged seventeen years, of a light complexion and delicate constitution, who is naturally costive, has a remarkable enlargement of her breast. The left is twenty inches from its junction with the chest above to its lower part, and its circumference measures twenty-three inches. The nipple is flattened, the areola excessively expanded.

The breast feels as if every lobe of the mammary gland was increased to several times its usual magnitude.

Treatment. The treatment consists in supporting the breasts in a suspensory bandage, in which each breast is received, and this is fixed over the shoulders.

The medicine best calculated to be useful is hyd: c. cretâ with rhubarb and soda.

THE MILK ABSCESS.

Treatment. This abscess requires the same general treatment in its adhesive, suppurative, and ulcerative stages, as we have recommended for abscesses of other parts. In general I leave them to break spontaneously; but there are two exceptions to this.

First, When the constitution and patient are suffering severely and the abscess is slow to break, it is right to assist nature with the lancet.

Formation of sinuses. And, secondly, when the abscess forms at the back of the breast very deeply, the aid of an artificial opening is required.

When they ulcerate, sinuses, difficult to heal, are sometimes produced; and the best treatment is to inject them with a solution of zinc, or a dilute sulphuric acid, and to apply it constantly over the breast by linen.

ON THE AREOLAR, OR MAMMILLARY TUMOUR.

Age at which it occurs.

At the age of seven years, and from that period until puberty, children are not unfrequently subject to the swelling behind the nipple, or mammilla of the breast. This swelling occupies a circle of an inch or more, involving the posterior part of the nipple.

Symptoms.

The child, feeling uneasiness in the part, is led to examine it with attention, and then finds a swelling, which is generally tender to the touch, and is sometimes, though not commonly, acutely sensitive. The skin over it is undiscoloured; it moves freely upon the pectoral muscle; but the nipple moves with it. I have seen it frequently both in boys and girls; but I think more frequently in the male than in the female. It generally affects only one breast; but sometimes, though rarely, it exists in both. It does not appear to accompany a scrofulous disposition, but is found in irritable young persons. The age at which it has most frequently presented itself to my observation, has been from eight to twelve years.

Within this period, then, a surgeon will be sometimes called upon to remedy a hard circular sensitive tumour behind the nipple and areola. Its cause I shall presently proceed to explain, when existing at this period of life.

Not productive of serious mischief.

I have never seen it productive of any serious disease. Sometimes, however, it endures for several months, if attention be not paid to the means for its removal.

Treatment.

The best mode of treatment consists in the application of the emplastrum ammoniaci cum hydrargyro, and in giving small doses either of the hydrargyrus cum cretâ, with rhubarb or of the oxymurias hydrargyri, with bark or sarsaparilla; under the influence of which remedies, it generally becomes gradually absorbed in the space of from two to three months. It sometimes yields to evaporating lotions.

Disease in the adult.

The same part which is affected posterior to the nipple, in earlier periods of life, becomes the seat of more serious disease in after

age. For the structure, which I am presently to describe, is liable, particularly in the male, to be affected with the two malignant diseases to which the body is subject, namely, to the scirrhous affection, or to the fungous.

OF THE SCIRRHUS OF THE MAMMILLA.

Symptoms.

This disease begins with a circular swelling at the root of the nipple. It is at first free from pain, but is excessively hard, and is somewhat irregular upon its surface. It gradually increases in size, and during its growth a shooting, darting, and occasionally a lancinating pain strikes through the swelling, and to the shoulder, in the course of the mammary nerves.

Ulceration.

A slight ulceration next supervenes upon the surface of the nipple, which is succeeded by a yellowish brown incrustation. When the first incrustation is separated, it is succeeded by another, and a deeper ulceration ensues, by which process the nipple of the breast is gradually removed, and the scirrhous substance is exposed. Whilst the ulceration is proceeding in the centre, the scirrhus increases in circumference, until it occupies a considerable circle round the nipple, and as the bulk of the disease augments, the pain with which it is accompanied is likewise aggravated; yet the diseased part is only in a slight degree tender to the touch, and the patient is often seen to handle it in an unfeeling manner.

Bleeding.

The discharge from it, which had previously formed an incrustation, now increases, and becomes fluid, and the sore frequently bleeds.

Glands affected.

The glands in the axilla become enlarged and hardened, after a long continuance of the complaint. The patient's lungs become diseased, and water is effused into the cavity of the chest. I have seen several males and one or two females die of this complaint; and I have given a view of the appearance which the swelling assumes on dissection.

Removal necessary.

As this disease is beyond the control of medicine, for none that I

have ever known recommended, or seen employed, seems to have the least influence in preventing its destructive effect, its removal must necessarily be effected either by the knife, or by the application of arsenic. The former mode is vastly preferable to the latter; it is upon the whole less painful in the execution, and it is of more certain efficacy in completely removing the disease. Arsenic, on the contrary, often but partially removes the complaint: and the irritation which it excites extends the disease to the neighbouring absorbent glands. The absorption of the mineral, also, sometimes produces serious effects upon the constitution. When the disease is clearly and completely removed by the knife, the edges of the wound are brought together, and they readily unite by adhesion.

Treatment if an operation cannot be performed.

If the disease has been neglected, if extensive ulceration has ensued, and the complaint has proceeded beyond the relief which is to be derived from surgical operation, the applications which I have seen most advantageous in tranquillizing the sore, and improving its appearance, have been chalk and opium, in the proportion of an ounce of the former to a drachm of the latter; oxyde of zinc and opium in the same proportions; or oxide of bismuth with opium. These means, however, only retard the progress of the disease, rendering the descent to the grave a little more easy and a little less rapid, but they do not prevent the fatal termination of the complaint.

OF THE FUNGOUS TUMOUR OF THE MAMMILLA.

Symptoms.

Of the fungous tumour of this part I have seen three different instances, each of which existed in the male, and each was removed.

The tumours began behind the nipple, which adhered firmly to their surfaces. They were globular, and did not possess the hardness of true scirrhus, but felt at first more like simple chronic tumours, and grew less firm as they increased. They were but slightly tender when pressed, and entirely free from pain. They neither of them had ulcerated. After they had existed for several months they began to increase rapidly, and this circumstance excited

alarm in the minds of the patients, so as to lead them to make application for surgical assistance. The medicines which I advised, and the applications which I proposed, appearing to have no influence in preventing the progress of the disease, I recommended extirpation. Two of the patients recovered without any returning disease; the third, after a few months, sunk under what was believed to be hepatic disorder.

More spongy than scirrhous.

I have given a plate of the appearance of one of these tumours; it is much more spongy than the true scirrhus. The vessels which it possesses are more numerous, and their diameters larger, more especially of the veins. It not only adheres to the nipple, but it proceeds from its basis. The vessels which supply it are of considerable size, and require to be carefully secured to prevent after-hæmorrhage. In neither of the cases had it contracted adhesion to the pectoral muscle; and there was therefore no difficulty in detaching it from the surrounding parts.

ON THE SEAT OF THESE DISEASES.

Having thus described the diseases which are placed at the basis of the nipple, I shall now proceed to point out the structure in which these complaints begin; and which the plates connected with the work will very clearly explain.

Discharge of fluid from the nipple of the infant.

A child born at the full period of gestation, whether it be male or female, is found to have, issuing from its nipple, a fluid of milky appearance, which, when alcohol is poured upon it, deposits a solid, which has the appearance of coagulated albumen. This fluid the nurses are in the habit of pressing out; as they pretend that it is liable to excite inflammation if suffered to remain. Whether this be the case or not, or whether the inflammation which sometimes ensues be the result of pressure and friction which the nurses employ, I am not able to state; but inflammation does sometimes ensue, and requires fomentation for its relief.

Structure of the part.

Thirty-two years ago I first learned there was such a discharge from the nipple; and was led to examine whence it proceeded;

when, upon making a section through the middle of the nipple towards the ribs, I found a circular glandular structure, larger than a large pea, and situated directly behind the nipple. It is of a red colour, from its extreme vascularity. It contains ducts which open at the nipple; and from these may be pressed, first a milky fluid, afterwards a sebaceous matter. The nipple over it is situated in a depression, and appears red and granular in many subjects. The artery which supplies the gland is derived from the axillary; and the branches derived from, and distributed to the gland are numerous. Veins return the blood in the course of the arteries; and filaments of nerves from the axillary plexus are distributed to it.

Mode of exhibiting it.

All that is necessary to do, in order to observe this structure, is to make an incision through the centre of the nipple. In the fœtal state, between the seventh and the ninth month, this glandular substance is found, but of smaller size. At the end of the first year, it is still large and continues so during the second and the third year; and thenceforward it seems to lessen in both male and female until the seventh and eighth year. It is most conspicuous in fat subjects, as it is kept extended from the nipple by the adipose substance.

Evolution of the nipple.

About the eighth year it begins to increase, but it varies as to time in different persons; and as it grows towards the age of puberty the nipple becomes evolved from it. In the female, at the age of puberty two tumescences will appear; the one a small sphere directly surrounding the nipple; which then rather sinks into this little swelling; and the other a larger sphere which is composed of the mammary gland, or gland of the breast. Thus there is a mammillary and a mammary growth; a mammillary producing the nipple, which is gradually evolved as the breast increases; a mammary which is composed of the lacteal gland, the lactiferous tubes of which proceed through the mammillary process. In the male, the mammillary gland forms the nipple; but instead of tubes proceeding through it, ligamentous cords are seen radiating from the point of the nipple through the mammillary substance. These ligamentous cords terminate in a compact cellular texture at the

basis of the nipple; and the cells thus produced become loaded with adeps, so as to sustain and preserve the projection of the nipple.

If, then, a section be made of the nipple of the male in the adult subject through its centre, radiated ligamentous cords are found in its substance, and a strong network containing fat at its basis. In the plate this will be well seen in a section of the nipple of Coombs, lately executed for murder, whom I selected on account of his age, and because he was a healthy person. I made a section through the nipple, and then threw it into warm water to melt out the fat which it contained, and thus unloaded the strong network of cellular tissue at its basis.

The evolution of the nipple is as follows:

In both male and female infants a gland exists which is the nidus of the future nipple, over which the skin is puckered into a small projection. This glandular substance lies concealed under the skin until near the age of puberty, and then it gradually evolves, and becomes everted into the nipple of the adult. In the male, the tubes through which the milk of the infant passes become ligamentous cords in the nipple of the adult, and in the female, the similar tubes become the lactiferous ducts of the nipple. Thus it is that the nidus of the adult nipple is protected until the age of puberty.

Disease seated in this structure.

It is this structure, then, of the male and female nipple, prior to the age of puberty, at the time when evolution of the nipple is commencing,—which produces the swelling to which young people are subject, from the age of eight years to the period of puberty; for, when the action is greater than the evolution requires, a hard inflammatory swelling is produced.

It is in this structure that in future years the malignant areola or mammillary tumour forms. Here the scirrhous tubercle commences, which destroys the nipple, and ultimately extinguishes the life of the patient. It is in this structure that the fungous swelling which the plate exhibits is formed; and both of these are from the male. The female is less subject to the disease, because the mammillary substance is principally absorbed, and lactiferous tubes are formed in its stead.

LECTURE XXX.

ON URINARY CALCULI.

URINARY calculi are found in the kidney, in the ureter, in the bladder, and in the urethra. Where seated.

The calculi which are met with in the prostate gland, are not urinary; they are formed in the ducts of that gland, into which the urine does not gain access, and they generally differ from urinary calculi in their composition. Calculi in the prostate, not urinary.

OF THE RENAL, OR KIDNEY CALCULUS.

The symptoms by which the presence of a calculus in this organ is known are, 1st, pain in the loin, in the situation of the kidney, which pain extends forwards towards the navel, accompanied with a sense of numbness in the bowels, and downwards to the spinous process of the ilium. The pain is of an obtuse kind, it often produces a sympathetic effect on the stomach, and occasions vomiting. The loin is so tender, that the least pressure on it occasions great suffering to the patient. The act of stooping, when a stone exists in the kidney, produces acute pain in the loins, and is sometimes followed by a discharge of bloody urine. Symptoms. Pain in the loins, abdomen and hip.

I knew a gentleman, who, in stooping on his horse to open a gate, felt severe pain in the loins; he immediately discharged bloody urine, and afterwards felt the symptoms (hereafter to be described) of a stone passing from the kidney by the ureter. He voided this stone by the urethra, four days subsequent to the first attack of pain in the loins. Case.

The presence of a stone in the kidney is sometimes manifested by extreme irritability of the bladder.

A chemist, in the city, had frequently consulted me (when I lived there) for an irritable state of his bladder and urethra, for which I had recommended various medicines, and bougies had been Case.

passed; but he did not experience any relief from their employment. After I left the city, I was informed that he was dead; and upon inspection of his body, no disease of the bladder or urethra was found, but a large stone was discovered in the kidney.

Sometimes removed by ulceration.

Nature sometimes succeeds in removing these extraneous bodies by a process of ulceration; an opening being formed in the loins, through which a stone can be felt, by passing a probe, and by which the calculus is ultimately discharged.

Case.

A person came to consult me from the country, with two openings, one above and one below the last rib, through which three calculi had been discharged. Dr. Marcet analyzed these, and found them to be composed of the ammoniaco-magnesian phosphate.

Opening to be dilated.

If the calculus cannot readily pass, from the small size of the opening, the aperture should be dilated by sponge tent; if this fails, a bistory may be carefully used, as the artery and vein are before the stone.

A stone in the kidney, when very large, may, in some instances, be felt through the loins. Mr. Cline informed me, that a patient consulted him who had this disease, in whom he could distinctly feel the stone, by pressing firmly on the loins; the patient's general health would not at that time bear an operation, otherwise Mr. Cline would have removed the stone by incision.

Upon dissection of persons dying with calculi in the kidney, there are found—

First, Sometimes numerous small calculi, like grains of sand, in the tubuli uriniferi.

Secondly, A stone lodged in an infundibulum, or often several, occupying different infundibula.

Thirdly, A large stone in the pelvis of the kidney, connected by processes to others, seated in the infundibula.

Kidney enlarged.

The kidney is sometimes scarcely altered in its size, at others it becomes considerably enlarged. If the stone interrupts the passage of the urine to the ureter, the glandular structure of the kidney becomes absorbed, the pelvis and infundibula extremely enlarged,

and these membranous bags, with the capsule of the kidney only remain.

Sometimes ulceration of the kidney is produced; it enlarges, then wastes, and gradually becomes in a great degree absorbed; matter is discharged with the urine; high constitutional irritation succeeds, and if both kidneys be affected, the life of the patient is destroyed. Ulcerates.

TREATMENT.

The medical treatment of stone in the kidney consists in giving the liquor potassæ; the carbonate of potash, or soda; not that they dissolve the stone, but they prevent the formation of uric acid; the stone becomes encrusted with triple phosphate, which is a softer substance, and, perhaps, less irritating to the surfaces on which it rests; these medicines also deaden the sensibility of the organ itself. If much pain be felt in the loin, the daily exhibition of a purgative, occasional cupping, or the application of a blister to the loins, will be useful. If there be a suppurative discharge, an issue should be made in the lumbar region. Medical treatment. Local treatment.

OF STONE IN THE URETER.

The presence of a calculus in this tube is shown by pain being felt near the spinous process of the ilium, and in the direction of the psoas muscle, if pressure be made upon it through the abdominal muscles; the pain extends in the course of the anterior crural nerve, as the stone descends over the lumbar nerves which form it; also to the testicle, as the stone passes the spermatic plexus; and spasmodic contractions of the cremastic muscle occur, as it passes under the spermatic vessels. The patient is sick, often vomits, is covered with a cold perspiration, and is unusually pallid. Symptoms.

The pain is sometimes so severe, that a gentleman, who had several times suffered from this disease, informed me, that once, Case.

when a quarter of a mile from his house, he was seized with this pain, and fell on the ground, being unable to walk until his servants came to his assistance, and carried him home.

Pain not constant.

The pain has remissions, and the patient is flattered with the hope of the stone having passed the ureter; but, after a few minutes, it returns with equal violence, and it is only after repeated attacks that it escapes into the bladder.

Calculi in the ureter I have known destroy life in the following instances:

Case.

Mr. Cline had removed a stone from a boy in St. Thomas's Hospital, by the operation of lithotomy; the boy had recovered from the operation, when he was seized with rigors, great pain in the course of the ureter, and vomiting; a swelling formed just above the seat of the cœcum, in the right iliac region, which gradually increased, and the boy's constitution quickly gave way. On examination after his death, the pelvis of the kidney and the ureter were found distended with matter; and at the end of the ureter, near the bladder, a stone was discovered, which had prevented the escape of the urine, and of matter, into the bladder, and thus occasioned death. The preparation of the diseased parts is in the Museum at St. Thomas's Hospital.

Case.

Mr. Hallam, of Walworth, gave me a preparation of a stone, stopped in the ureter, which was taken from a patient of his, who had for a length of time discharged matter from the colon per anum; nature had formed an opening for the escape of the urine and pus, in this case, first by producing adhesion between the ureter and colon, and then by making a communication between the two by a subsequent ulcerative process.

Case.

We have another curious preparation of a stone in the ureter, surrounded by an abscess, taken from a patient who came to my house for advice. She had great pain in her loins, and tenderness in her abdomen, with so much fever as led me to suppose that she had but little time to live; I advised her to apply to a Mr. Smart, a surgeon, in my neighbourhood in the city, who sent to inform me, a few days after, that she was dead, and that he had permission to

inspect the body. Upon making an incision into the abdomen, there issued a strong urinous smell, and a watery fluid, mixed with matter. The intestines were inflamed and adherent; the bladder was small; one kidney was much enlarged, and the other unaltered; the ureter of the enlarged kidney was greatly increased in size, and full of matter, it was completely closed at the lower part by a calculus, and had given way above, so as to allow of the escape of the urine and matter into the abdomen.

A calculus may be discharged from the ureter, by ulceration, through the muscles of the abdomen.

Mr. Stone, of Mayfield, Sussex, gave me a calculus, which was discharged from a man who worked as a gardener. An abscess formed near the anterior superior spinous process of the ilium, from which this calculus and a quantity of matter were discharged. The man recovered. Case.

TREATMENT.

If the pain is very severe during the passage of the stone, the patient should be bled largely, to produce relaxation of the ureter, that it may yield to the pressure of the stone, and urine, and he should be put into the warm bath, to aid such relaxation. Opium, and the liquor potassæ should be given, to allay irritability; and the abdomen should be fomented, and gently rubbed from above downwards, in the course of the ureter, in order to assist mechanically the passage of the calculus. Bleeding. Warm bath. Medicine.

OF STONE IN THE BLADDER.

The symptoms change as soon as the stone quits the ureter and enters the bladder; the patient is relieved from the pain in the course of the ureter, in the testis, and thigh, but suffers usually in the following manner: Symptoms.

First, He experiences acute pain, particularly opposite to the frænum, but also along the course of the urethra; this varies in its Pain in the urethra and at the frænum.

degree, more according to the irritability of the patient, than the form or roughness of the calculus; the pain is sometimes slight, but generally severe, and is described by the patient as a cutting sensation; or, sometimes, as if boiling water or lead were passing through the urethra. Relief is experienced by pressing on the glans penis, and adult persons do so; children nip and draw the prepuce until the latter becomes excessively elongated; they also, under severe suffering, after passing urine, cross their legs, and press upon the organs of generation with great force.

The adult, when voiding his urine, often rests his head against the wall, bends his knees, and relaxes the muscles generally.

Pain after the discharge of urine.

The pain is felt more after discharging the urine, when the bladder contracts around the stone, than before it is voided.

Frequently the fæces pass at the same time with the urine, and a prolapsus ani is a common consequence of the excessive action of the muscles of the perineum and lower opening of the pelvis, more especially in children. I have seen the abdominal muscles thrown into the most violent spasmodic actions for some time after the discharge of the urine, in some of the worst cases of stone.

Bladder irritable.

The bladder is very irritable, is capable of retaining but little urine, and becomes diminished in size.

Sudden stop to the flow of urine.

Often, as the urine is discharging, a sudden stop to its flow is produced with violent pain, from the stone falling on the beginning of the urethra and acting as a valve; as the force of the bladder's contraction lessens, the stone recedes a little, and the urine again escapes. Patients, therefore, pass their urine best in a recumbent posture, as the stone does not then fall upon the neck of the bladder.

At first no change is produced in the appearance of the urine, which can direct the judgment; but when the disease has existed for some time, and more especially from violent exercise on horseback, or in a rough carriage, the urine becomes bloody. A person having a stone in the bladder cannot ride far on horseback, without dismounting to pass his urine; and is obliged to quit a carriage often for the same reason.

Urine becomes bloody.

Discharge of mucus.

As the disease increases, the bladder becomes more irritable,

the urine is loaded with mucus, and sometimes precipitates a white sediment, composed of flakes of adhesive matter, thrown out by the mucous membrane of the bladder, when it has become inflamed. This state is often attended with rigors, succeeded by heat, and other symptoms of intermittent fever, and matter is sometimes discharged with the urine. The mucous membrane of the bladder becomes ulcerated when a stone has existed long; the patient loses his health; is incapable of getting sufficient rest; and thus he is destroyed by the disease.

Mucous membrane ulcerates.

A person labouring under this complaint walks with excessive care; he does not raise his feet much from the ground, to prevent any shock to the body, which would create pain, and occasion spasmodic action of the bladder; he also lies down with great caution, as the sudden change of posture might alter the position of the stone, and produce irritation.

DISSECTION.

In examining persons who die with a stone in the bladder, the mucous membrane appears loaded with blood, it is thickened, and highly villous. Its muscular coat is much increased, and the capacity of the bladder lessened. Numerous sacculi are sometimes formed, the mucous membrane being forced between some of the muscular fibres, and, in these bags, stones are wholly or partially received. We have a preparation in the Museum showing this state of the bladder, with stones lodged in these sacculi.

Mucous coat.

Muscular coat.

Sacculi.

I have seen ulceration of the mucous membrane, and we have an example of stones ulcerating the basis of the prostate, and making their way into the urethra.

Ulceration of the mucous coat.

We have also another very curious specimen, in which the upper part of the bladder had contracted around the stone, whilst the lower part is in the natural state.

Bladder contracted in part.

A stone is often found with an enlarged state of the prostate

gland; and in some cases is met with in a bag, formed directly behind the prostate.

Hour-glass contraction.

We have a preparation showing an hour-glass contraction of the bladder, in which one large stone is lodged in the superior part, and several in the inferior; and another, exhibiting a stone in the bladder, with a large fungus growing from the prostate gland.

Ureters.

The ureters are dilated, the kidneys enlarged; sometimes one is enlarged and the other wasted from an ulcerative process.

Size of calculi.

The size of calculi generally varies from a drachm to two ounces; but the weight is not always proportioned to the size, but depends upon the composition of the stone.

The largest stone, which I have successfully extracted, weighed near six ounces. At the Norfolk and Norwich Hospital there is one eight ounces. Mr. Mayo, of Winchester, removed one, in fractured portions, of fifteen ounces. I have one in my possession which I extracted, but not successfully, weighing sixteen ounces. We have a model of a stone, given to the collection by Mr. Forster, which, I understand, was twenty-five ounces in weight. One in Trinity College library, at Cambridge, weighs thirty-two ounces and seven drachms. But the largest stone which has been found in the human body is that given to the College of Surgeons by Sir James Earle, this weighed forty-four ounces.

Pain not more severe from a large stone.

The severity of the symptoms is often in an inverse ratio to the size of the stone; which, when it is very large, produces less pain, because the urine dribbles away, or is voided by very slight contraction of the bladder.

Number of calculi.

The number of calculi is very various; but in the majority of cases only one is found; two or more not unfrequently exist. I have extracted nine in one case, thirty-seven in another, and the greatest number I ever extracted in the operation was one hundred and forty-two; these were from Mr. Allis, of Worcester, a patient of Mr. Carden; I have them now in my possession, many of them are about the size of marbles.

A great number of stones does not add much to the patient's

danger in the operation; for it is not the frequent introduction of the forceps into the bladder, but the violence which is used in extracting the stone or stones which produces mischief; thus the removal of one large stone is more to be dreaded than that of many small.

Removal of a number of stones not dangerous.

When more than one calculus exists, the first extracted is found smooth, and often hollowed by the friction of the others; so ttha the form of the first shows the existence of a second or more.

Stones rounded or hollowed, when more than one.

The form of stone varies extremely; but when there is only one, it is generally oblong; when more than one, they are usually rounded and smooth: and when very large, they assume the form of the bladder.

Form of stones.

The surface of stones is sometimes smooth, as the uric acid calculus; a little irregular when composed of triple phosphate; and very rough if formed of the oxalate of lime: this latter is called the mulberry calculus. But the severity of the symptoms does not always depend on the irregularity of the surface of the stone, but on the irritability of the bladder.

Surface of stones.

Calculi are generally composed of concentric lamellæ, formed upon a centre, called the nucleus. The colour of the different layers varies considerably, and the materials of which they are composed are of very different nature: some calculi are brown, some are white.

Composed of lamellæ.

The nucleus, or centre, is often some extraneous body introduced into the bladder, as a portion of coagulated blood, a piece of bougie, or catheter.

Nuclei.

In the collection at St. Thomas's Hospital are preparations exhibiting various foreign bodies, as forming the nuclei to stones; as a portion of slate pencil; a needle, which had traversed a part of the body previous to its entering the bladder; also a piece of tobacco pipe, which had been introduced into the urethra by the patient, to relieve some impediment to the passage of the urine, it broke and passed into his bladder, and was extracted some time afterwards by Mr. Godwin, surgeon, at Derby, with a stone formed around it. Sometimes a small stone of uric acid forms in the kidney, and

descending by the ureter into the bladder, it there acquires an increase from the formation of a calculous deposit on it, of a different nature.

COMPOSITION OF URINARY CALCULI.

My friend, Dr. Dowler, who has paid much attention to the analysis of these calculi, has favoured me with the following account:

Urinary calculi of the human body may be comprehended under the following species.

1. Lithic acid, or uric acid calculus.
2. Lithate of ammonia.
3. Phosphate of lime, or bone earth.
4. Triple phosphate, or phosphate of magnesia and ammonia.
5. Oxalate of lime, or mulberry calculus.
6. Cystic oxide.

Besides these, other substances have been mentioned as forming distinct species of calculi, such as xanthic acid, carbonate of lime, and the fibrinous calculi; but they are of extremely rare occurrence.

The above calculi present the following chemical characters.

1.* Lithic acid calculus. Before the blowpipe it blackens and emits a peculiar smell, somewhat resembling that of burnt feathers; it is soluble in the caustic fixed alkaline solutions by the assistance of heat, and is again precipitated from these by the addition of an acid. The nitric acid dissolves and decomposes it with effervescence; if the solution be evaporated to dryness, a new acid, called the purpuric, and ammonia are formed; these, uniting, produce a purpurate of ammonia, which is of a pink colour, and soluble in water.

2. Lithate of ammonia. By the addition of a caustic fixed alkali, ammonia will be disengaged. The lithic acid may be shown by

* I have omitted every character which is not essential to the particular species.—D.

treatment with nitric acid, as in the former instance. When mixed with triple phosphate, its presence is ascertained with difficulty. It is more soluble in water than the lithic acid calculus, and is of a clay colour; but its characters have not as yet been sufficiently investigated.

3. Phosphate of lime. Before the blowpipe, it first blackens, then becomes white, and afterwards resists the action of heat. If, after being heated in order to decompose the contained animal matter, it be dissolved in very dilute nitric acid, the subsequent addition of nitrate of silver will produce a yellow precipitate, which is a phosphate of silver, and of course indicates the presence of phosphoric acid. The lime may be detected by adding oxalate of ammonia to the above nitric solution.

4. Triple phosphate. Before the blowpipe, it emits an ammoniacal smell, becomes reduced in size, and at length melts with difficulty. The caustic fixed alkalies disengage ammonia. It is very soluble in dilute acids, and the subsequent addition of ammonia causes it to be precipitated in a crytalline form.

5. Oxalate of lime. When heated by the blowpipe it swells, its oxalic acid is decomposed, and the lime is left in the caustic state. When digested with carbonate of potash, a double decomposition follows; and the oxalate of potash, thus formed, presents its peculiar characters, which are indicative of the presence of oxalic acid.

6. Cystic oxide. This calculus may be readily distinguished by its external appearance. Before the blowpipe it emits a peculiar and fœtid odour. It is soluble in a solution of the neutral carbonates of soda and potash; also in those of the caustic alkalies, and most of the acids. Its solution in nitric acid is precipitated by alcohol.

The Xanthic oxide, of which only one specimen has as yet been observed, was so named by Dr. Marcet, from the circumstance of its producing a peculiar yellow compound with nitric acid.

Carbonate of lime is sometimes, but very rarely, met with, forming small urinary calculi. These effervesce in dilute muriatic acid, and a precipitate is formed by the addition of oxalate of ammonia to the muriatic solution.

The fibrinous calculus, observed by Dr. Marcet, was probably formed from the fibrin of blood which had accidentally escaped into the bladder: it possessed the usual character of fibrin.

Mr. Brande analyzed one hundred and fifty stones, from the collection of Mr. Hunter, and the materials of which they were composed were as follow:

Uric acid	16
Uric acid plus, triple phosphate minus	45
Uric acid minus, triple phosphate plus	66
Triple phosphate	12
Uric acid on phosphate nuclei	5
Oxalate of lime	6

In addition to these, Dr. Wollaston found one of the cystic oxide; but Dr. Marcet met with this stone in the kidney: it is not composed of lamellæ, like the other calculi.

TREATMENT.

Medical treatment.

With respect to the medical treatment of calculi, I do not believe in the power of chemistry to dissolve a stone in the bladder, if it acquire any considerable magnitude. The medicines, given for this purpose, become so much changed in their passage through the circulating and secreting system, that their chemical influence is in a great measure destroyed. They may alter the surface of a stone, so as to render it soft and less irritating; but they do not prevent a calculous secretion.

Case.

Dr. Baillie and myself attended a gentleman from Birmingham, who secreted a large quantity of triple phosphate, which appeared in white crystals in his urine: we gave him the muriatic acid, and the secretion of the triple phosphate ceased, but uric acid was produced in equal abundance: he had then alkalies given to him, and the triple phosphate reappeared; he was at length, but not under many months, cured by attention to his diet and general health.

I had a patient in Guy's Hospital with a stone in his bladder, in whom various experiments were tried to dissolve the stone by chemical menstrua. A catheter was introduced into the bladder, and through it injections were thrown; thus an opportunity was given for a direct application of the menstruum to the stone. After a lapse of time, I said to this man, "Well, have my medical friends dissolved the stone?" his answer was, "No, Sir, and I have given up all the injections except opium, from which I receive considerable relief." The patient died in the Hospital, and, on examination after death, a stone was found in his bladder. Case.

But although a stone cannot be dissolved in the bladder, yet the irritability of the latter may be so far diminished by alkaline remedies, as to enable the patient to bear the disease with much less suffering. Alkalies may lessen the sufferings.

Admiral Douglas was the subject of stone; I sounded him, and in the evening of that day a portion of the stone was discharged by the urethra, and I sent it to my friend Dr. Marcet for analysis, who found it to be oxalate of lime; I therefore gave him acids, but he was not relieved by their use; he then took subcarbonate of soda ʒss. four times in the day, in some water. Some months afterwards I was requested to meet Dr. Reynolds and Sir E. Home in consultation upon the case of the Duke of Portland; and when I entered the room, Sir Everard said, "Cooper, how did you dissolve the stone in Admiral Douglas?" to which I answered, "I never dissolved a stone in my life."—"But," said Sir Everard, "he expresses himself well from some medicine you ordered him." I called in consequence on the Admiral at his hotel; when he said, "You saw me in dreadful agony, unable to cross a room; but since I have taken the soda, I went from Yarmouth, in Norfolk, to Portsmouth, by land, and bore the journey well; and I could now go down a country dance." Yet the stone still existed in his bladder; but the soda had lessened its sensibility, so as to enable him to bear the complaint without much suffering, and only a little inconvenience from the stone, which still occasionally stopped the flow of urine. Case.

Magnesia and soda have been recommended together; but as Magnesia and soda.

many stones are magnesian, the use of the former medicine may be improper.

Diluents.

Great dilution relieves the severity of the symptoms, and more especially mucilaginous drinks.

Stomachic medicines.

Medicines which assist the digestive process are the most appropriate to prevent this disease, as it is often the result of taking food which is difficult of digestion; or of a weakened state of the stomach, which renders common food indigestible.

Disease returns.

After removing a stone from the bladder, a medical treatment should be adopted, to prevent a return of the disease. The uric acid and oxalate of lime calculi return less frequently than the triple phosphate, which are very often reproduced.

Case.

I cut a Mr. Miles for the stone, and removed a triple phosphate calculus; in about twelve months the disease returned, for I sounded him, and found a stone. Mr. Layford, an excellent surgeon at Winchester, extracted this stone by the usual operation; yet, on examination of this gentleman's body after his death, which occurred several months subsequent to the second operation, several calculi were found in his bladder.

In another case, in which I extracted a triple phosphate calculus, from a patient of Mr. Van Oven's, in the city, the disease returned, and I again performed the operation, and found a large coagulum of blood in the bladder, surrounded by a triple phosphate deposit.

LECTURE XXXI.

OF THE OPERATION OF LITHOTOMY.

Previous inquiries

BEFORE performing the operation for the stone, it is right to inquire carefully if the functions of the body are well performed in other respects: if the digestion be tolerably good, and the breathing and circulation be free. For if the liver be diseased; if the chest be oppressed; or if the heart have an irregular action, the patient does

not in general recover from the operation. Pain in the loins, vomiting, or the discharge of matter, indicating disease of the kidneys, also form insuperable objections to the operation.

A patient came into Guy's Hospital to be cut for the stone; I sounded him and found a calculus, but he made water almost immediately, and at the time discharged a considerable quantity of matter. I saw that he was emaciated; he complained of pain in his loins, and his stomach was much disordered. I therefore said, "I will not operate upon this man, for he would die from the operation." In less than a month he died, and I was happy that I had not operated, as one kidney was found wasted, and the other at least twice its natural size, with its cavities full of a purulent secretion. Case.

The success of one surgeon being greater than that of another chiefly depends upon his judgment in this respect, viz. not to operate when there is much functional or any organic disease.

The age of the patient does not much influence the result of the operation, with the exception I shall mention. Old age is not to be a bar to it, if, so far as the stone will permit, the patient be active, and has no other complaints. I generally, therefore, say to a patient, "If the stone were removed, would you be capable of taking exercise? is your digestion good? is your breathing free?"—If he answers, Yes, the operation may be performed. The age of the patient.

Mr. Cline operated successfully upon a patient at 82: Mr. Attenborough, of Nottingham, at a still more advanced age. I operated upon a gentleman aged 76, who had been near sixty years in the island of Jamaica: I performed the operation in 1812, and he died about ten years after, having returned to Jamaica and enjoyed his health there.

About sixty years of age is the period at which stone is most frequent in the adult, and then the operation is very successful. In the middle period of life, fever is more violent from the operation, and the patient is often too much loaded with adeps to be submitted to it. Fat persons do not generally bear operations well, they have little vital power; they should be reduced by diet and medicine, and they must be accustomed to irritation of the bladder, by the frequent Sixty a favourable age.

introduction of the sound; but still they have more fever and disposition to peritoneal inflammation, than at a later period of life.

The most favourable age.

The age at which there is least danger from the operation is from three to twenty, for death is then a very rare occurrence. Under the age of two years, children often become convulsed and die from the operation, on account of their excessive irritability.

Average number of deaths.

The number of deaths from the operation, taking all ages, is one to eight. Fat persons at all periods, but more especially in middle life, are those who most frequently die. A surgeon sometimes proceeds to twenty or even thirty cases with extraordinary success; but then he loses several patients, which still produces the average I have experienced.

Previous preparations.

A short time prior to the operation, in addition to the exhibition of purgatives, &c. an enema should be administered, in order to empty the large intestines, and particularly the rectum, which, if distended with fæculent matter, would be in great danger of being wounded.

OF THE OPERATION.

The table.

The table on which the patient is to be placed, should be two feet six inches high; it is to be covered with two blankets and a sheet, and several pillows are required to support the patient's head and back.

Bandages.

Three bandages are required to secure the patient; of these, two are employed to confine each hand and foot of the same side together; a loop, at one extremity, is first passed around the wrist, and the patient then grasps the outer side of the foot, about its middle, having the bandage passing from the wrist between the two; the bandage is then passed under the foot, brought round on its inner side over the instep, and so round the wrist and ancle; after two or three turns around these parts, it should be passed over the hand and under the foot, then to the wrist and ancle again, until the whole is used. The other bandage is to be placed round the back part of the neck, and each extremity being passed under the ham of

the same side from within to without, they are to be carried back and tied behind the neck. These bandages prevent the patient from making any movements likely to impede the operation, or occasion danger during its performance.

Instruments. First the sound.

The instruments required are, first, a sound, consisting of a solid portion of steel, curved as the urethra, about twelve inches in length; its thickness should be well proportioned to the size of the urethra.

State of the bladder when sounding.

Persons often require to be sounded with their bladder full, and with it empty. I have frequently found a stone directly after the urine has been discharged, which I could not perceive when there was much urine in the bladder. It is right, therefore, to sound the patient first with his bladder full; and, if the stone cannot be felt, then to have it emptied, and sound again. On this account, it is often useful to employ a silver catheter, at first preventing the escape of the urine, and afterwards allowing it to flow through the instrument, at the same time continuing to sound. When the bladder is empty, it frequently happens, however, that the instrument is so confined that it cannot be moved sufficiently to strike the stone.

Position of the patient.

The patient should be sounded first in the recumbent position, and if the stone be not then felt, in the erect; as the calculus, by falling upon the urethra in the latter posture, may be easily detected.

Stone not always detected.

I have myself sounded and not detected a stone at one time, which I have afterwards felt. I have sounded and not discovered a stone, which another surgeon has afterwards perceived. I cut a patient, and extracted thirty-seven stones from his bladder, who had been sounded and declared not to have a stone.

Those who have not had experience in this disease, and have not frequently sounded patients afflicted with it, sometimes mistake the extremity of the sacrum, or the os coccygis, for a stone.

The staff.

The next instrument is the staff, which is somewhat similar to the sound, but rather more curved, and having a groove on its convex part; this groove should be as large as possible; first,

because it is more easily cut into; secondly, because the gorget or knife passes more readily by it into the bladder.

How to be held.

When performing the operation, the staff is to be held by an assistant, perpendicularly, or nearly so; and its extremity should, if possible, rest upon the stone; its groove is to be slightly inclined to the left side of the rapha of the perineum. Nothing can be more unsafe than to incline the handle of the instrument towards the patient's abdomen, as it draws its point out of the bladder into the urethra; and when the gorget or knife is passed on it towards the bladder, either is likely to slip between it and the rectum.

Position of the patient during the operation.

Before commencing the first incision, the surgeon should see that the patient be placed evenly upon the table, so that one side be not higher than the other; and also that the shoulders be sufficiently raised, and well supported.

The scalpel.

The knife, for commencing the incision in perineo, should have a considerably convex cutting edge, as by it the urethra is more freely opened. The scrotum being elevated, the incision is begun opposite the under part of the arch of the pubis, and is continued on the left side of the raphe, along the perineum, as far as mid-way between the tuberosity of the ischium and the anus.

The first incision.

The first incision should divide the skin, &c. and expose the accelerator urinæ; the second should be carried between the left crus penis and the bulb; the latter being pressed towards the right side by the fore finger of the surgeon's left hand.

A part of the accelerator urinæ is divided, and the transversus perinei should be freely cut, as it forms a great impediment to the extraction of the stone, if undivided.

Opening the urethra.

The next incision should be made into the groove of the staff, by cutting into the membranous portion of the urethra; for this purpose the knife must be directed upwards, and not horizontally, otherwise the rectum is endangered: the opening made to expose the groove of the staff should be an inch in length.

A gorget, or a knife with a probed extremity, is next usually employed, to complete the opening into the bladder.

The gorget may be considered as the dividor of the prostate gland and it also serves as a director to the forceps. It was formerly used with a blunt edge, so that it acted as a wedge: when so formed and employed, the scalpel should be carried along the groove of the staff, so as to divide the prostate gland laterally, after the urethra has been opened, which allows the blunt gorget to enter the bladder with comparative facility. The operation performed with this instrument is attended with very little bleeding, and has been very successful in its issue. The gorget. The blunt gorget.

Hawkins had one of the edges of the blunt gorget made to cut. Mr. Cline made the greatest improvement upon the cutting gorget, in having the left side entirely removed, leaving only the beak and its right blade, which had a sharp anterior edge: this instrument enters with ease. It should be introduced horizontally, for there is considerable hæmorrhage if it be introduced obliquely, as it then opens a plexus of vessels surrounding the prostate, and which is continued to the vesiculæ seminales, and terminates in the internal iliac veins. Cutting gorget.

It is quite contrary to my experience to say, that persons do not die of hæmorrhage after this operation, for I have known many instances of it; four in particular, in which death was the immediate consequence of bleeding, suffered to continue for several hours; and several I have known die from gangrene of the scrotum occurring after severe hæmorrhage. The patient should never be left until the bleeding has ceased; and, if it be very considerable, the surgeon should place his finger within the wound and compress the bleeding vessel; but he should be careful not to quit his patient whilst any hæmorrhage remains. Hæmorrhage.

It is best to use a small cutting gorget, as it lessens the danger of wounding blood-vessels; and then, if necessary, on account of the size of the stone, to dilate the wound, do it with the blunt gorget.

The beak of the cutting gorget is passed into the groove of the staff, where it has been previously opened at the membranous part, and the instrument is then pushed along the groove into the bladder, Mode of passing the gorget.

so as to divide the left half of the prostate gland. It is necessary to press the beak against the groove as it glides along, and occasionally to move it slightly backwards and forwards, to be certain that no portion of membrane has got between the two. When the gorget enters the bladder, the urine flows out over its superior concave surface.

Size of the gorget.

The length of the gorget should be proportioned to the size of the patient. The breadth of its cutting part, when used for an adult, should not exceed one inch; and the blunt gorget should be used, if the first opening be not sufficiently free.

The gorget which I at first used in my own operations was double, and cut upon both edges; but I thought it occasioned too much bleeding, and divided more than was absolutely necessary for the removal of the stone.

The knife.

The knife is now frequently substituted for the gorget, and that which I for some time employed, in various cases, was straight and narrow, with a probed end.* After opening the membranous part of the urethra, as before, I passed this knife along the groove of the staff into the bladder. In the young this answers very well, and also in a thin adult; but in a deep perineum, or enlarged prostate gland, I prefer the gorget, as being more definitive in its cut.

The forceps.

Forceps of various sizes are also required to lay hold of the stone, and those employed must depend on the bulk of the patient: the handles should occupy two-thirds, and the blades one-third of the length. I have tried many others of different proportions, but think that which I have mentioned the best. Some of the blades must be flat, for small stones, or fragments of stones; some should be curved, to remove calculi from behind the pubes or prostate: one pair should be large, as small forceps will not retain a large stone in their grasp, with sufficient firmness to extract it.

The forceps must be passed along the groove of the gorget with

* Mr. Thomas Blizard, who was an excellent and successful operator, employed a knife of the same kind, excepting that the beak was at an angle with the blade, instead of straight.

great care, and the gorget must be well retained during their passage. I have seen the forceps pass between the bladder and rectum, from the surgeon's pulling back the gorget as he thrust forwards the forceps, which should never be done. The gorget must not be removed until the surgeon has thrust his finger forwards to feel that the groove of the staff has been freely opened. I frequently, if the perineum be not very deep, remove the gorget after it has entered the bladder; and introduce the forceps by my finger, carried along the groove of the staff.

Mode of using the forceps.

When the forceps have passed into the bladder, the gorget and staff are to be removed; and the surgeon, before opening the forceps, should sound with them for the stone. When the situation of the calculus has been thus ascertained, the blades of the forceps are to be separated and the stone received between them; and this must be done with great gentleness, not only to save the patient pain, but to prevent any injury to the internal surface of the bladder.

When the stone is drawn down to the opening in the perineum, wait a little for the cessation of muscular action from the perineal muscles, and introduce the finger by the side of the forceps, to feel if any obstruction exists, and to press it out of the way of the stone; for the finger is the best instrument for this purpose. It is right to turn one blade of the forceps to the pubes, and the other to the rectum, as the stone cannot then injure the urethra. If the extraction of the stone be violently resisted, disengage and remove the forceps, then introduce the finger and feel how the stone is placed, and, if necessary, turn its long axis into the direction of the long axis of the bladder.

Having grasped the stone with the forceps, do not be hasty in extracting it, but be gentle in the employment of your power, depending upon the gradual, rather than the sudden exertion of force. The great danger, and the most frequent cause of death, in my opinion, arises from the surgeon's employing excessive violence with the forceps; first, bruising the bladder; secondly, disengaging it from its situation by tearing down its natural adhesions; it

injures the peritoneum, and brings on peritoneal inflammation; thirdly, it injures the prostate, sometimes tears the urethra at the membranous portion; and I have known the rectum lacerated, where it had not been injured by the incisions, which can only arise, in the use of the knife, from ignorance or negligence.

If the stone cannot be grasped with the straight forceps, a curved pair should be employed.

The operation for the stone consists, therefore, first, in opening the membranous part of the urethra, and dividing the transverse perineal muscles on the left side with the knife, and exposing the groove of the staff; secondly, in dividing the left half of the prostate gland horizontally, and that portion of the bladder connected with it, by means of the gorget, or probed knife; thirdly, in introducing the forceps, by which the stone is seized and extracted.

OF THE DIFFICULTIES AND DANGERS OF THE OPERATION FOR THE STONE.

Stricture in the urethra.

If the urethra be the subject of stricture, do not perform the operation until it will admit a large staff. The strictures being removed, the operation is less difficult, and the recovery quicker and more certain.

Enlarged prostate.

An enlarged prostate gland offers great difficulties to the operator, and if the stone be of large size, the patient will seldom recover, as the impediment to extraction is excessive, and the violence obliged to be used such as the patient can ill bear, at the period of life at which such disease of the prostate occurs. It is, therefore, in such cases, a very fortunate event when the stone breaks, as it is removed with less risk to the patient, although it renders the operation tedious.

Lateral enlargement.

A lateral enlargement of the prostate gland produces less difficulty, if it be freely divided, than the enlargement of the middle lobe; and this gland should always be examined per anum in aged persons, to prevent the surgeon being baffled by this disease, and if

he finds it enlarged laterally, he must use a large gorget, or else divide freely with the knife.

Middle enlargement.

If it be an enlargement of the third lobe, the circumstance is known by the passage of the staff, which only enters the bladder by its handle being greatly depressed; also by the stone being felt distinctly at one time and not at another; and here let me observe, that when this happens in sounding, I have generally found some difficulty in the operation. The curved forceps are proper to be used in this form of disease.

Sac behind the prostate.

The enlarged prostate gland often gives rise to another difficulty, by occasioning a sac to be formed immediately behind it, in which the stone is principally lodged, its extremity only projecting into the bladder so as to be felt by the forceps; in this case the curved forceps are required, and the finger must be passed up the rectum, to raise the stone from this situation, and to bring it into the axis of the bladder.

Part of the prostate nearly detached.

A portion of the prostate is sometimes nearly separated in extracting the stone, so as to be afterwards pendulous into the bladder; this occasions symptoms somewhat similar to those of the stone to remain. This happened to Mr. Cline, who operated upon a gentleman very successfully as to the immediate result, but who, after his recovery from the operation, found all the symptoms of stone return. He lived a long time after, and before his death desired that his body might be opened. Mr. Ramsden inspected the parts, and sent me the bladder, which is now in the collection at St. Thomas's Hospital, and a portion of the prostate gland hangs by a narrow neck into the bladder; this portion, by falling on the urethra, produced the symptoms.

Enlargement of the third lobe.

From the enlargement of the third lobe of the prostate gland, little advantage is, on the same account, derived from the operation of lithotomy, as the patient still experiences all the symptoms of stone, excepting that the urine is not usually bloody; but even this circumstance I have known to happen.

Contraction of the bladder.

I have seen a difficulty arise in performing this operation, from a partial contraction of the bladder, by which the stone has been

firmly embraced, so as to impede the use of the forceps. This arises from the sudden escape of the urine which the bladder contained previous to the operation. The fungus of the bladder, and half of the organ near to it, embrace the stone closely, the forceps are passed into the anterior part of the bladder, and opened at its cervix; but, in attempting to seize the stone, only one of its extremities is nipped by the forceps, which slip from it immediately the surgeon tries to extract the calculus; this occurs several times, until the patient becomes exhausted, when the contraction of the bladder subsides, and then the stone is readily seized. In such a case the flat forceps answer best, gliding most easily over the stone. If the patient does not retain his urine for a long period before the operation, this difficulty seldom occurs.

Narrow pelvis. In persons who have been the subject of rickets, the pelvis is sometimes so narrow as to render the performance of this operation excessively difficult. I once saw Mr. Cline operate in a case of this kind, and only his coolness and perseverance could have overcome the obstacles it presented. The subject was a child; the tuberosities of the ischia were very near each other, and when the forceps were introduced into the bladder, only the handles remained external to the wound; the extremity of the stone only could be caught hold of, and from this the forceps repeatedly slipped. Mr. C. finding that the longest pair of forceps usually employed for children would not reach beyond the centre of the stone, and that it could not be held by them, introduced a pair of forceps made for an adult, and with these he succeeded in grasping the stone, but the opening of the pelvis was too small to admit of its being extracted whole; he, however, after repeated efforts, broke the calculus with the forceps, and removed it by fragments. The child afterwards recovered.

Large stone. The stone is sometimes so large as to produce great difficulty in the extraction. The largest which I have successfully removed has been between five and six ounces; but I remember to have seen one in the Norwich Hospital, which weighed eight ounces, and was extracted without being broken. If broken, a very large stone

may be successfully removed. Mr. Mayo, of Winchester, in this way, extracted one weighing altogether fifteen ounces. The largest which I have extracted whole was from Mr. ——, of Fore Street, in the city, a relation of Mr. Field's, surgeon, in Wilderness Row; it weighed sixteen ounces; I was obliged to extend the incision in perineo to the sacro sciatic ligaments, and when I seized the stone with the largest forceps, I found I could not extract it; I therefore endeavoured to bore a hole in it with a gimblet, as I held it between the blades of the forceps, but scarcely made any impression upon it: at last I succeeded in removing it in the following manner: Mr. David Babington, son of Dr. Babington, then my apprentice (a most amiable and excellent young man, who entirely fell a victim to his professional zeal, and who, if he had lived, promised to be one of the highest ornaments of his profession,) assisted me. I placed a single blade, or crotchet, on the upper part of the stone, under the symphysis pubis, and then, whilst I pulled the stone with the forceps through the opening in perineo, Mr. B. pressed down the stone by elevating the handle of the crotchet, and thus brought it below the line of the symphysis pubis, and thus it was extracted. The time occupied by the operation was nearly an hour, and the patient survived only a few hours.

Case.

For extracting very large calculi, a free incision is required, and the forceps must be large and strong. Mr. Cline had some made so that the blades could be introduced singly and joined together afterwards; or one blade could be used alone, as above described.

Forceps with blades which separate.

Forceps have been constructed with teeth, to break a large stone; and Mr. Earle has invented a perforator for the same purpose: such an instrument, easily applied, is in the highest degree desirable.

Instruments to break large stones.

Soft stones create a difficulty in the operation, by rendering it necessary to remove the stone in fragments. It is thought to be very desirable afterwards to wash out the bladder by means of a syringe, with a view to prevent the future formation on any remaining portion. I believe it is better to use the scoop, and to remove with it all the particles of stone which the urine cannot carry off, such as sand; for injecting the bladder will not remove frag-

Soft stones.

ments, and the after-flow of urine through the wound will remove sand.

Necessary caution.

Stones are often broken which might be removed whole, if the surgeon were less violent, and more cautious. The mode of preventing them from breaking is, when the stone has been seized with the forceps, to put the index finger between the handles, so as to prevent them violently approximating, and to limit the degree of pressure.

Number of stones.

A number of calculi render the operation more tedious, but not so dangerous as one large stone. It is not the number of times that the forceps are introduced, but the violence used with them, which endangers the patient. When there are several in the bladder, care must be taken that none be left; and the surgeon must not be content with examining by the forceps only, but it is best to pass a sound into the bladder, either by the urethra or by the wound, to feel if any remain; he should also pass his finger into the rectum and raise the prostatic part of the bladder, so as to throw any stone lodged there into the axis of the bladder; as it often happens that the prostate gland is enlarged when several stones exist, and they are generally situated behind this enlargement.

Calculi not always detected.

In the instances of the greatest number of calculi which I have seen, it was doubted for a length of time if any existed; yet, in one case, the urine had been repeatedly drawn off, and in the other the patient had been several times sounded, but a stone could not be felt:—on examination, after the patient's death, fifty-six stones were found in the bladder.

Form of the stone.

The form of the stone sometimes adds to the difficulty of its extraction; if its long axis much exceeds its breadth, when seized by the forceps in the centre it will not pass the opening in the bladder, from its extremities projecting on each side of the forceps: the surgeon, finding great resistance, should withdraw the forceps, and passing his finger into the bladder, he should turn the stone, and place its long axis from the fundus to the cervix, after which it can be easily extracted.

Sacculi enclosing stones.

Sacculi in the bladder sometimes enclose stones so far, that only the end projects into its natural cavity, and can be alone felt by the

forceps. In my own practice I have met with only one decided case of this kind, which was the following:

Case. A boy was admitted into Guy's Hospital, in whose bladder, by sounding, I found a stone; but the symptoms were less urgent than usual, and each time I sounded, the stone was felt in the same part of the bladder. This led me to examine per rectum, and I then perceived a stone lodged and fixed at the under part of the bladder over the rectum, I therefore made an incision between the bladder and rectum in perineo, and, directed by my finger in the rectum, I reached the stone without wounding either the rectum or bladder; I then opened the sac with the knife, and seizing the stone with a pair of dressing forceps, I extracted it. The boy for three days only passed his urine by the wound, and then it took its natural course, and the wound healed rapidly.

Case. In a case which I attended with Mr. James, surgeon, at Croydon, he found, on inspection of the body after death, two calculi, having large extremities connected by a narrow stem, one extremity of each was situated in a sac, and the other extremity in the cavity of the bladder.

As I have stated, a sacculus behind an enlarged prostate gland is a frequent occurrence, but the calculi are only occasionally falling into its cavity.

Corpulency. Corpulency greatly increases the danger of the operation, as well as its difficulty. The perineum is often so deep as to render it impossible to reach the bladder with the finger; and, if the stone be large, the impediments to its extraction are greatly augmented, by the resistance afforded by the perineum.

Prolapsus ani. When a child has been long subject to prolapsus ani, it often becomes troublesome at the time of the operation. The anus should be supported by an assistant at the time the surgeon commences the operation, or it protrudes whilst he is making his incision. It may be observed, that in cases in which the prolapsus happens after opening the bladder, that if the instruments be withdrawn, they cannot again be introduced until the prolapsus be returned.

OF THE CAUSES OF DEATH FROM THE OPERATION.

The causes of death from lithotomy which I have witnessed are:

Nervous irritability in children.

First, Nervous irritability occurring in very young persons: they are generally pale and almost comatose on the day after the operation; on the day following, their eyes roll quickly, and there is excessive restlessness; they then become extremely weak, are convulsed, and expire. To relieve this irritable state, calomel and opium are the best remedies.

Peritoneal inflammation.

Secondly, Peritoneal inflammation, occurring when much violence has been used in extracting the stone.

The symptoms are; vomiting, tenderness in the region of the bladder, tension of the abdomen, and difficulty in procuring motions.

The treatment consists in administering calomel purges, in applying fomentations, leeches, and blisters to the abdomen; in bleeding from the arm, and the use of the warm bath.

In inspecting these cases, I have seen not only inflammation of the bladder and peritoneum, but extravasation of blood between the bladder, pubes, and abdominal muscles, showing that the bladder had been drawn down during the extraction of the stone. The removal of a large stone, when the prostate gland is enlarged, kills in the same manner.

Hæmorrhage.

Thirdly, Hæmorrhage. This I have seen repeatedly destroy life, and it has been with no small degree of surprise that I have heard it denied to be a cause of death.

Case.

I cut a man in Guy's Hospital at one o'clock in the day; the operation was soon over, and apparently under the happiest auspices; the patient was put to bed, and I soon after quitted the Hospital. In the afternoon the man became faint and vomited several times. At nine o'clock in the evening, the sister of the ward, in turning down the bed-clothes, found the lower part of his body surrounded with blood, and the man was extremely faint. Mr. Callaway, my apprentice, was sent for, but the patient died in an hour.

A surgeon should not quit his patient until the bleeding caused by

the operation has ceased: the patient should not be put to bed whilst any hæmorrhage continues; and when in bed he should be very lightly covered for some time.

I find that bleeding more frequently occurs when the gorget is passed obliquely, in the direction of the external wound, than when it is passed horizontally.

Gangrene of the scrotum.

Fourthly, Gangrene of the scrotum. This I have seen several times, in persons who have been of intemperate habits, or in those extremely weakened by age.

Extravasation of urine.

Fifthly, Extravasation of urine into the scrotum, producing great inflammation and swelling, and leading to gangrene; it arises from the incision being made too high, so as to open the cellular tissue of the scrotum.

Scrotum to be supported.

After the operation of lithotomy, the scrotum should be always supported by a bandage, to prevent the urine which flows through the wound, from irritating it, and thus the disposition to gangrene is lessened.

Ulceration of the bladder.

Sixthly, An ulcerated state of the bladder, shown by offensive urine, evacuation of mucus and of pus, mixed with blood, in some, are sufficient to lead to a fatal issue in lithotomy.

Diseased kidney.

Seventhly, Diseased kidneys, whether inflamed, wasted, suppurating, ulcerated, or containing stones; marked by pain in the loins, by purulent discharge, and by a disordered stomach.

Visceral disease.

Eighthly, Visceral disease, as a morbid state of the liver; dyspnœa from some chronic affection of the lungs; palpitation of the heart; irregular or intermitting pulse; which tend to destroy the powers of restoration.

OF THE AFTER-TREATMENT.

When the operation is concluded, the patient is unbound; but the legs should not be immediately brought together if any bleeding continue, as the blood is apt to pass back into the bladder, where it coagulates; and producing great urgency to make water, the coagulum is forced out, occasioning a renewal of the hæmorrhage.

To be kept dry. No dressing is to be applied to the wound, but a folded sheet or napkin is to be placed under the nates of the patient in bed, and this should be frequently examined, to ascertain if the urine be secreted and pass away: it should be changed for a dry one whenever it becomes wet.

Opium. Opium may be given, if the patient be very irritable; but as it is apt to check the action of the intestines it should not be administered unless absolutely necessary.

Diluents. The patient should be allowed to take diluents freely at first; such as linseed tea, or barley water with gum acacia in it; and, when the danger of inflammation has passed, beef tea, broth, or gruel may be given.

Saline medicines, with excess of alkali, are useful; if a tendency to fever or inflammation arise, purge the patient with castor oil, and foment the abdomen; if it increase, give calomel and antimony, and occasionally castor oil; if the pain in the abdomen become severe, bleed from the arm of the adult, and apply leeches to the abdomen of a child.

Tying the legs together. When the wound begins to granulate, and not before, tie the legs together; as much mischief arises from doing so, soon after the operation; First, in bleeding, as already mentioned; Secondly, it prevents the free escape of the urine; it is of no use until the wound be disposed to close.

Position. It is not necessary that the patient should rest on his back only; there is not any danger in his turning to the side, and great relief is often obtained by it.

Passage of the urine. The urine passes, in some cases, entirely by the urethra in the first few hours, but this is not desirable; the patient suffers less in its discharge, and has less local irritation, if it escapes easily by the wound. In cases of enlarged prostate gland, it is proper to introduce a flexible catheter by the urethra, to permit the urine constantly to flow off. When the urine, under the common consequences of the operation, takes its natural course, the patient frequently suffers from a rigor.

Recovery. Children usually recover from the operation in about three weeks,

and adults in about a month: sometimes both have the wound healed within a shorter period.

I have known two evils arise from the operation; one, a loss of the power of the retention of urine, when the patient is obliged to wear a yoke, or jugum; the other, an interruption to the passage of the semen, from some injury done to the veru montanum, where the united ducts of the vesiculæ seminales and vasa deferentia terminate. Evils following the operation.

I know a gentleman, who has undergone this operation, has pain in coitu, but does not pass any semen, although he experiences the orgasm. Case.

The patient's digestion and state of urine require to be attended to after the operation, to prevent a return of the disease.

Mr. Key, surgeon of Guy's Hospital, performs the operation of lithotomy in a different manner from that usually adopted. The points in which it differs from that commonly performed consist in the employment of a staff, nearly straight, and a scalpel-formed knife, which serves both for the external incision and for the division of the prostate gland, thus obviating the necessity for a change of instruments. The staff is slightly curved for about an inch from its extremity, to enable it to pass more easily over the prostate gland, and the knife is about twice the length of a common scalpel. The mode of performing the operation is as follows: the patient being secured, and the staff introduced into the bladder, an assistant is to hold the handle of the instrument inclined somewhat toward the operator, in order to keep its extremity projecting some way into the base of the bladder. The staff having been fairly laid open by the usual free external incision, and the point of the knife being steadily pressed against the groove, the operator takes the handle of the staff in his left hand, and lowers it till he feels his hand checked by the ligament of the pubic arch. In this movement of the staff, the prostate is raised from the rectum, the ligament of the arch acting the part of a fulcrum, and the staff that of a lever, by which the gut is put out of danger of being wounded. The groove of the staff and the edge of the knife are then to be turned,

by an easy simultaneous movement of both hands, in the direction most favourable for the free division of the prostate, which will be about an angle of 50° with the horizon. The knife is now to be carried gently along the groove through the prostate into the bladder, until the gland is completely divided, which the operator easily ascertains, by the resistance afforded to the knife ceasing.

In passing the knife, to complete the section of the prostate, its handle should be lowered to the bottom of the external incision, by which a sufficiently large angle is formed between the knife and staff, and thus an opening in the gland is made, large enough to admit the extraction of a moderate sized stone. When the stone is of unusual dimensions, or the prostate increased in size, it will be advisable to dilate the opening in withdrawing the knife, in the same manner as when the beaked knife is used: in common cases the knife may be withdrawn along the groove of the staff without the necessity of dilating.

OF THE HIGH OPERATION, OR THAT ABOVE THE PUBES.

Not successful.

Attempts have been made to revive this operation, in this country and in France; but in England, hitherto, they have been very unsuccessful.

Preferable under peculiar circumstances.

Those who have witnessed the general safety and facility in performing the lateral operation will never make use of the high operation, but under peculiar circumstances; as when the prostate gland is very much enlarged, or when a stone of great size exists. My opinion is, that it should be confined to a combination of these two circumstances, viz. the large stone, and large prostate, which render the operation in perineo very unsuccessful. Those who wish to be fully informed on this subject will consult the work of Mr. Carpue, who has taken great and very laudable pains to explain this operation.

OF REMOVING STONES FROM THE BLADDER BY THE URETHRO-VESICAL FORCEPS.*

Number of calculi.

When a great number of calculi are found in the bladder, there is generally an enlargement of the prostate gland, and a sacculus formed in the bladder directly behind it. In these cases the bladder is rarely emptied completely of its fluid contents, and calculi form from the urine retained in the sac.

Usually small.

Such stones do not in general acquire the magnitude of those formed under the usual circumstancés; and from their number and friction against each other, their surfaces are generally smooth, and their shape rounded. Fifty-six such calculi were found in the bladder of Mr. Perkins, the brewer, who died from retention of urine.

Sometimes passed with the urine.

Persons who labour under this form of the disease, sometimes pass the smaller of the calculi whilst making water; but the larger still remain, producing retention of urine, and the operation of lithotomy has often been performed for them; but, as the following cases will prove, they may be extracted from the bladder by means which do not expose the patient to any loss of blood, do not occasion the slightest danger, or any very considerable degree of suffering.

I am fully aware of the impossibility of extracting large urinary calculi by the means which are here recommended; yet I cannot but feel a hope that they may be removed, in the early stages of the disease, by the following means, before they acquire a bulk too large to pass by the urethra.

In the infant also, it will be extremely difficult to contrive an instrument of sufficient delicacy to be introduced into the bladder through the urethra, which shall possess such a degree of strength as to enable it to grasp the stone firmly, and to extract it with safety.

* These observations and cases have been already published in the Medico-Chirurgical Transactions, vols. xi. and xii.

Instrument for extracting small stones.

The instrument which I first had made for the purpose of removing these calculi, was merely a common pair of forceps, made of the size of a sound, and similarly curved; but Mr. Weiss, surgeons' instrument maker, in the Strand, showed me a pair of bullet forceps, which he thought would, with a little alteration, better answer the purpose I had in view. He removed two of the blades of these forceps (for there were four), and gave them the form of the instrument which I had constructed; the blades of this instrument could be opened whilst in the bladder, by means of a stilette, so as to grasp and confine the stone; it gave but little pain on its introduction, but when opened to its greatest extent, and stones were admitted between its blades, their removal was painful, more particularly at the glans penis, which appears to be the portion of the urethra furnishing the greatest resistance to their removal.

I shall now proceed to detail the circumstances of the first case, as they have been related by the patient himself.

Case, as related by the Rev. Mr. Bullen.

The Rev. John Bullen, of Barnwell, near Cambridge, aged sixty-four, of a spare habit of body, and of a sanguine temperament, having enjoyed an uninterrupted state of good health, capable of partaking largely of the amusement of hunting, and living always with great moderation, was attacked, in May, 1818, with symptoms, of which he gives the following account:

"I was suddenly seized with a frequent inclination to pass my water, and an uneasy sensation along the course of the urethra, which continued with greater or less violence for about a fortnight, when I was surprised by the appearance of a small round white stone at the orifice of the passage. The escape of this small calculus, which was attended with scarcely any pain, failed to produce any beneficial effect on my former symptoms, which continued unabated, both as to the degree of irritation, and the frequency of making water. In this state I remained till June following, during which

month several similar calculi passed, to the number of about thirty, producing no other inconvenience than a slight smarting pain along the urethra. At the end of June, without any assignable cause, I was suddenly relieved from this discharge of calculous matter, and from every other symptom but that of a frequent desire to void my urine, which latter inconvenience occasioned me no feelings of anxiety or apprehension.

" In the ensuing winter I was seized with pains across the back and loins; for which Mr. Brewster, of Cambridge, supposing they proceeded from gravel, ordered me medicines, which he considered likely to alleviate them, but without producing any permanent good effect.

" I was, however, still enabled to pursue my favourite amusement of hunting, though frequently obliged to dismount to make water; at this time making no alteration from my accustomed mode of living.

" Without any material change, I remained until the December of 1819, when I found the exercise of riding was becoming considerably more painful, and the inclination to pass my water more frequent, attended with some degree of difficulty in its passage, and a change from its usual colour and clearness to a fluid resembling chocolate. For these symptoms several formulæ of medicines having been prescribed without any material benefit, I was induced to consult Mr. Abbott, a most respectable surgeon, at Cambridge, who ordered me medicines highly beneficial in their first effects; the relief, however, they afforded me was but of short duration, for my symptoms recurred with all their former violence; and though the prescriptions were repeatedly altered at Mr. Abbott's suggestion, no sensible impression could, by the most judicious treatment, be made on the disease.

" My friend, Dr. Thackeray, of Cambridge, was, in the June following, called in consultation with Mr. Abbott; and both agreeing that the symptoms were produced by stone in the bladder, the sound was introduced to ascertain its presence, but failed to discover it. My symptoms continuing unabated, Mr. Abbott, a

fortnight afterwards, still impressed with the idea of stone, again sounded me; but the stones, for the reasons hereafter given, escaped detection. To relieve my frequent inclination to make water, and to mitigate the pain I experienced in its discharge, I was recommended the use of an opiate glyster at bed-time, which afforded me considerable relief; but if the injection were omitted but for a single night, the symptoms returned with all their former violence.

"In this state of suffering I determined to consult Mr. Astley Cooper, and on the 17th of August went to town for that purpose. Mr. Cooper, suspecting from my account, that a stone was present in the bladder, sounded me; but after searching for some minutes was unable to detect one; he then directed me to discharge the water from my bladder, and the sound being again introduced was distinctly heard to strike upon a stone. He then informed me that there was no hopes of permanent relief but from the operation of lithotomy; at the same time remarking that, as I had not been sufficiently reduced by the irritation of the disease to render me a favourable subject for the operation, it would be better for me to return to Cambridge, and by pursuing a certain plan of diet and regimen, to reduce the high health which I appeared to possess. He also prescribed alkaline medicine, for the purpose of lessening irritation. With this advice I returned home, where I remained till October, 1820, pursuing the use of the soda and the opiate injection. My sufferings being alleviated only for the moment, and seeing no probability of experiencing further relief from medicine, on the 23rd of October I came to London to submit myself to the operation, and the 30th was the day proposed for its performance.

"On the day appointed, Mr. Cooper, his nephew, Mr. B. Cooper, and Mr. Merriman, jun. attended at my house. Upon sounding me, the instrument could be distinctly heard by every person present, and even by myself, to strike against a stone. Mr. Cooper, however, was of opinion that the stone was so small, as to admit of extraction without cutting into the bladder; and, therefore determined not to perform the operation, but told me that

he would try less dangerous means to rid me of this complaint; and, happily, under these circumstances, the operation was deferred.

"On the 3rd of November, I called at Mr. Cooper's house, when he passed a full-sized bougie into the bladder, for the purpose as he said, of dilating the urethra, and thus giving the stone an opportunity of passing with the flow of urine. This operation was repeated on the 6th, 10th, and 13th of November; but on the 14th an inflammation took place in the prostate gland, from the introduction of the bougies, and put a stop to the prosecution of this plan of treatment. The effect of this inflammation was a retention of urine, rendering it necessary for Mr. Cooper to draw off my water every twenty-four hours; at which time the calculus could always be distinctly felt by the catheter. After the inflammation had subsided, the power of making water not having returned, Mr. Cooper passed an elastic catheter into my bladder, and directed me to wear it; teaching me, at the same time, how to withdraw it when it became either painful or obstructed; and, on several occasions, I discovered small white stones in the opening of the instrument, similar to those which had passed in 1818. Mr. Cooper, upon being acquainted with this circumstance, expressed a wish to remove the instrument himself; when, upon withdrawing it, a stone was seen large enough to fill the opening in the side of the elastic catheter. The passage of these calculi suggested to Mr. Cooper the possibility of inventing an instrument, by which he might remove those that remained in the bladder; and on the 23rd of November he brought with him some instruments contrived for the purpose; one of which he directly employed, and was so fortunate in the first trial as to remove eight calculi of small size. The operation was productive of a very inconsiderable degree of pain.

"On the 28th, eight more were removed by the same means, of a larger size than the former, two being as big as horse-beans. This operation was attended with even less pain than the former.

"On the 30th, eleven were extracted; three or four being engaged each time the instrument was withdrawn. The removal

of these gave me great relief, for I was immediately enabled to pass a considerable quantity of urine by my natural efforts; and previously to this, ever since the large bougie had been introduced, I had been unable to pass my water without the aid of the catheter.

" On the 8th of December, six stones were removed by the same means.

" On the 13th, nine more were taken away.

" On the 19th, three more were extracted.

" On the 23rd, twelve more were removed; thus only allowing the intermission of a day or two for the irritation to go off. The operations were repeated until eighty-four calculi were, by these means, extracted from my bladder; when Mr. Cooper pronounced, after a most careful examination, they were all removed. My health has been all this time uninterruptedly good with the exception of the attack of retention of urine from the use of the large bougie; and I am now able to discharge my urine without the use of the catheter, and to walk nearly as well as ever I did."

The following case is, in part, detailed from the patient's account of his symptoms; and, in part, from the statement of Sir Gilbert Blane, who is the patient's physician.

Sir William Bellingham's Account of his Case.

" Sir William B——— is in his sixty-seventh year; he suffered much at times from long and severe attacks of the gout, from about his thirty-fifth to his sixtieth year; since which period the attacks have been much less frequent, much mitigated, and of short continuance. He thinks he first perceived red gravel, or sand, to come from him occasionally, soon after a long fit of the gout, about seven or eight years since, but did not suffer much inconvenience from it. About four years since he passed pieces of gravel at different times, and has continued occasionally to do so ever since; sometimes larger than a pea, but generally of an oblong shape. When they occasioned any stoppage in the passage, he used a hot bath at 94°, and drank plentifully of some diluting drink, which,

after a little time relieved him. In the summer of the year 1820, having had occasion to use a great deal of walking exercise in London, for three or four days he was much surprised on passing, first, a considerable quantity of very dark stuff, nearly like coffee-grounds; and afterwards a considerable quantity of what appeared chiefly blood. He did not experience any pain of consequence with this; and by the following day his urine was as clear as before. Upon going into the country, he found that if he rode fast at any time, it brought on the passing of the dark stuff, and afterwards, if persisted in, of blood. By degrees he gave up riding, and finally ceased to ride about Christmas last; and finding the same effects to arise, in a slighter degree, from walking much, he has very nearly given up that also, for the last six months. Sir Astley Cooper and Sir Gilbert Blane attended him for these symptoms, in June and July, 1821, when he left London for Ireland; whilst there, he continued to experience the same inconvenience as before, with but little pain, and the same on his return to London. Early in June last, he called on Sir Astley Cooper to say he was going again to Ireland, and wished to have some conversation with him, when Sir Astley advised his being sounded; which he then was, and it was ascertained that there was a stone. As it appeared to Sir Astley Cooper to be a small one, he proposed trying to extract it; and on the fourth trial, with intervals of a week or so between them, a stone weighing seventeen grains and a half was extracted on the 18th of July. About three weeks after, Sir William, having some fears that there still remained some stone behind, again applied to Sir Astley Cooper, who, upon sounding, found that such was the case; and on making at that time, at his house, an attempt to extract, he brought it part of the way, but found it too large to bring forward, and therefore returned it; and, as soon after as the parts would permit, he commenced enlarging the passage by bougies, which he continued at intervals for nearly a fortnight, and then extracted a stone weighing fifty-four grains, on the 28th of August, 1822."

Sir William B. suffered pain in making water; swelling of the

corpus spongiosum at the scrotum, with considerable urethral discharge, until September 23rd, when the symptoms subsided, under the application of fomentations and poultices.

When the size of the stone is observed, it will not excite surprise that I had considerable difficulty in extracting the larger, which weighed fifty-four grains. It was in that part of the urethra near the glans that the chief impediment was found; and, if I had thought proper to do so, I could have easily removed it from thence by incision, but I preferred completing the extraction without occasioning a wound. Yet I am now disposed to believe that, in a stone of equal magnitude, it would be better to make a small incision into the urethra, anteriorly to the scrotum, than employ force for the extraction of the stone through this narrower part of the urethra. A. C.

Mr. King's Case.

Mr. William King, aged sixty-six, mariner, residing at Rochester, was sent to me by Mr. Newsom, surgeon, of Rochester, on account of his having symptoms of the stone.

He came to London on the 29th of October, 1822, and on the 30th he visited me. I sounded him, and found that he had, as Mr. Newsom supposed, calculi in the bladder. I passed the urethral forceps into the bladder, and in a few minutes extracted four calculi; and although I could still perceive that some remained in the bladder, I did not choose to risk the production of any considerable degree of irritation; but advised him to come on November 1st, to have the operation repeated.

On the 1st of November I extracted three calculi; on the 4th, five more; on the 7th, twelve calculi; on the 11th two; and on the 13th, three more. I then examined the bladder with care, but could not perceive any more stones; and, even before the removal of the last, he had experienced considerable diminution of the pain in making water, and of the difficulty in passing it.

It is delightful to hear the expressions of gratitude which this

patient pours forth for the relief which he has experienced from these operations, under which he has suffered but a slight degree of pain, and has never for a moment been confined from whatever exercise he was disposed to take.

Some years ago he passed red sand (uric acid); but for several months before he had symptoms of the stone, he had not perceived any.

Case. I have lately removed from a young person (a patient of Mr. Rutherford, in Ratcliffe Highway), of the name of Errington, a calculus of moderate size, and enabled two others to pass, by withdrawing the instrument in its dilated state, and thus extended the urethra, in such a degree, that the stones passed in the afternoon of the same day in a copious discharge of the urine.

I have heard that it has been stated, that there was no novelty either in this idea or in the instrument. To this I have only to observe, that if the idea had previously occurred to any individual, he had so far buried it in his bosom that I had never heard of it; and, as to the instrument, I am quite sure that Mr. Weiss consulted no musty volume for its formation; for, so soon as I mentioned my wish, that he should construct a pair of forceps by dividing a sound in its middle, and giving it a joint two inches from its end, he, without quitting me, observed that he should make them to open, in the mode in which he now makes them. Mr. Weiss has a strong and ingenious mind, and does not use petty artifices to obtain employment or character. But let us for a moment suppose (what I do not believe) that the idea had occurred to others, and the instrument had been made centuries ago, what are we to say of the apathy of those bright ornaments of their profession, Cheselden, Pott, Hunter, Cline, Home, Blizard, &c. who, if they had heard of such an instrument, had never employed it.

OF BREAKING OR SAWING STONES IN THE BLADDER.

An instrument for the purpose of breaking stones in the bladder

(called lithontripteur) has been invented; and, during the last year, successfully employed in Paris, by Mons. Civiale.

A description of the instrument, of the mode of using it, and an account of three cases in which it has succeeded, have been published from a Report of the Royal Academy of Sciences.

The size and straight form of the lithontripteur render it only applicable to peculiar cases. The urethra must have acquired its full growth, and the prostate gland must be in a healthy state, or the instrument cannot be employed with safety: even then the urethra must, in most cases, be gradually dilated by the passage of bougies, before the operation can be performed. When introduced into the bladder, the lithontripteur is not calculated to seize a large stone, as the claws or holders do not separate to a sufficient width to grasp it, which cannot be remedied unless the size of the instrument be increased, or the springs weakened.

The lithontripteur is therefore only adapted to the case of an adult, having a sound state of urethra and prostate, provided the calculus be also of a moderate size.

This instrument has not yet been successfully employed in this country.

Mr. Weiss, whose name I have already had occasion to mention, has made an instrument, which is well calculated to break stones of small size, and of not very hard consistence: it is on the same plan as the urethro-vesical forceps, but having strong springs. He is now engaged in perfecting an instrument, which will divide a stone into minute pieces by means of a saw.

OF CALCULI IN THE URETHRA.

They may be best described in the three situations in which the surgeon is called upon to aid their passage, or to remove them by operation; viz. first, in the membranous part of the urethra; secondly, above the scrotum; thirdly, opposite the frænum.

In the membranous part.

If you are consulted on account of a stone being arrested in its progress at the membranous portion of the canal, you find the

patient having the strongest desire to void his urine; but able only to pass a few drops, with dreadful agony. You introduce a catheter to the membranous part of the urethra, and, feeling a stone grate against its extremity, you should immediately withdraw it, and pass a bougie as large as the passage will admit; when this touches the stone it should be left in, and the patient should be directed to sit in water as hot as he can bear it, and continue it as long as he can: at the same time he should take opium with small doses of tartarized antimony. In half an hour, or an hour, withdraw the bougie, whilst the patient tries to make water, when the stone will frequently follow the bougie, being forced from him by the *vis-a-tergo*. I have found this plan to be the most successful.

Operation to extract the calculus.

If the stone permanently lodges in the membranous portion of the urethra, pass a catheter down to it, and introduce a finger into the rectum, to press upon the canal behind the stone, so as to prevent any retrograde movement of it towards the bladder; then make an incision in perineo upon the calculus, and extract it with the common dressing forceps.

Stone behind the scrotum.

If the stone be placed in the urethra above the scrotum, try to press it forwards with the fingers, until it be brought before the scrotum; if this cannot be effected, it must be pushed back behind the scrotum, and there cut upon, if the use of the large bougie, as in the former case, is not successful.

Scrotum must not be opened.

Do not cut through the scrotum to remove a calculus until all other means have been tried; and if it be at all necessary, which I doubt, let the external opening be free, so as to allow of a ready escape for the urine, aud thereby prevent its extravasation into the cellular tissue, which would produce extensive inflammation and suppuration. A catheter should be introduced into the bladder after the operation, and left there, that the urine may flow through it during the time the wound is healing.

Stone near the glans.

If the stone be situated near the glans, the surgeon should try to press it through the meatus; but, if he cannot accomplish this, he should introduce a common probe, curved at its end, behind the stone, and draw it forwards.

Forceps cannot be introduced effectually, because they open in the urethra before the stone, but cannot be passed over it.

Meatus to be enlarged.

It is better to enlarge the meatus with a lancet, to free the passage of the stone, rather than risk the laceration of the parts from violence.

Preparations in the Museum at St. Thomas's Hospital.

In the collection at St. Thomas's Hospital I have two preparations, showing calculi which have ulcerated their way into the urethra. One, a stone of the form and size of the little finger, and slightly curved, which I cut from a young man who had a fistula in perineo: with a probe I felt the end of a calculus through the fistulous opening, and therefore made an incision and extracted it; its anterior extremity was in the membranous portion of the urethra, its posterior in the bladder. In the other preparation, the stones are seen partly in the prostatic part of the urethra, passing there by ulceration. I have twice known a stone in the urethra destroy life by occasioning an extravasation of urine into the scrotum.

LECTURE XXXII.

OF CALCULI IN THE PROSTATE GLAND.

I SEPARATE these from urinary calculi, because they are formed independent of that secretion, and they differ generally in their component materials from urinary calculi.

Found in two situations.

I have found them in two situations in the prostate: first, several calculi, each seated in a separate small duct; secondly, numerous calculi placed together in a cyst or bag in the substance of the gland.

Do not acquire a large size.

They rarely acquire any considerable size; the largest I have seen not being bigger than a pea, and they seldom are so large; but their numbers are sometimes very considerable.

Case.

I was called by Mr. George Vaux, to see a Mr. Lewis, in the Old Jewry, who had retention of urine, and in whom there was

difficulty in passing the catheter. As the instrument entered the bladder through the prostate gland, it grated over a stone. I passed my finger per rectum, and felt two or three calculi grating against each other, and I endeavoured to persuade him to let me extract them, but he would not consent. He died of diseased kidneys, and I have his prostate gland, containing the calculi, in the collection at St. Thomas's Hospital.

The second case was that of General B——, whom I cut for the stone in his bladder: I removed many calculi, some of which were prostatic and some urinary. The surgeon, who had attended the General previously, had observed that a bougie, which he had introduced into the bladder, was marked by the calculi. The patient recovered. Case.

I operated on a patient of Mr. Forbes, surgeon, at Camberwell, and removed an immense number of prostatic calculi. These calculi had produced not only painful feelings in the perineum, but a degree of irritation, which kept the patient in continued mental excitement, bordering upon insanity. I introduced a staff into the bladder through the urethra, and opened the perineum as far as the prostate, cutting into the urethra, as in the operation for lithotomy; I then made an incision into the left lateral lobe, and extracted many calculi from a bag formed in it. The patient bore the operation well, but did not perfectly recover; a fistulous opening remained, and his symptoms became as distressing as before. On examining by the fistulous opening, I could distinctly feel more calculi, although I could not discover them by introducing my finger per rectum. The sufferings of the patient induced me, about six months after the first operation, to perform a second, which I accomplished by passing a director into the fistulous opening, and then enlarging this opening by a bistory; I extracted about half as many calculi as in the first operation. The patient soon recovered from the effects of this second operation, and the wound closed entirely; but, after a short time, his sufferings became as dreadful as before, and, believing that he could not procure any relief, he destroyed himself six months after the second operation. Case.

The operation is not difficult, and is certainly not dangerous. If the calculi are in a single cyst, a single operation will produce complete relief; but if more than one cavity exist, other operations will be required.

These calculi are composed of phosphate of lime.

OF CALCULUS IN THE FEMALE.

Operation seldom necessary.

Lithotomy is much less frequently required in the female than in the male, probably on account of the meatus readily permitting the escape of materials which would have become the nuclei of stones in the male, whether they be portions of gravel, of blood, inspissated mucus, or extraneous bodies.

Symptoms.

When the female labours under calculus, her sufferings are more severe even than those which the male experiences from this disease: at first the symptoms are of the same kind, as urgency to make water, and frequent inclination to do so; sudden stoppage to the flow of urine; pain at the end of the urinary passage; and blood occasionally mixed with the urine. In addition to these symptoms, as the irritability of the bladder increases, the pain during micturition is excessive, and there is agonizing suffering after the discharge of the urine, from a bearing down of the bladder, uterus, and rectum, with a sensation of their being forced through the lower opening of the pelvis. The retention of urine becomes imperfect, and the person is always wet, and smells offensively of urine. The sufferings of the patient at length render her incapable of moving from her bed.

The calculus is usually lodged in the bladder, as in the male; but I have once seen a case in which the stone was placed half in the urethra and half in the vagina; the extremities of the stone were large, and connected by a narrow portion, which passed through an ulcerated opening in the under part of the urethra.

Unnatural propensities in women.

Women sometimes render themselves the subjects of lithotomy from perverse or unnatural propensities. I have known a female put a pebble into the meatus urinarius.

A lady in using a catheter for herself, broke it in the bladder, and I extracted it in the presence of Mr. Ilott, of Bromley.

I have known women introduce extraneous substances into the vagina, to invite the operation for the stone.

A girl, about twenty years of age, came to St. Thomas's Hospital, describing herself to suffer all the symptoms of the stone; she was placed upon the operating table, before all the students, and Mr. Cline passed a sound to ascertain the presence of the stone; he struck some solid body, and a person of less caution might have immediately proceeded with the operation; but he said, "I feel a solid body, which has not the hardness of stone;" he then examined by the vagina, and drew from thence a portion of coal, and afterwards several other pieces: she had no disease. Case.

I cut a woman in Guy's Hospital for the stone, and found a large piece of a brass nail in her bladder, which is now in the collection at St. Thomas's Hospital. Case.

In the female, a stone will form around an extraneous body, as in the male, of which the following is a curious instance:—a woman was the subject of retention of urine, and required the frequent introduction of the catheter: she was under the care of Mr. Castle, surgeon at Sittingbourne; and one of his assistants having passed the catheter, allowed it to escape from his fingers into the bladder, and there it remained for several months: she was then sent to Guy's Hospital, where I sounded her and felt the catheter. I opened the urethra freely with a knife, and passing my finger into the bladder, found the catheter placed transversely in it, and on its centre a large calculus with each end free from such accumulation. I then brought down one end of the catheter to the meatus, with my finger, and thus removed it. The calculus deposit on the instrument weighed at least an ounce. Stone formed on an extraneous body. Case.

Very large calculi can pass by the meatus. Mr. Giraud gave one of more than an ounce weight, which a woman had passed with her urine. Large stones may pass the urethra.

The same medical treatment is proper in the female as has been recommended in the male, to lessen the patient's sufferings. It Medical treatment.

might be thought that solvents could with advantage be injected, but the patients cannot bear them, and will not submit to their use, as they irritate excessively. Opium may be injected, or a suppository be introduced; but they only relieve for a very short period.

Calculi extracted without cutting.

Stones of large size may be extracted from the female without the use of cutting instruments. Mr. Thomas has related, in the Medico-Chirurgical Transactions, a case in which he dilated the meatus urinarius to extract an extraneous body from the bladder. Guided by this circumstance, I removed a calculus, having, by the use of sponge tent, dilated the meatus; and in another case, by the dilating forceps, I took away a portion of a catheter.

Case.

Dr. Nuttall and myself attending a case together, he objected to my mode of dilating the meatus, and thought that forceps with blades opening in parallel instead of divergent lines would be better. We walked together to Mr. Weiss, who, with his usual ingenuity, made a forceps upon that principle.

Unless a stone be extremely large, it should be removed by dilatation of the urethra, which may, by a speculum or pair of forceps, be opened sufficiently in a few minutes for this purpose. The advantage attending this mode of extracting a stone is, that the passage again contracts, and the urine is afterwards retained.

In the first case in which I performed this operation in Guy's Hospital, having used sponge tent, the patient perfectly recovered in a very few days.

Mode of operating with the knife.

If the operation for lithotomy be required in the female, it should be performed in the following manner:—the patient having been bound in the same position as in the operation on the male; the sound is to be introduced (and it may be sometimes necessary to use a curved male sound, which Mr. Cline used to recommend,) in order to detect the calculus.

The stone being found, a straight staff is to be introduced when the sound has been withdrawn; and this the surgeon should hold in his left hand, with the groove turned to the left branch of the

ischium: the beak of the straight bistory is then to be passed along its groove into the bladder, so as to divide the meatus and urethra obliquely downwards and outwards on the left side, between the vagina and branch of the ischium. The finger may then be passed into the bladder, to ascertain the situation of the stone, after which the forceps are to be introduced and the stone extracted. The curved forceps are sometimes necessary on account of the capacity of the bladder, and the usual position of the calculus, which rests behind the neck of the bladder, over the posterior and upper part of the vagina.

A large stone is with difficulty extracted from the female, on account of the proximity of the meatus and pubes. Large stones difficult to extract.

In all cases of this operation which I have performed or witnessed, the urine has not been afterwards retained; but I would not deny that a patient might recover the retentive power. Operation causes incontinence.

As the loss of retention is a greater evil than I can describe, producing excoriation, and a very offensive state, I shall, in any future operation of lithotomy, try what may be effected by employing a suture to bring the divided parts together.

ON CALCULI IN THE SUBMAXILLARY DUCT.

Stones forming in this duct produce considerable inconvenience, and the cause of the symptoms generally exists for some time before it is discovered. Produce inconvenience.

When I was living with Mr. Cline, he used frequently to say, "I have a spasm in my mylo-hyoideus muscle," and it was usually at the time of eating that he made this observation: at length he said, "I have discovered the cause of the uneasiness and spasm under my tongue, it arises from a stone in the submaxillary duct," which he desired me to feel, and which I removed from him in the manner I shall presently describe. Case.

A medical man called upon me and said, "I have an irritation and swelling under my tongue; I have taken great quantities of blue pill; but as my health has become impaired, and the disease Case.

continues, I am advised to go to the coast." On putting my finger under his tongue, I felt a calculus, which I immediately removed, and in a week he was well.

Situation. These calculi are generally situated in the trunk of the duct, but sometimes in its branches within the substance of the gland.

Size. The largest I have seen was of the size of an almond deprived of its shell; I have seen one fluted so as to allow of the passage of the saliva through the depression.

Composition. They are composed of phosphate of lime.

Operation to extract them. The operation for their removal is to be performed as follows:— the cheek is drawn back by means of a blunt hook introduced at the angle of the mouth; the duct is pressed upwards by the finger of an assistant, placed under the lower jaw: an incision is then made, with a pointed and curved bistory, upon the stone from under the tongue, within the mouth, so as to divide the lining membrane of the mouth and open the submaxillary duct; the stone being exposed, is to be brought from its situation by means of a small hook which is to be passed under it. If the stone be deep seated in the substance of the gland, a small pair of forceps are required to extract it.

LECTURE XXXIII.

OPERATIONS FOR RETENTION OF URINE.

It is not my intention, in the present Lecture, to enter into a detailed description of the causes which give rise to the retention of urine; but merely here to state them generally, and at a future time give a more particular account of each.

Causes. The causes which I have known produce retention of urine in the male are:

1. A narrow orifice to the urethra.
2. A congenital obstruction in the urethra.
3. Permanent stricture.

4. Inflammatory stricture.
5. Spasmodic stricture.
6. Abscess or tumour pressing upon the urethra.
7. Stone in the urethra.
8. An enlargement of the prostate gland.
9. Paralysis of the bladder.
10. Chancres or other ulcers in the urethra, which in healing close it.

In the female:

1. Polypus of the vagina.
2. Polypus of the uterus.
3. Ovarian enlargement.
4. Retroversion of the uterus.
5. Loss of power from uterine affection, a species of hysteria.

Consequences. From whatever cause the retention be produced, the bladder must be relieved of its load, or the patient will die from inflammation or gangrene, or perish from irritation.

An operation necessary. If, therefore, a catheter cannot be introduced; if relaxation by bleeding, the warm bath, and antimony; if lulling the patient by opium, do not succeed in giving a passage to the water, an operation will be required to save the patient.

Symptoms. Besides the dreadful pain and excessive irritation occasioned by the distention of the bladder, retention of urine is marked by a frequent urgency to make water, and swelling of the lower part of the abdomen, from the accumulation in the bladder; this swelling reaches as high as the navel, and on each side to the lineæ semilunares: the fluid accumulation can be distinctly felt through the abdominal parietes.

Operation. The mode of relief which has been usually resorted to has been to puncture the bladder: but, in the male, it is not the operation which I perform, nor do I recommend it as a general practice; but as it may be occasionally required, I shall describe the different modes of puncture.

Founded on anatomical knowledge. The operations of puncturing the bladder are founded upon a knowledge of the reflexion of the peritoneum, which passes from

the abdominal parietes above the pubes to the fundus of the bladder; and is continued to the back of the bladder, near to the prostate gland, and is then reflected to the fore part of the rectum.

Thus the cervix of the bladder and its fore part above and behind the pubes, also the posterior and inferior part behind the prostate gland as far as the entrance of the ureters, are devoid of peritoneal covering.

OF THE PUNCTURE ABOVE THE PUBES.

When the bladder becomes excessively distended, its fundus rises towards the umbilicus, and carries with it the peritoneum, so that a considerable space is left above the pubes uncovered by this membrane, at which place a trocar may be easily introduced, without danger of wounding it.

This space is covered by the linea alba, in the centre, and at the sides by the pyramidales and recti muscles, the bladder being attached beneath by cellular tissue.

Operation.

The operation requires the following attentions.

First, The patient is to be placed on a table, in the horizontal position, with his knees a little elevated.

Secondly, The hair is to be removed from the pubes.

Thirdly, An incision, one inch in length, is to be made through the integument immediately above the pubes, in the direction of the linea alba.

Fourthly, A trocar and canula, of sufficient length, are passed through the opening in the skin, and then thrust through the linea alba, cellular tissue, and fore part of the bladder into its cavity.

Fifthly, The direction of the trocar should be to the basis of the sacrum, that is, a little upwards, and not directly downwards in a perpendicular line, as it may then pass between the bladder and pubes; and even if the instrument enters the bladder, as the organ contracts it slips from the canula.

Sixthly, The trocar is to be withdrawn to allow the urine to escape through the canula.

Seventhly, A male flexible catheter is to be passed through the canula, cut to a proper length, so as to remain in the bladder, and is to be secured so as to prevent its escape.

This operation is easy of performance, requiring little anatomical knowledge, and has therefore usually had the preference given to it.

When the inflammation following the operation has subsided, when all danger from extravasation of urine into the cellular membrane has ceased, and the patient recovers his health, it is right to begin attempts to re-establish the urethra by the use of bougies, sounds, &c. and this may be generally effected. After-treatment.

I saw a man from Essex, below Malden, whose bladder had been successfully punctured by Dr. Hare, above the pubes, twelve months before, and who came to town to consult me, with a female catheter still remaining in the bladder, in the same opening at which the urine had been drawn off. I, after a time, succeeded in passing a catheter into his bladder through the urethra, the female catheter was removed, and he returned into the country with the wound above the pubes quite closed. Case.

An objection to this operation, formerly urged, was, that the canula remaining in the bladder produced irritation: this is obviated by the use of an elastic gum catheter, instead of the metallic one. Objection to the operation.

OF PUNCTURING THE BLADDER BY THE RECTUM.

When the bladder is greatly distended, and has not undergone any morbid change, it generally projects into the rectum; so that if the finger be introduced into the gut, a fluctuating swelling is felt just beyond the seat of the prostate gland. Bladder forms a projection into the rectum.

When the prostate gland is enlarged, this part of the bladder is more remote from the anus and less accessible, although still within reach.

Behind the prostate gland is a triangular space, bounded in the following manner:—on each side by the vasa deferentia and vesiculæ seminales meeting at the prostate; and the peritoneum is the boundary behind. In the centre of this space a trocar and Part to be punctured.

canula may be passed through the fore part of the rectum, through the cellular tissue connecting it to the bladder, and through the coats of the latter into its cavity.

If the centre of the space be kept, there is no danger of wounding the vasa deferentia or vesiculæ seminales if the bladder be distended. The trocar may be safely introduced an inch behind the prostate without risk of injuring the peritoneum, and the vasa deferentia may be thus completely avoided, whereas a puncture near the gland might endanger them.

Operation.

The operation is to be thus performed:

First, The patient is to be placed on a high table, so that the surgeon can sit lower than the patient.

Secondly, The finger is to be passed per rectum to the projecting portion of the bladder behind the prostate.

Thirdly, A trocar and canula, three inches long, are to be passed upon the finger to the protruding part of the bladder, and forced through the fore part of the rectum and posterior part of the bladder into its cavity. A curved trocar has been advised and employed, but it is quite unnecessary if the silver canula be not suffered to remain.

Fourthly, The trocar is to be withdrawn, and a flexible gum catheter is to be passed through the canula into the bladder; the canula is then to be removed, and the elastic catheter to be confined to a T bandage, or to a tape passed between the thighs.

After-treatment.

When the patient has sufficiently recovered from the inflammation which the disease and operation have produced, it will be right to begin with re-establishing the urethra.

This operation is easily performed; but it is decidedly objectionable, on account of the urine being liable to produce a diseased state of the rectum.

Dr. Cheston, of Gloucester, told me that he had seen great disease of the intestine occasioned by it.

I was sent for to a patient who had undergone this operation for retention of urine from a disease of the prostate gland. The bladder had been punctured just before my arrival, yet I easily passed a

catheter into his bladder through the urethra. I mention this to show how little the operation was required, and that the enlarged gland did not prevent the introduction of the catheter.

OF THE OPERATION IN PERINEO.

The neck of the bladder around the prostate gland is devoid of peritoneum; and, excepting the posterior surface, where the vasa deferentia and vesiculæ seminales are seated, there is no important part which can be injured by a puncture.

Requires anatomical knowledge.

This operation requires more anatomical knowledge than the two which I have described; it is more difficult to perform, and much more care is required to preserve the opening into the bladder, yet, to a scientific surgeon even this presents but little difficulty. Mr. Cline used always to advocate its performance.

Operation.

The steps of the operation are as follow:

First, An incision is to be made in perineo, as in the operation for the stone, and it is to be carried to the bulb of the urethra, where it is covered by the accelerator urinæ.

Secondly, The bulb is to be pressed by the finger to the patient's right side, and the incision is then carried onwards between the bulb and left crus of the penis, as far as the prostate gland.

Thirdly, The surgeon is to pass his finger into the wound as far as the left side of the prostate gland, so that it may serve as a guide to the canula and trocar.

Fourthly, The trocar and canula are to be pushed into the cavity of the bladder, by the left side of the gland.

Fifthly, The trocar being withdrawn, the canula is left in the bladder to allow of the escape of the urine.

Sixthly, Through the canula an elastic gum catheter is to be passed and secured, as in the former case.

Subsequent treatment.

When the patient has recovered sufficiently, the natural canal is to be opened by the use of a sound or bougie; and in all cases of considerable difficulty, when the urine passes freely by the artificial opening, a caustic may be safely employed.

Other modes of relief.

Having described the different operations which are performed for the relief of a patient having retention of urine, I shall now proceed to point out the practice which I have myself pursued in these cases.

Most frequent causes of retention.

I must premise, that I consider, from the experience that I have had in this disease, that nine tenths of the difficulties in passing the urine arises from strictures of the urethra, or from enlargement of the prostate gland: with respect to the latter, I have never yet seen a case in which I could not pass a catheter, made of proper form and size, although I do not wish to be understood to say, that there never can be such a case; but only, that in the course of a very extended experience I have never found an instance of it. I shall say more upon this subject when I speak of the diseases of the prostate gland; but shall now return to describe the mode of relieving retention from diseases of the urethra.

Preferable operation.

The operation which I prefer is, to open the urethra only, and not to puncture the bladder, which I hold, in the male, to be scarcely ever necessary.

Case.

One night, when giving the surgical lecture at St. Thomas's Hospital, a dresser of Mr. Chandler's, then surgeon to the Hospital, came into the Theatre to inform me that a patient was labouring under retention of urine from the use of a caustic bougie; that the man was in great pain, and that a catheter could not be made to pass the stricture. I said "I will go with you into the ward after lecture, and do what is necessary." The pupils accompanied me. Upon examination of the man, I found that the stricture was seated in that portion of the urethra which was covered by the scrotum. I tried to pass different instruments, but could not succeed.

Reflecting on the case, it appeared to me to be exposing the patient to unnecessary pain and danger if I punctured his distended bladder; as, when I directed him to make attempts to discharge his urine, the urethra swelled excessively behind the stricture, from the urine passing as far as its seat. I therefore determined to make an incision into the urethra only, which I immediately did, being directed to the place by the distention which an attempt to void the

urine produced. The urethra was opened behind the scrotum, and the urine readily discharged. The patient rapidly recovered without any bad symptom.

I was also induced to act as I have described, by the following case. I was sent for early one morning to visit a patient with retention of urine, who had a cicatrix at the extremity of the urethra, from a chancre; for some time the urine had passed in a great degree by drops; and when in a stream, in one not larger than a hair. When I saw him, the urgency to make water was excessive, but not a drop would pass, yet I found that it distended the urethra as far as opposite to the situation of the frænum. I therefore immediately passed a lancet through the cicatrix in the usual seat of the meatus, and so soon as I penetrated the glans the urine rushed by the sides of the lancet. Case.

Mr. Robert Pugh, of Gracechurch Street, sent to me to visit a patient of his who had a retention of urine from stricture in the urethra, which no instrument would pass. Upon directing him to try to micturate, the urethra could be felt to swell behind the stricture, and I passed a lancet into it behind the obstruction. The urine directly flowed through the opening. Case.

I now never open the bladder, but merely do as I have above described; and I am happy to say, that some of my surgical friends, at our Hospitals, have repeatedly adopted the same plan, and successfully.

I sometimes introduce a female catheter into the urethra through the wound, to prevent extravasation and to permit the easy passage of the urine, but this is not absolutely necessary.

This operation has been objected to, on the supposition that it requires great anatomical knowledge, and is very difficult to perform:—to the first objection I will say, that he who is adverse to an operation because it requires anatomical knowledge, should immediately give up his profession; for if surgery be not founded upon an accurate knowledge of anatomy, it will be better for mankind that there should be no surgery, as disease will proceed better with the natural means of relief, than with the aid of those surgeons who are not anatomists. Objections to the operation

Difficulty obviated.

With respect to the difficulty of the operation, I would say to him who finds any, pass a catheter or staff, to the stricture, and, directed by its point in making the incision, carry it an inch behind, and in a line with the point of such director, and the difficulty will vanish.

The state of the urethra in stricture is very different to that which exists with fistula in perineo: in the former case it is large behind the obstruction, in the latter it is contracted and very difficult to find.

Little danger in this operation.

By the mode I have advised, the danger of retention of urine is almost entirely dissipated, for opening of the urethra will be rarely followed by fatal effects.

OF RETENTION OF URINE IN THE FEMALE.

Puncture rarely necessary.

The puncture of the bladder is rarely required in the female; and when it becomes necessary, the surgeon can hardly hesitate in his choice of the mode he shall adopt.

Different modes.

It might be performed through the vagina, or it might be executed by the side of the meatus between it and the branch of the pubes in some cases; but the former would probably cause a fistulous orifice, by which the urine would constantly irritate the vagina, and the latter would for some causes of retention be impracticable.

Above the pubes the best.

The operation above the pubes appears to be, in all respects, preferable to any other; the steps of it are the same as those in the male, and therefore there is no necessity for my again describing it.

OF AMPUTATION OF THE PENIS.

When necessary.

This operation is occasionally required for a cancerous state of the part.

Disease commences.

The disease, which renders the operation necessary, commences sometimes upon the prepuce and sometimes upon the glans.

In the prepuce.

First, When seated upon the prepuce, it begins on a pimple,

surrounded by a hard base; it ulcerates slowly and discharges a bloody serum, occasionally with a mixture of pus. At first, slight irritation only attends it; and, after a time, the patient experiences sharp darting pains. As the disease extends, a large portion of the prepuce participates in it; and if it be long suffered to proceed, a gland in one or both groins becomes affected. A phymosis is gradually produced, and a division of the skin must be made, to ascertain the exact nature and extent of the disease; and if the complaint be decidedly cancerous, it will be best to complete the operation at once, by cutting away the whole of the affected prepuce by a circular incision, and then securing the divided vessels. When the bleeding has ceased, a poultice should be applied, with which the wound heals better than by any other dressing.

Commencing in the glans.

Secondly, When the disease begins upon the glans penis, it usually makes its appearance in the form of a wart, attended with considerable irritation, and a discharge of serous fluid. The wart ulcerates, and the surrounding parts acquire a great degree of hardness and swelling. Other warts, of a similar nature, are produced, so that the ulcers become numerous: they also extend deeply, and phymosis is occasioned by the surrounding tumefaction. Great impediment arises to the passage of the urine, but at length apertures form from the urethra through the skin of the penis: the patient suffers from irritation of the raw surfaces by the urine, and the disease is accompanied with those lancinating and shooting pains, which usually attend cancerous affections.

If the prepuce be slit up, the whole glans is found swollen, and excessively hard; and the penis, from the number of its warty excrescences, and from their eversion, has somewhat the resemblance in its appearance to the cauliflower.

State of the corpus spongiosum.

The corpus spongiosum and the urethra are diseased nearer to the pubis than the glans, and the surgeon must examine with care the extent of the complaint in that direction.

Hæmorrhage.

Free hæmorrhage from the ulcerated surfaces occasionally occurs, the glands in the groin become enlarged, and sometimes several in each groin; and when this happens all hope from surgery has

vanished. The glands sometimes ulcerate and produce a very troublesome sore, with everted edges and irregular surface, a serous discharge, and sometimes free hæmorrhages.

Destruction of the penis.

The penis continues ulcerating until that part which is naturally pendulous becomes destroyed, occasioning retention of urine, and great difficulty in its discharge at other times. The urine passing in various directions excoriates the scrotum, and leads to a most painful but lingering termination of existence.

Frequent cause.

This disease is often the result of a natural phymosis, leading to a confined and irritating state of the secretions of the glandulæ odoriferæ; and, when the constitution becomes unhealthy, to the production of unnatural actions in the part.

Medicine of no service.

As to the treatment of this disease, nothing is to be done by medicine or applications, but to tranqullize the parts and to keep them clean.

Irritating applications prejudicial.

All irritating applications should be avoided. Poultices, ointments of bismuth, lead, chalk, opium, zinc, may be alternately employed, as that previously used loses its effect.

Arsenic.

Arsenic I have tried in these cases, but have never succeeded with it; on the contrary, it has greatly irritated and made the sore more extensive and the warts more numerous.

Removal.

The only means by which the effects of this dreadful malady can be averted, consist in the early removal of the diseased portions of the penis.

It is required, in doing this, that the surgeon proceed somewhat beyond the exact limits of the disease; more especially must he examine with care the urethra and corpus spongiosum, in which the complaint is usually most extensive.

The operation is dreadfully painful, but it lasts only for a moment.

Operation.

Its steps are as follow:

First, Draw forward and elongate the penis as much as is possible.

Secondly, Tie a piece of narrow tape tightly around the penis at the pubes.

Thirdly, Make a direct cut through the penis, behind the disease, without any attention to preserving the integuments to cover the corpora cavernosa and corpus spongiosum; for to do so is a great evil, by preventing a free escape of the urine.

Fourthly, Tie a tape tightly around the remaining part of the penis, and make pressure upon it, and there is no necessity for securing any blood vessel. After-treatment.

When the bleeding has stopped, remove the tape and apply lint upon the wound.

In a few hours, the necessity of micturating will remove the dressings; and when the danger of bleeding has ceased, a poultice should be applied as the best means of exciting granulation and of healing the sore.

When the surface begins to granulate, a piece of bougie, two inches long, is to be worn constantly in the urethra, to prevent its contraction, otherwise it gradually closes as the wound heals, and produces retention of urine. Introduction of bougie.

LECTURE XXXIV.

OF FISTULA IN ANO.

This is an abscess of the cellular membrane, near to the rectum, which produces an aperture into the rectum, or by the side of the anus. Definition.

If it be asked why this abscess is so much more difficult to heal than others, and why it frequently requires an operation; the answer is, that from its vicinity to the rectum, it is influenced by the action of the sphincter and levator ani; and that these muscles have a constant tendency to prevent the union of the granulations and coalescence of the sinus. It therefore rarely happens, but that the surgeon is required to assist nature in the restoration of the parts to a healthy state, by dividing the sphincter, and thus destroying its influence upon the sinus. Difficult to heal.

Symptoms.

The symptoms of this disease are, pain near the anus, with considerable hardness, bearing down, and tenesmus upon going to stool, and difficulty in the evacuation; throbbing and darting pain in the rectum, and on the diseased side of the nates. A fluctuation is perceived; and if the case be left to nature, the abscess breaks either into the rectum, and the matter and blood are discharged with the fæces, or it breaks externally near the anus, but sometimes at a distance from it, either in the perineum or in the nates. The matter which issues from the abscess is sometimes excessively putrid, extricating a considerable quantity of air, and is highly offensive.

Discharge of the matter.

The fistulous orifice, when it is formed into the rectum only, is the most difficult of management, because the orifice is with difficulty discerned. When the abscess breaks both externally and into the rectum, it is most easy of treatment; but it generally discharges itself only externally; and a probe, when introduced, passes to the side of the rectum, sometimes to the external surface of the intestine, at others from half an inch to an inch from it, so that the original seat of the matter is in the cellular tissue surrounding the rectum.

Extensive sinus.

I have several times known a sinus form on each side of the anus, and communicate around the rectum, of which we have a preparation in the collection of St. Thomas's Hospital, so that the rectum has been considerably separated from the surrounding parts.

Case.

I examined a man who died of a discharge from a sinus in the groin, and who had a fistula in ano; and upon tracing the sinus in the groin, it passed under Poupart's ligament and took the course of the vas deferens, and descended into the fistula in ano.

Small sinus.

Sometimes the sinus only just reaches the sphincter, and is extremely small, at first appearing only as a suppuration of one of the follicles of the anus. Sometimes the matter burrows four inches by the side of the rectum.

Caused by a pile.

The abscess has, in some instances, its origin in a suppurating pile.

Origin sometimes local.

Fistula in ano is, in a few instances, a local disease, depending

upon a change in the part itself; but is much more frequently the result of distant visceral complaints, and of a broken state of the constitution.

When confined to the part, it arises from obstinate costiveness and the efforts to discharge the fæces; and the passage of an indurated stool produces inflammation of the muscles and cellular tissue of the rectum. But the opposite state to the above I have several times known produce it; thus, in a severe diarrhœa, which determining large quantities of blood to the rectum, and being accompanied with tenesmus, is followed by inflammation and suppuration at the extremity of the rectum. How produced.

But the more common cause is disease of the liver, which, preventing the free return of blood from the intestines, leads to inflammation at the anus, and by influencing the secretions from the intestines, occasions a similar effect.

Diseased states of the lungs are also frequently giving rise to it, from the impediments they produce to the free return of blood, local venous congestion is produced: piles are a common effect, and abscesses at the anus frequently follow.

Often, therefore, before a person perishes from phthisis, he has a fistula in ano; and this is the reason fistula is considered as a dangerous disease; although in reality it is not so, but it is the consequence of more important diseases, which destroy life. Connected with phthisis.

The surgeon often brings discredit upon himself by operating in these cases in the last stage of phthisis, when no operation ought to be performed, and when it is impossible the disease can be cured; therefore that death, which is the result of pulmonary disease, is falsely attributed to the fistula in ano.

The medical treatment of this disease consists in restoring the secretions of the liver and intestinal tube, by submurias hydrargyri, or pil: hyd: at night, and infus: gentianæ compositum, with soda and rhubarb, twice in the day; and if there be any pulmonary or pectoral disease, its treatment must precede, and its cure be performed, before any active local means of treatment be had recourse to. The strength of the patient must also be restored Medical treatment.

before any operation be performed, or the wound will not heal favourably.

Local treatment.

If a patient applies with a tumour near the anus, threatening the production of an abscess, and the general health be tolerably good, its treatment is to be as follows:—apply leeches to the part, and let a lotion of the acetate of lead be constantly kept upon the surface. Give to the patient the confectio sennæ with sulphur, as the most gentle aperient; all drastic medicines exert too much action of the muscles of the rectum, and determine blood to the anus, so as to add to the irritation and increase the disposition to suppuration.

To be opened early.

If the swelling increase and become more painful, apply fomentation and poultice to the part. When a fluctuation can be perceived, put a lancet into the swelling, as an early opening prevents a large collection of matter, and I have known the wound immediately close and no fresh accumulation follow.

If it break by natural efforts, it is best to suffer it to discharge and to fill by granulating, to make the sinus as small as possible before any operation be performed.

The sinus very rarely heals entirely by natural processes, because, as soon as its sides adhere, they are pulled asunder by the action of the sphincter ani, and union is thus constantly prevented.

Four states of fistula.

There are four variations of the fistula, as regards the operation.

Operation for the first.

The first is that in which the abscess breaks into the rectum and near to the anus; and the operation consists in the following steps: introduce a probe into the sinus, by the side of the anus, and carry it into the rectum, so as clearly to ascertain the course of the sinus, and to learn if any part of it extends above the opening into the rectum. Then introduce the director, and pass the probe-pointed bistory of Mr. Pott through the sinus into the rectum. The finger covered with oil is next to be introduced into the intestine, and is to be placed upon the extremity of the probe-pointed bistory; then, if the sinus be of considerable length, the finger and knife are brought out together, so that the knife cuts the intestine and

sphincter as it is withdrawn. If any portion of the sinus remain above the opening into the rectum, it should be divided with the probe-pointed scissors; one blade of which is passed into the extremity of the sinus, and the other into the rectum, and then, by shutting them, the sinus is divided. If the opening into the intestine be situated only a short distance from the anus, the end of the bistory may be first brought out at the anus, and the operation completed by pushing the knife forwards.

Second state. The second state of the sinus is that in which the opening is only at the anus; and when the probe is passed into it, it is felt at the extremity of the sinus, at some distance from the rectum.

Operation. In this case, what I do is this: I pass the probe-pointed bistory to the extremity of the sinus and my finger into the rectum. I then, with the extremity of the finger and the finger-nail, move the rectum upon the blade of the knife near its probed extremity, and sometimes move the knife a little at the same time. Thus, I easily make the knife divide the intermediate parts, and then bring its probed point into the rectum, when the operation is concluded as in the first case. I have known, in this instance, the division made by the sharp-pointed curved bistory; but the objection to it is, that its point rarely takes the course of the sinus: then a portion is left undivided.

Savigny, an ingenious instrument maker, made a double bistory, with a pointed and a probed knife: the one sliding by the side of the other. When it was introduced the sharp-pointed bistory was thrust forward, and then retracted, and the probed bistory succeeded it; but the objection to this instrument was, that it was too large for its easy introduction into the sinus, and it is really quite unnecessary.

Third state. The third state is, that where the sinus enters the rectum, and has no external opening. It is required, if the orifice cannot be felt by introducing the finger into the rectum, to wait until an accidental inflammation leads to the capacity of feeling a swelling externally, when a lancet should be put into it from the side of the

anus. A probe being introduced, it passes into the suppurating cavity communicating with the rectum.

Operation. In this case it will be proper to perform the operation which has been described for the first state of fistula when there is an opening externally, and within the rectum.

Fourth state. The fourth and last state is, that in which the sinus or sinuses extend from the anus into the nates.

Operation. The practice I pursue is, then to divide the opening in the nates through the external skin, but leave that near the anus at first undivided, and when I have healed this part, then operate upon the other in the same manner as in the second kind of fistula.

OF TREATMENT AFTER THE OPERATION.

Local treatment. When the fistula has been divided, put dry lint into the wound, and compress the part until all bleeding has stopped. On the following morning apply a poultice, and in two or three days the lint will separate. Then pass a probe into the wound often, to prevent the union of the sides of the sinus for five or six days from the operation, and continue to poultice; but after this time, when granulations arise, it is right to introduce lint into the wound, and prevent their inosculation, until the wound, gradually granulating every where, the cavity becomes filled. If lint be introduced into the wound on the second, or third, or following days from the operation, great pain is given, and much inflammation is excited, so that there is danger of fresh suppuration: wait, therefore, until the inflammation has ceased, and then introduce but a small quantity of lint, and with great gentleness.

Constitutional treatment. If the sore be very indolent, occasionally purge the patient, and give him the confectio piperis, which produces very healthy granulations, and apply to the wound lint dipped in a solution of the sulphate of copper, or spread with the unguentum hydrargyri nitrico oxydi.

OF INJECTIONS FOR FISTULA.

Of the cure by injection.

Although, as it will be readily believed, I have seen a multitude of cases of fistula, I have only known two cured by injection, which were as follow:

I was attending, with Mr. Pugh, surgeon, of Gracechurch Street, a lady, in Fenchurch Street, who had a fistula on each side of the anus. I opened one fistula, and cured it; but the patient would not submit to the operation upon the other. Mr. Pugh and I therefore agreed that we would try other means, and we injected into the sinus with oxymurias hydrargyri, the liquor calcis gr. 1. ad ℥j. and the sinus healed.

Case.

The second case was a gentleman from the North, a friend of Lord Harewood, who had been under the care of Mr. Hey, of Leeds, for a fistula on the right side of the anus, and who came to me for advice. The fistula was of great depth and distance from the rectum upon the opposite side. I feared opening it, both from the delicate health of the patient, and the danger of hæmorrhage; and therefore threw into the sinus equal parts of port wine and water. My nephew, Mr. Bransby Cooper, finding it did not bring on sufficient inflammation, injected port wine, undiluted, and thereupon inflammation followed; adhesion was produced, and the case terminated without further alteration.

OF SETON FOR FISTULA.

Of the cure by seton.

Timid persons prefer this mode of treatment to the knife, although in the one case the irritation is long continued, and in the other the pain is only of a few minutes continuance.

That it succeeds, in some instances, I have known; for some of my patients, having submitted to this remedy, returned to me well.

My objection to it is, that the irritation it produces is liable to occasion other abscesses, whilst healing that for which it is employed.

OF PILES OR HÆMORRHOIDS.

Two states.

These are found in two states, viz. a varicose enlargement of a vein; or an excrescence arising from its adhesion and organization.

The first is external or internal.

Of the external

The symptoms of the first are an external swelling, which feels round and hard, which is painful at the passage of the stools: is hot and itches at other times. It sometimes bursts, and discharges blood with the stools. In a few days it declines and disappears. Sometimes it becomes inflamed, and very acutely painful; and it now and then suppurates, and lays the foundation of fistula. If cut into before suppuration, a large and very solid clot of blood passes from it.

Repeated returns of this complaint engender an excrescence, which arises from the swelling having undergone adhesion, and become organized, forming a cutaneous tumour which is very vascular. The skin over it is thin,—the substance very irritable, and pains shoot from it into the rectum to a considerable height from the anus. I have known a person confined to her bed from the excoriation and suffering produced by such excrescences originating in external piles.

Internal.

The internal piles are originally enlarged veins: they produce pain about the sacrum, bleed frequently, and render the passage of the motions difficult; and the stools are often mixed with blood.

At length many of these become obliterated by adhesion, and form very vascular pendulous tumours in the entrance of the rectum.

Occasion prolapsus ani.

They often occasion prolapsus ani; the patient feels as if there was more motion to discharge, and he forces the rectum until a part of it becomes everted, and the internal piles appear externally, thus producing prolapsus ani. The patient, after each evacuation, is obliged to return these with the finger; the evacuation is in consequence highly painful, tedious, and very often the return of the part is exceedingly difficult.

The bleeding from the piles thus everted is often so profuse, that the weight of the blood exceeds that of the fæces. They sometimes vent a considerable serous discharge. When the number and size of the piles, and the degree of prolapsus becomes great, and there is much difficulty in their return, inflammation sometimes arises in them, and their return is rendered impracticable, without giving an unjustifiable degree of pain. When in this state, in addition to other sufferings, the urine is retained, the fæces pass with extreme difficulty, and there is a free sanious discharge from the part. When thus inflammation is the result of a strangulation of the piles from the pressure of the anus, it is immediately relieved by the return of the parts; but often the inflammation precedes the descent, and then the parts are too tender to be returned. It now and then happens that by this process nature effects a spontaneous cure of the disease; the parts proceed to gangrene, and a slough of the piles is produced, the rectum ceases to prolapse, and at least for a great length of time the patient is rid of his complaint.

Profuse hæmorrhage.

The usual cause of piles is a sedentary habit, which leads to congestion of blood in the vessels of the rectum.

Causes, sedentary habits.

A diseased state of the liver is also a cause, by preventing a free return of blood.

Diseased liver.

Obesity occasions them, by the pressure of the omentum and mesentery upon the mesenteric veins.

Obesity.

They, like fistula in ano, frequently arise from pectoral complaints, which affect respiration and the freedom of circulation.

Pectoral disease.

OF THE TREATMENT OF PILES OR HÆMORRHOIDS.

If a patient applies with an external pile, open his bowels freely with confectio sennæ and sulphur. Apply leeches to the parts, and a lotion of acetate of lead. If, when the inflammation be subdued, the vein remains enlarged and hardened, puncture it with a lancet, and discharge a large and very firm clot of blood which it contains.

Of the external

If it suppurate, fomentation and poultice will be the best appli-

cations: and when it bursts, if it shows no tendency to heal, it must be opened into the rectum.

The excrescences left by external piles are growths only of the skin, and they may be freely removed when they become troublesome. Subdue the inflammation first, with evaporating lotions, and then remove them by scissors, or by the knife. The former is by far the most painful mode to the patient, but most easily performed by the surgeon.

Do not bleed. These excrescences furnish no bleeding of any consequence.

Mode of removal. I generally pass a tenaculum through them, draw them towards me, and cut them off with a lancet.

Treatment of internal piles. The treatment of internal piles is more difficult, and requires attention to a number of circumstances.

Medical. First. The medical treatment demands the exhibition of confectio sennæ cum sulphure; the bals: copaibæ is also a good medicine. If there be hepatic congestion, gentle doses of blue pill should be given, to restore the biliary secretions; in general, however, mercury disagrees in piles: Ward's paste, or confectio piperis of the London Pharmacopœia, is an admirable remedy, opening the bowels gently, and contracting the dilated vessels; soda and rhubarb I have known useful. If piles arise, as they sometimes do, from diarrhœa, the confectio opiata is the best medicine.

Local. The local treatment, to prevent their increase, is to inject cold water into the rectum twice per diem; a dilute aluminous injection is also useful, combined with decoction of oak bark.

Diet. The diet must be attended to; animal food is better than vegetable, as occupying less bulk to afford the same degree of sustenance, and consequently presses less upon the returning blood vessels. Mutton is the best butcher's meat. White fish is easy of digestion. All flatulent food should be avoided. A good deal of exercise should be taken; and I have seen, in the incipient state of this disease, horse exercise of great benefit.

Hæmorrhage. When the piles bleed, the medicine should be infusum rosæ cum magnesiæ sulphate; cold water should be still injected.

If prolapsus be produced, it should be washed with a solution of alum and oak bark, and it should be returned by a piece of linen dipped in oil, or covered by ceratum cetacei. Prolapsus.

When the piles are inflamed and a prolapsus is produced, purge the patient once freely; apply leeches; foment and poultice the part, and give opium as soon as the purgative medicine has operated. For two or three days let the bowels be quiet: the leeches, fomentations, and poultices being continued, then purge again; for daily purging adds to the inflammation and irritation. Inflammation.

I have known the application of cold water to the prolapsus useful, also the acetate of lead lotion, and the lotion mixed in a poultice, agrees best upon the whole; although the warmer applications are the most congenial with the patient's feelings.

Spontaneous bleedings from the piles greatly relieve them; and I have therefore sometimes punctured them with a lancet, with a view to the relief of the congestion of the vessels. Puncture.

However, all the means which can be employed will not always prevent their increase; nor when they are once suffered to acquire considerable magnitude, and to produce prolapsus ani, can they be subdued by any medical or local treatment short of operation.

To examine a patient properly under these circumstances, and to enable you to form a correct judgment of the necessity for, and the mode of operating, it it necessary that the patient should have an evacuation; and that, before the return of the prolapsus, the surgeon should examine the part. Mode of examination.

He will then observe a portion of the rectum, forming the outer circle, and a number of round and dark-coloured projections, occupying the more central parts of the protruded mass. The operation is then ascertained to be necessary or not, according to the degree of prolapsus and the number and size of the piles.

Having determined that an operation is required, it is next to be considered in what manner it is to be performed.

It may be done by excision, or by ligature, or it may be effected by a combination of the two. Two modes of operation.

Excision.

For excision, in the early part of my surgical career, I was a strong advocate; for I found it a less painful operation than ligature, and it appeared to me not dangerous; but as my experience increased, I was induced to change my opinion, and to consider excision as not divested of danger.*

The three following cases are proofs of this: the first, dying of inflammation; and the second and third from hæmorrhage. I have also seen, in a fourth case, extensive suppuration produced by excision.

Case.

Mrs. O——, the wife of a respectable medical man, came to London to have some hæmorrhoids removed; and I advised their excision, observing, that her constitution was of a feeble and irritable kind. I removed only one of three which appeared. In three days after the excision by scissors, I found her complaining of great pain in her abdomen, from intestinal and peritoneal inflammation: she frequently vomited, and her abdomen became tense. The symptoms were not relieved, although motions were procured, and she died in a week from the operation. The internal surface of the intestine, and the peritoneum, were inflamed extensively.

* A notorious quack, ambitious of Chirurgical notoriety, would try his hand on a poor unsophisticated Welchman, in the employ of Messrs. B. & P. for the cure of his piles. He excised one of considerable magnitude with his shop-scissors, but before the poor fellow got home, the hæmorrhage became so profuse that the blood literally overflowed his shoes. This Pile-doctor was sent for to arrest the further effusion of blood, but all his efforts, from the previous evening till Seven o'Clock the next morning, were unavailing: persons about him declaring that he must have lost a pailful of blood, notwithstanding a large wash-hand basinful of *Parker's Roman Cement*, flour, brick-dust, and rags, were to be removed from his nates, before the bleeding vessel could be discovered. To repress the hæmorrhage, I introduced a cylindrical tent into the rectum, and applied a ligature on the bleeding vessel; no peritoneal inflammation followed, but the man was a considerable time before he recovered. What a contrast! Sir A. Cooper is justly applauded for the candid admission of his unsuccessful cases—the hero of this note narrowly escaped immersion in a horse pond. L.

Mr. Esdaile came to London from Guernsey or Jersey, in order to have a hæmorrhoid removed. Mr. Leman and I attended him, and I removed a single pile by scissors. On the following day he was exceedingly low, his pulse small, so as to be scarcely perceptible. On the next he voided a great quantity of blood from his intestines; and on the day after he died, falling a victim to internal bleeding, from the return of the divided vessel with the prolapsed intestine. Case.

The Earl of S—— applied to me for piles with prolapsus ani, and I removed some of the largest with scissors; the prolapsus was greatly relieved; and for more than twelve months after he was little troubled, either with hæmorrhoids or prolapsus. About two years afterwards he again applied to me, for a return of his complaint; and seeing his age, and having examined the piles, I thought before I operated, I would have a consultation, when the operation of excision was again recommended. I removed with the scissors one of the largest, and desired his lordship to keep the recumbent posture. He laid down upon the bed immediately after the pile was removed. In about ten minutes 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 hæmorrhage. 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 he complained of pain in his abdomen; he had sickness, and tenderness upon pressure, and in four days he died. In the presence of Mr. Wardrop, I opened his body, and found inflammation of the rectum, and disease of the glandulæ solitariæ of the intestine, they being enlarged and Case.

hardened, so that the intestine internally had a curious spotted appearance. He was not, therefore, a healthy or sound man in other respects; and it is in such cases that unexpected symptoms arise after operation.

Ligature.

As a ligature prevents the danger of bleeding, it is best to use it although the process is more tedious and painful. The pain which it produces may be mitigated by not drawing the ligature too tight. Draw down the pile with forceps, or a tenaculum, and tie a piece of waxed silk around it, draw the knot until the patient complains severely, then tie a second, cut off the ligature a little way from the knot, and return the intestine and pile.

Double ligature.

But in cases in which the pile is very large, a safer and less painful plan may be adopted; namely, to pass a needle and ligature through them, and to cut them off beyond it.

Operation.

The mode of operating for these large hæmorrhoids is as follows: Draw down the pile, pass a needle, with a double ligature, through its juncture with the intestine. Cut off the needle, and the two ligatures will remain on the pile; then tie one above, and the other below, and thus the whole pile is included; then cut off the pile with a lancet or scissors beyond the ligature, and in the evening, or on the following day, the threads may be removed, as all danger of bleeding has ceased.

By this operation hæmorrhage is prevented, and the pain is exceedingly diminished, as the ligature does not require to be made very tight.

The prolapsus ani generally soon ceases after the complete removal of the piles; but if it does not, cold and astringent injections should be employed, and the confectio piperis be given.*

* Persons afflicted with piles will do well to observe the following plain rules.

First, Never to strain at stool, for by the violent expulsion of the fæces, and the great haste with which it is frequently accompanied, the hæmorrhoidal veins become distended with blood, before there is time for them to return to their natural state.

Secondly, Wash the part immediately with a sponge and cold water: the habit is cleanly, consequently salutary: and the cold water exerts a very considerable influence in astringing those over-gorged veins.

LECTURE XXXV.

OF POLYPUS OF THE NOSE.

Four kinds.

POLYPI of the nose are of four kinds; First, the common pendulous polypus; Secondly, the hydatid polypus; Thirdly, the cancerous; Fourthly, the fungoid.

OF THE COMMON PENDULOUS POLYPUS.

Symptoms.

This disease is marked in its commencement by an occasional obstruction in the nose, as if from catarrh; the obstruction being increased in foggy and damp weather, and being greater early in the morning and late in the evening than in the middle of the day.

Age.

Persons of all ages are subject to the formation of these polypi: but it is of more common occurrence between the ages of forty and fifty than at any other period.

Appearance.

On looking into the nose, a jelly-like appearance is seen, which, upon directing the patient to inhale through the nostrils, recedes, and upon his exhaling advances and re-appears; the degree of motion, however, necessarily depends on the magnitude of the polypus compared with that of the nostril. The voice has a nasal sound, and there is generally some uneasiness felt between the eye-brows, in the situation of the frontal sinuses.

Thirdly, Let this be the last action of the day, in order that the horizontal position may be assumed immediately after; which will greatly facilitate the ascent of blood in the hæmorrhoidal veins, and this might be assisted by gentle pressure.

Fourthly, As piles are produced by the blood being obstructed in its passage about the anus, proper attention should be paid in emptying the lower portion of the bowels; and when this difficulty exists, the ordinary posture on the water-closet may be dispensed with advantageously. L.

Seat.

The polypus grows from that portion of the schneiderean membrane which is situated upon the same side with the turbinated bones. I have never yet seen a polypus growing from that covering, the septum narium. The body of the polypus is generally yellow, and is streaked with few vessels. Its neck diminishes often to a very small stalk. Now and then two or three polypi grow from a single stalk. When a polypus becomes very large, instead of advancing to the nostril it recedes into the throat, appearing behind the velum palati; and sometimes when it grows from the back of the nares, it makes its first appearance in the throat. It here becomes of very considerable size, and at length would readily allow a ligature to be passed around it; but this, as I shall presently describe, is not the best mode of its removal. When it appears in the throat, I have seen its body divided into a number of different portions.

In the collection at St. Thomas's Hospital, their great size and broken surfaces are well seen in many preparations, as well as their origin from the pituitary membrane.

OF THEIR REMOVAL.

An operation necessary.

No other mode than an operation will succeed in removing these excrescences. I have repeatedly tried the application of caustic; but it only acts upon the surface, and the root grows faster than that surface can be destroyed. Aluminous and other astringent applications render the breathing a little more free at the moment, but produce no permanent relief.

Three modes.

Three modes have been proposed for their removal: First, by laceration; Secondly, by excision; Thirdly, by ligature.

First, by laceration.

First. Laceration is the usual mode. For this purpose, a surgeon should be provided with two pair of forceps; one pair slightly curved, terminating in a point hollowed at the end, and that hollow containing pointed teeth, having an aperture in each blade. A second pair, formed like common dressing forceps, only the blades longer and more slender, having serrated teeth, received

between each other like a serrated suture of the skull. These can be received into the smallest nostril, and readily made to act in any part of it.

Operation.

The operation is performed as follows: the patient sits upon a chair opposite a strong light, a probe is then introduced into the nostril, and the surgeon feels with it the exact situation of the stalk of the polypus; then withdrawing the probe, he passes the forceps to the stalk, and, enclosing it between the blades, with very gentle jerks, he either tears through the stalk, or draws away the portion of membrane from whence it grows: instead of removing it by jerks, the surgeon may turn the instrument upon its axis, and thus lacerate the stalk of the polypus. Now and then a thin film of bone separates with the pituitary membrane, which only more effectually secures the patient from a return of the disease.

If more than one polypus exist in the nostril, a separate operation is required for each; and if they exist upon each side, the operation may be performed on the same day in each nostril, for there is no danger in this operation. I never knew but one person die in consequence of it; he had previously had some disease in the brain, a piece of lint was placed in the nostril, after the operation, and this gentleman died a few days after of inflammation of the brain. It is better not to introduce lint, or any extraneous substance likely to produce irritation, immediately after the operation.

No serious hæmorrhage.

The hæmorrhage which results from this operation never amounts to any serious quantity.

As the disease is liable to return, when the inflammation succeeding the operation has subsided, aluminous injections may be used, or the liquor calcis with oxym: hydrarg: to lesson the disposition to the return of the complaint.

To remove them from the posterior nares, I have used curved forceps, introduced behind the velum; but they do not answer so well as the mode I have next to describe.

Secondly, by excision.

This operation requires a pair of scissors with probed extremities, made straight, with long and slender blades.

Operation.

The patient being placed as in the former operation, the scissors are at first introduced shut, in order to ascertain the attachment of the polypus; and being then opened, the stalk of the polypus is cut through; then the surgeon, closing the other nostril, directs the patient to blow forcibly through that in which the operation has been performed, when the polypus is immediately ejected; but if the polypus appear in the pharynx, the surgeon divides the stalk in the same manner as before, and then putting his finger behind the velum palati, he with it draws the polypus away through the fauces. In that way the largest polypi are to be removed; and I have never seen either danger or difficulty arise from its performance; but, on the contrary, have several times succeeded when the forceps by the nostrils had been employed in vain.

Objection to this mode.

It has been objected to this mode of operating, that very considerable hæmorrhage is produced by it; but this can only arise from a very indiscreet manner of performing it, by repeatedly cutting the pituitary membrane, which could hardly happen with probed scissors.

Thirdly, by ligature.

The third operation, namely, that by ligature, is now very generally abandoned by surgeons, on account of the difficulty of its application, and the necessarily imperfect removal of the disease.

Disease resembling polypus.

There is a disease in children very frequently mistaken for polypus, by men who have not had much experience in surgery. It is an elongation of the pituitary membrane of the nose, from relaxed constitution, and from effusion of serum into the cellular tissue of the part; it is red and very vascular. It appears more upon the extremity of the superior turbinated bone than upon the inferior; but I have seen it upon both. It sometimes becomes chronic. It requires alterative medicine, and the application of a solution of alum, or of sulphate of copper, or nitrate of silver. I

have more than once known this disease removed by forceps cruelly and unnecessarily.

OF HYDATID POLYPUS.

The nostrils of young persons sometimes become filled with growths which appear of the hydatid or encysted kind. They resemble wetted bladders hanging within the nose, are unattended with pain, but produce the inconvenience of occasional obstruction. When pressed with forceps they burst, and discharge a mucus, somewhat resembling that secreted by the schneiderean membrane: the cyst only is removed by the forceps. The nose may be repeatedly cleared of them by instruments, but they are always regenerated. By continued growth they enlarge the nostrils, and deform the face.

Occurring in young persons.

I have seen them removed in two modes: First, by the use of a strong solution of alum introduced on lint, and constantly worn; Secondly, by the daily application of the muriate of antimony used by a dossil of lint through the medium of a canula. The first is the preferable mode; but I cannot decidedly speak as to its preventing the return of the disease: they are destroyed more quickly by the muriate of antimony, but with much more suffering.

Two modes of removal. By alum. By muriate of antimony.

OF THE CANCEROUS POLYPUS.

This is a disease of age.

Occurs in elderly persons

It commences with obstruction in breathing, but is, at first, unattended with pain; as the disease increases, the sufferings are very acute, and not confined to the diseased part, but extend to the different branches of the fifth pair of nerves, striking sometimes into the brain itself.

Symptoms.

Its growth is slow, and it is some time before it produces any discharge; but at length it ulcerates, and discharges a bloody serum.

Slow growth.

Colour. Its colour is purple; its feel is firm. It sometimes bleeds with great freedom. It sloughs, and in its progress it produces great alteration in the form of the face, which it disfigures horribly. It extends into the sinuses, and frequently affects the lachrymal sac.

Produces deformity.

It often alters the roof of the mouth, producing absorption of portions of the superior maxillary and palate bones.

Destroys life gradually. It is a long time in destroying life; the latter days of the patient cannot but excite pity in the most unfeeling bosom. Medicine and surgery do nothing for this disease: excepting opium, belladonna, hemlock, and hyoscyamus are administered locally and constitutionally, to mitigate, in some degree, the patient's tortures; and the dose of the former is at last increased to keep the patient in a constant state of torpor.

OF THE FUNGOID POLYPUS.

Occurs at all ages. The fungoid polypus occurs at all periods of life; but the best case which I can give of this disease is the following:

Case. A young gentleman came to my house with a large purple excrescence projecting from the nostril, which completely obstructed the passage on that side. I made a cast of this disease, which is now in the collection at St. Thomas's Hospital. There was a copious discharge of sanious fluid from it; but the disease was little painful, and the general health was, at first, but little affected. I passed a ligature around the root of the polypus as high as I could reach, and it sloughed away without hæmorrhage. I was gratified with the result of this operation, as the patient appeared to be greatly relieved; but some time afterwards I heard that the disease had returned, and that it had been again removed. It again grew, and ultimately destroyed life. The head was examined, and the disease was found to have grown from a very small surface of the pituitary membrane.

Extends. In general, the disease enters the different sinuses, affects the lachrymal sac, and ductus ad nasum; bleeds copiously, but has not

the pain accompanying cancerous disease. The patient dies from copious discharge, the frequent hæmorrhages, and at last from nervous irritation.

OF POLYPOUS EXCRESCENCES IN THE PHARYNX.

I have seen two cases of this disease.

One in a Spanish gentleman, who came through Paris, where he consulted various surgeons; and on his arrival in London, asked my advice for a polypous excrescence in his pharynx, of the colour of the mucous membrane of this portion of the alimentary tube, beginning from the fold over the palato-pharyngeus, and hanging down like a sausage into the pharynx. By great efforts he could regurgitate it into his mouth. I requested him to permit me to pass a ligature around its root, which I succeeded in doing, without much difficulty, and it separated in eight days. Case.

I lately saw a second case, with my nephew, Mr. B. Cooper: it was similar to the former in appearance, but not quite so large, and grew more from the root of the tongue. I removed it also by ligature, and both these cases completely succeeded. Case.

POLYPUS OF THE RECTUM.

I have several times seen the following disease.

A lady sent for me to see her infant, who, she observed, after a motion, had a substance like an earth-worm appear at the anus, of considerable length, and of a red colour. Upon examination, after an evacuation, I saw at the anus a red projection, and upon pulling it down, found it to be of considerable length, growing about an inch to an inch and a half from the anus, attached to the interior of the rectum. I drew it down, put a thread around it, and cut it off as near to its origin from the rectum as I could, and it never returned. Case.

Sometime after, a child was brought to me from Surrey, with the same disease; the substance looked like a leech, and I cut it off Case.

without putting a thread around it. Whilst at Lecture I was sent for to attend the child on account of hæmorrhage, and I begged Mr. H. Cline to visit the patient for me; but he soon returned and informed me, that the bleeding had been of little consequence, and had stopped spontaneously. The child recovered.

Case. In a stone patient of Mr. Gaitskell's, upon whom I was operating, the child having prolapsus ani, I saw a small excrescence, red and pendulous, growing upon the mucous membrane of the intestine, which I thought was the commencement of one of these diseases.

Case. I have only twice seen this disease in the adult; once at the age of twenty-three years: I put a ligature upon its root, and removed a portion beyond the ligature, having the external appearance of a common earth-worm.

Case. An apothecary of Bristol, a friend of Mr. Brickenden, surgeon, in the Borough, came to me, some years ago, with a polypus growing in his rectum, about two inches from the anus, which I removed: he had previously been subject to dyspeptic symptoms, with great irritability of the rectum, which subsided after this operation, and the use of alterative medicines which were given him.

OF FUNGOID POLYPUS OF THE RECTUM.

Case. A gentleman was brought to me by Dr. Hopkins, of Peterborough, who laboured under this disease, the symptoms of which were a copious and sanious discharge from the rectum; very little pain; but upon his going to stool, or even by efforts in which the fæces were not discharged, a polypus was protruded, having a broken surface like a cauliflower, large as an egg, and of a dirty brown colour, breaking readily, and bleeding where it broke. The general health had not materially suffered. I put a ligature upon the neck of this polypus near to the mucous membrane of the intestine: it sloughed away in a few days, and for some time the gentleman appeared to be well; but having occasion, many months afterwards, to go through Peterborough, I was requested to see this

gentleman; when I found the disease had returned, that the rectum had ulcerated, and that his health was broken: soon after he fell a victim to the disease.

In the present state of medical and surgical knowledge, this disease, like the scirrho-strictured rectum, will prove destructive.

OF ENLARGED TONSILS.

Enlargement of this part, from common angina, is a frequent occurrence; and it is best relieved by purging, by leeches applied to the throat, or by a blister placed beneath the angle of the lower jaw. Of frequent occurrence.

If the gland suppurate, the pain is exceedingly severe; the attempts to swallow are agonizing, and the painful sensations extend along the Eustachian tube to the ear. When matter has formed in the tonsil, it may be detected by applying the finger to the surface of the gland in the fauces. Sometimes suppurate.

Fomentations and poultices assist its progress most effectually; and I think, upon the whole, that they do best when left to break spontaneously. But when great difficulty of breathing attends the presence of matter, it should be discharged by puncture with a small lancet, or with the knife used to divide the cornea. Some danger attends the operation of opening such abscesses, and circumspection is required to prevent a wound of the internal carotid artery. Treatment.

After the matter is discharged, the case speedily does well.

Sometimes a chronic enlargement of the tonsils occurs, and injures the health by the difficulty of breathing it produces, the person is obliged to sleep with the mouth widely opened, yet still there is much impediment to the passage of the air, and consequently much stertorous noise. Chronic enlargement.

Children labouring under this disease are often found during sleep, in profuse perspiration, especially about the head, arising from this excessive dyspnœa. Symptoms.

Treatment. The treatment of this state consists in applying powdered alum to the surface of the tonsil; in using the sulphate of copper, in substance, so as to whiten the surface; or the nitrate of silver, which produces the same effect, and from the employment of which I have known great advantage derived; scarification I have also seen of service.

Removal sometimes required. If the disease resists these modes of treatment, it will be right to remove the enlarged portion of the gland, either by ligature or by excision.

By ligatures. A ligature is employed in those cases in which the tonsil is pendulous, and in which the enlarged part is connected to the throat by a narrow neck.

To apply a ligature, an iron is required, with a small fixed ring at its end, and a waxed portion of silk.

Operation. The patient sitting before the surgeon, and the thread being passed through the ring of the tonsil iron, an assistant holds one end of the ligature against the cheek, and the surgeon retains the other in his hand. The iron is then carried above, behind, and then below the tonsil, and is, with the end of the ligature, brought out of the mouth; after thus nearly surrounding the gland, a single knot is made, and one end of the thread being again passed through the ring of the tonsil iron, the knot is by means of it made fast, and a second knot is then made, in the same manner. The silk is left upon the tonsil until it ulcerates through the gland, which it does in about a week.

Another mode. When the basis of the swelling is large, a needle has been advised, armed with a double ligature, which is to be passed through the base of the gland: then each ligature is to be tied separately, one before and the other behind the tonsil, and by this mode the ligatures are prevented from slipping; but their application is very difficult, and, as far as I have seen, very imperfect. Rather than adopt it, I advise the removal of a portion of the gland by excision.

By excision. This is to be done by a pair of curved scissors, with probed

extremities, with which there is less risk of wounding any important part. It is best, however, to remove small portions, and to proceed gradually, by repeating the operation as occasion requires; and to touch the surface with nitrate of silver or sulphate of copper.

In these cases there is usually much general debility, and it is right to give soda, steel, and rhubarb, and advise country or sea air with bathing, and a generous diet.

OF ELONGATION OF THE UVULA.

Sometimes of great length.

I have seen this part grow to a considerable length. There is one in the collection at St. Thomas's Hospital, which the boy could throw forwards between his incisores teeth.

Symptoms.

By hanging upon the epiglottis, it produces coughing, or by irritating the pharynx it occasions sickness; and by creating irritation of the glottis it produces an alteration in the voice.

Cause.

It arises from relaxation and over exertion of the voice in speaking.

Treatment local.

Stimulating gargles, sulphate of copper in solution, or directly applied in substance, and alum, are useful; but sometimes the enlargement becomes so distressing, as to occasion a necessity for its immediate removal.

Operation.

The mode in which this is effected is as follows. The end of the uvula is seized with a pair of polypus forceps, and it is then drawn forwards, so as to be put upon the stretch, and that portion which exceeds the natural length of the part is removed by a pair of curved and probed scissors.

No bleeding of any consequence follows; and the only attention afterwards required is, to avoid any unnecessary exposure to cold air.

Not dangerous

I have several times had occasion to perform this operation, and have never seen any ill effects arise from it, but often the greatest advantage produced.

LECTURE XXXVI.

PARACENTESIS OF THE ABDOMEN.

Two kinds.

Dropsy of the abdomen is of two kinds: First, Peritoneal, or ascites; Secondly, Encysted, or ovarian.

OF ASCITES.

Symptoms.

The first symptoms of this disease is an unnatural sense of fulness in the abdomen after taking food, which renders it necessary to loosen the clothes; next, an increase of the lower part of the abdomen, observable at all times whilst the patient is in the sitting posture. When the patient lies down, the increase in the abdomen is general, and the enlargement is accompanied with an unusual tension; as if the abdomen were inflated In the sitting posture, a fluctuation can be perceived in the hypogastric and lower part of the umbilical regions, by placing the finger on one side and tapping on the other. In the recumbent posture, the intestines appear to undulate in the cavity, having more than their usual motion. As the disease increases, the swelling extends from the lower to the upper part of the abdomen, occupying the whole cavity.

Little pain is felt, but considerable inconvenience arises from the distension, more particularly when the patient is in the recumbent position, on account of the action of the diaphragm being impeded. In proportion as the distension is greater, the fluctuation becomes distinct; and when the tension is extreme, the gentlest tap on the abdomen leads to a perception of the fluid. The secretion of urine is scanty. The enlargement of the abdomen is followed by swelling of the legs, either from the pressure of the fluid upon the veins returning the blood from the lower extremities, or from the general debility which accompanies this disease. I have known, when the omentum has been very considerably thickened, the perception of

the fluctuation in the abdomen to be indistinct; and, under the same circumstances, in tapping, the quantity of fluid which has escaped has been a portion only of that contained in the cavity, part being confined behind the omentum.

Quantity of fluid.

The usual quantity of fluid collected is from twenty-eight to thirty pints; but when a patient has been tapped several times, the abdomen becomes much more enlarged, and the quantity is then from thirty to forty pints. In young persons the quantity is small; and the smallest quantity I have known drawn off by operation was in a medical student; it amounted only to six pints.

Nature of the fluid.

The nature of the fluid secreted varies but little in ascites; it is much more watery than serum, containing relatively a small proportion of albumen. It has generally a watery appearance, has a slight yellow tinge, and does not vary in its appearance and consistence, as the fluid of other species of dropsy. If inflammation succeeds the performance of the first operation, flakes of fibrin or adhesive matter are contained in the fluid next discharged.

Cause.

The cause of dropsy, when it is confined to the abdomen, is most frequently a disease in the liver, which acts mechanically in producing it. The pressure which the diseased organ occasions upon the vena portæ interrupts the free flow of blood through the vein, produces a congestion in the arteries and veins of the alimentary canal, and of the organs which are connected with it, and consequently leads to a greater effusion from the exhalent extremities of the arteries. Diseases of particular abdominal organs will, by the irritation they excite upon the peritoneum, occasion a greater determination to its secreting surface. Thus disease of the omentum, or of the spleen, will produce this effect.

I have known diseased mesenteric glands produce ascites; and two children, who, in my recollection, have been tapped for this disease, have recovered. Taking large quantities of spirituous liquors tends to produce this complaint, independently of the organic change it is likely to excite in the liver; its stimulus leading to a greater determination of blood to the vena portæ than can readily

circulate through this vessel, and consequently to effusion from the extremities of the arteries.

But ascites is frequently the effect of disease in the chest, of water accumulated in the cavities of the pleura, of water in the pericardium, or of some organic change in the heart, interrupting the action of the source of the circulation: the blood therefore accumulating in the right side of the heart and in the veins returning the blood to the right auricle, leads to the production of water in the abdomen, and of a general anasarcous state.

It has been a question whether dropsy arises from an increased secretion of the blood-vessels, or from an absolute diminished action of the absorbent vessels. It is generally the former I have no doubt, for reasons which I have already given, when speaking of hydrocele.

OF THE TREATMENT OF ASCITES.

Medical treatment.

The disposition to this disease may be prevented, its progress, when it has begun, may be retarded, and large accumulations of fluid may be removed by medical treatment, and by external applications. If the disease originate in a complaint of the liver, the restoration of its secretions, and an action upon the alimentary canal by mercury, combined with other purgative remedies, become the best means of preventing effusion. If the complaint originate from local disease in some of the other viscera, as in the spleen, or omentum, the secretions must be increased in a similar manner, and blisters should be applied, and for some time continued, on the abdomen.

If water has already begun to form, the best medicines, as far as I know, are the submurias hydrarg: gr: jss. pulv: gambogiæ gr: ss. scillæ gr: iij. in the form of a pill, taken every night: and spir: æther: nitric: ℥ss. to ℥j. oxym: hydrarg: gr. $\frac{1}{8}$. tinct: digital: gutt. xv. with some camphor mixture, twice or three times in the day.

If water has already formed in considerable quantity, and if the powers of the constitution are sufficiently strong for its employment, the use of elaterium becomes not only justifiable but desirable, as being the most powerful and successful mode of promoting the absorption of the fluid which has been effused. But if the powers of the constitution have been much enfeebled, this remedy becomes dangerous from its severe effect. Even if the ascites be accompanied with other dropsical symptoms, the elaterium is still the remedy most to be depended upon, if the constitution will allow of its use.

An operation necessary.

When medicines fail of their wonted and expected influence, and the accumulation is so considerable as to impede breathing, by preventing the free descent of the diaphragm, or when the patient finds it difficult to assume the recumbent posture, it becomes necessary to remove the accumulation by the operation of paracentesis. I have, however, known in a young person the operation performed for comparatively small collections of fluid, when the increase of the collection had ceased, and no disposition to its absorption had manifested itself. It is absolutely necessary that the fluctuation should be extremely distinct before the operation be proposed; and in cases of diseased liver, spleen, omentum, and mesentery, there is danger of the surgeon's being deceived respecting the disease.

Result of an operation.

With regard to the result of the operation for ascites, when the dropsy arises from disease of the liver, or from organic alteration in the chest, the relief is only temporary; but when it is the effect of constitutional disease, as fever, or arises from functional change only, under these circumstances the operation of paracentesis is frequently followed by a cure. Even in diseased liver, after the removal of the water by the use of the medicines which we have already recommended, I have known the patient ultimately recover. Considerable pressure upon the abdomen after the operation, lessens the disposition to the return of the effusion. Before the operation of paracentesis is described, I shall speak of ovarian or encysted dropsy.

OF OVARIAN OR ENCYSTED DROPSY.

This is a bladder of water, formed within or upon the ovarium.

Symptoms. The disease is, at first, discovered as a swelling upon the brim of the pelvis, from two to three inches above Poupart's ligament, and is confined to one side of the pelvis. It is unattended with pain, and the general health remains uninjured. Under varied positions of the body, it moves, in some degree, from side to side. It is a very circumscribed swelling, and has an elastic feel; it is often accompanied in its early stages with an irritation to make water, and now and then with a difficulty in its discharge.

Progress. As it gradually increases, it rises from the lower part of the abdomen to the upper, and occupies more and more the centre of the abdomen; at length it extends over to the opposite side from that in which it began: although it is generally largest on the side in which it commenced; at first the breathing is unaffected; but when the size of the swelling is very large, the action of the diaphragm is greatly impeded by its pressure.

Fluctuation. The fluctuation in this disease is much less distinct than in ascites; but when it acquires considerable size, it becomes proportionally more and more perceptible. It depends, however, upon the thinness of the cyst. In ascites, the fluid is in direct contact with the peritoneum, on the posterior surface of the abdominal parietes; but in ovarian dropsy a cyst sometimes of considerable thickness intervenes between the water and the peritoneum.

Solid enlargement. The ovarium is subject to solid enlargements of very considerable bulk; and an ignorant surgeon might plunge a trocar into such a swelling, mistaking it for ovarian dropsy, which a little more attention to its want of fluctuation might have led him to discover.

At first, the water which is formed in the encysted dropsy is contained, not in a single bag, but in several; the septa between which become gradually absorbed, and their number consequently diminished; and this is another reason for the fluctuation being more distinct as the disease advances. The cyst which is, at first,

of considerable density, becomes thinned by a process of absorption, leading to a more distinct perception of the fluid.

Nature of the fluid.

The fluid contained in an ovarian cyst varies much in appearance, it being sometimes watery; sometimes serous, containing a large quantity of albumen; sometimes mucilaginous and tenacious, so as to be ropy, but yet coagulating little under the influence of heat.

Its colour.

The colour also varies; sometimes being yellow like serum; sometimes it is brown and frothy; three times I have seen it yellow like pus, and containing similar globules. One case with Mr. Simpson, surgeon, in Lime Street Square, in which a pailful of this fluid was drawn off; a second in a Miss Warner, of the Kent Road; and a third in a Mrs. R. of Chatham Place, whom I lately attended with Dr. Key.

Hydatids.

I have seen hydatids discharged with the fluid.

Quantity of fluid.

The quantity of fluid accumulated in this disease is necessarily varying, but the proportion averages from twenty-five to thirty-two pints. The greatest increase of the ovarium which I have seen is in the collection of St. Thomas's Hospital, in which the accumulation was ninety-seven pints. The least which I have removed has been sixteen pints.

Case.

The following is the account upon a tomb-stone, near Dartford, Kent, "Here lies the body of Ann Mumford, daughter of John Mumford, Esq., of Sutton Place, in this parish. Her death was occasioned by a dropsy, for which, in the space of three years and ten months she was tapped one hundred and fifty-five times. She died the 14th of May, 1778, in the twenty-third year of her age, an example of patience, fortitude, and resignation."

This then is a proof of extent of the secretion, and of the necessity, in some cases, for the repetition of the operation.

Situation of the cyst.

In the collection of St. Thomas's Hospital there is a preparation showing the origin of this disease; in one ovarium, bags are formed within its tunica albuginea; on the other side, a cyst is produced externally to the ovarium, but pendulous from it; thus there are some cases of it internal and some external to the ovarium.

Adhesion of the cyst.

At first, the bag does not adhere to the peritoneal lining of the abdomen; but as it becomes large, it gradually acquires such adhesion; and, upon dissection of these cases, the cyst is found to have united itself with the parietes of the abdomen, so as to leave no space between it and the peritoneum: the intestines and omentum are situated behind it, under great accumulation.

Burst by accident.

The ovarian cyst sometimes bursts by accident.

Case.

Miss Warner, to whose case I have already alluded, was thrown out of a one-horse chaise, and burst the ovarian cyst. She soon afterwards began to make large quantities of water, and the disease disappeared; but in seven years it returned, and she was obliged to be tapped.

Case.

A lady with ovarian dropsy, in getting from her bed, fell against the corner of the night-chair, and ruptured the ovarian cyst, producing extravasation of blood externally: her secretion of urine became abundant, and her abdomen much lessened; but the disease afterwards returned.

Medical treatment.

With respect to the medical treatment of ovarian dropsy, I fear a difference of opinion with many other medical men, when I say, that medicine has but little influence over this complaint.

I have seen the most gentle, as well as the most drastic medicines given to promote the absorption of the fluid, but without success; and when we consider the little vascularity of the cyst in which the water is contained, and also how little influence medicine has over common hydrocele, we shall not be inclined to expose our patients to the trial of these agents.

Case.

Dr. Baillie and myself attended a lady together, who could only hiss her answers to our questions; and when we asked the cause, we learned that for an ovarian dropsy, of which she afterwards died, she had undergone a course of mercury, which had occasioned a sloughing from the inside of her cheeks, without relieving her dropsy: the contraction of the cicatrices in the mouth had produced the alteration in her voice.

Diet.

Case.

With regard to diet, I tried in a case of dropsy the following experiment. I tapped a woman in Spitalfields, and I ordered her

afterwards not to drink, but merely to suck an orange when she was thirsty: with respect to her solid food I put her under no restraint. The next time I tapped her, I allowed her to take as much fluid as nature prompted, but she filled faster with water in the former than in the latter case; the cause of the difference appeared to me to consist in the excitement of the kidneys which the fluids occasioned.

A considerable effect is produced in retarding the progress of this disease, by the patient's wearing a belt, which, by its pressure, prevents the ready secretion from the exhalent extremities of the vessels into the interior of the bag. I therefore always lay my patients under the injunction to obtain and wear one. Pressure.

A patient who is affected with this disease has the general health so little deranged, as not to require any change in the general mode of living; exercise may be taken, and the same diet allowed as under ordinary circumstances.

OF THE OPERATION OF PARACENTESIS.

This operation ought never to be performed early in the disease, but it should be deferred until the accumulation of water by its pressure upon the diaphragm influences the function of respiration. Not to be performed early.

If the quantity of water in ascites be but small, much danger is to be apprehended of the trocar reaching the viscera; and in the ovarian dropsy the operation must not be performed early, because the adhesion of the ovarian cyst to the peritoneum on the fore part of the abdomen is not yet produced. The viscera, therefore, glide down between the cyst and the parietes; and I once saw, in a case of ovarian dropsy, the omentum caught by the canula, and a portion of it was brought through the opening in withdrawing the instrument, which was obliged to be returned by a probe; inflammation succeeded, and the woman died. This might have been avoided by further delay; therefore the operation should not be performed until the ovarium ceases to move easily from side to side. Reasons for delay.

A second reason for delaying the operation exists in the numerous cysts of which the tumour is first composed, which afterwards break

into one; but when the operation is performed early, the escape of water is only from a single small cyst.

Before performing the operation in the encysted dropsy, as the fluctuation is much less distinct than in ascites, the greatest care is required to prevent an error.

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.

Case. 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.

Anecdote. The circumstances which were told me of the other case were as follow: A surgeon in a country town called upon another surgeon,

Dry tapping. 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 sitting at one end, with her abdomen bare. The surgeon then, taking his trocar and canula, 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 canula, and again renewing his attack, he a second time introduced the trocar into the abdomen; but was equally unfortunate as before, in finding that no water followed. Waiting a few moments, he withdrew the canula, 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."

Preparatory position.

Before performing this operation, the patient should be placed upon an elevated seat with the abdomen bare, a sheet is to be doubled to about a foot in breadth, and is to be passed around the body at the upper part of the abdomen, and the ends being crossed at the back, are to be held by assistants; but instead of doing this, I frequently suffer my patient to remain in the horizontal posture in bed, turning only to the side; by this plan that faintness is prevented, which usually attends the escape of the water if the patient be in the sitting position; a pail is required to catch the water in the first instance, and a basin afterwards. The necessary instruments are a trocar and canula, or a lancet, with a canula shut at its end like a catheter, and with holes on its sides equal in diameter to the canal of the canula.

A long trocar necessary in ovarian dropsy.

If it be ovarian dropsy, and the cyst possesses considerable thickness, it is very desirable that the surgeon should be provided with a trocar and canula of an inch more than the usual length, as I once operated upon a patient of Dr. De Vallangin, in whom I was obliged to employ a much longer trocar and canula, being unable to reach the cavity of the cyst with an instrument of the common length.

The proper spot for the introduction of the trocar.

The place at which the operation is performed was changed by Mr. Cline from mid-way between the umbilicus and anterior superior spinous process of the ilium on the left side to one inch below the umbilicus; and his reason for this change was, that in the spread of the abdominal muscles from the pressure of the water, the epigastric artery is brought into a situation of risk of being wounded by the trocar, a circumstance which did happen to Mr. Cline. He was tapping a person in St. Thomas's Hospital,

Case.

and he saw florid blood issue through the canula; the quantity gradually increased as the water flowed; and as the patient was becoming faint, he withdrew the canula and closed the wound, but

the bleeding continued into the abdomen, and the man died; upon inspection, the epigastric artery was found wounded.

Reflecting upon this circumstance, he was led to consider, that an inch below the umbilicus in the linea alba would be the safest spot for the introduction of the trocar, as no vessel would be there endangered, and it was only required that the bladder should be previously emptied. This part has been therefore of late years usually selected for the operation.

Danger of operating at the umbilicus.

Some have recommended the umbilicus, but the frequency of hernia renders that spot unsafe. An inch above the umbilicus has been also advised; but if there be hernia, it is equally dangerous with the umbilicus itself; and if the umbilical vein remain unclosed, there is a danger of hæmorrhage in performing the operation at that part.

Beside the danger to the epigastric artery in the operation performed at the part formerly selected, there was danger of wounding the spleen when it had become enlarged.

Operation.

The surgeon should place himself on a low stool by the side of the patient; the sheet is then tightly drawn by the assistant across the upper part of the abdomen, by which its lower part is rendered prominent, and the point of the trocar is placed an inch below the umbilicus, and is passed slowly and gently through the linea alba; the trocar is then withdrawn, and the canula being left in, the water is allowed to escape through it. If any interruption to the passage of the fluid by the pressure of the omentum, or of the mesentery on the end of the canula arise, a probe should be gently passed through the interior of the canula to remove the obstruction.

Canula left in the wound.

It has been recommended by Mr. Guy, of Chichester, and others, to leave the canula in the wound, occasionally to suffer the water to flow, and thus prevent its future accumulation.

Sometimes produces a cure.

A slight inflammation of the peritoneum in these cases sometimes succeeds the operation; and by the change of action thus excited in the vessels, its disposition to a future secretion is lessened, and in this way a cure is produced.

Pressure.

Immediately after the operation has been performed, a belt is to be

tightly applied around the abdomen, to prevent the re-accumulation of water by lessening the determination of blood to the parts.

The result of the operation is generally unsuccessful in ascites, as the greater number of cases are accompanied with organic disease: the operation only acts upon the effect, and not upon the cause, and the hope of permanent advantage must be derived from medical treatment, and not from surgical operation; but the removal of the water gives additional facility to the operation of the medical means which are employed. Operation rarely successful.

With respect to the ovarian dropsy, the operation is the only means of relief; but it generally fails in producing a permanent cure.

In ascites forming after fever, and after a course of mercury, and in ascites unaccompanied by organic disease, I have known the operation succeed in producing a permanent cure. In ovarian dropsy, the instances of permanent cure from operation are exceedingly rare.

The case which I have given from the neighbourhood of Dartford, shows the number of times this operation may be repeated.

In the very young and in the very old, I have known the operation succeed.

Of a spontaneous cure of ovarian dropsy I have known several examples. Spontaneous cure of ovarian dropsy.

The wife of a veterinary surgeon had an opening at the umbilicus produced by ulceration, through which large quantities of fluid were for a length of time discharged; but the opening ultimately closed, and the disease did not return. Case.

I have known the water discharged by the Fallopian tube; and I attended a lady in whom an ovarian cyst burst into the intestinal canal; for several years afterwards she was subject to occasional returns of the disease, but ultimately recovered.

I have known a person die from suppuration of an ovarian cyst.

The injection of an ovarian cyst has been occasionally practised with success; but it has also failed; so that its salutary influence remains in doubt. Injection of the cyst.

Removal of the cyst.

The removal of an ovarian cyst from the abdomen might be performed in the early stages of the disease by making an opening into it, discharging its contents, and by dividing the membranous bag from its natural adhesions.

OF PARACENTESIS OF THE THORAX.

When required

This is required for accumulations of matter within the cavities of the pleuræ, or matter partially encysted in those cavities. With respect to a collection of water in the thorax, I have only once known an operation performed for it, which proved unsuccessful; the effusion of serum being only the effect of some more formidable disease.

OF EMPYEMA.

Causes.

Collections of pus in the chest are the result of inflammation of the pleura, or of the pericardium; but as the latter does not admit of relief, I shall only describe the former.

Symptoms.

The formation of matter in the cavity of the pleura is preceded by the usual symptoms of pleuritis—viz. pain in the side, cough, a hurried breathing, and imperfect expansion of the thorax; these are succeeded by rigours and greater dyspnœa, by a frequent, small, and often irregular pulse; and if the disease be confined to one side, the patient can only rest on one side. When the sides of the thorax are accurately compared, the diseased is found to be considerably larger than the sound side; the upper part of the abdomen is also much fuller on the side affected; a tense and elastic swelling may be felt there, varying with the state of respiration.

A swelling of the legs succeeds from the pressure of the accumulated fluid affecting the free circulation of the blood through the lungs, as well as altering the position of the heart.

Spontaneous cure.

Nature occasionally performs a cure, in the following manner: The intercostal muscles give way to the pressure of the matter, or

an ulcerative process is produced, by which the pus escapes to the outer side of the ribs under the integument, which at last also ulcerates, and thus the matter becomes discharged.

I was sent for to Miss B—, in Chatham Place, Blackfriars, to meet her medical attendant, Mr. Murley, on account of her being under the following circumstances. She had great dyspnœa, severe cough, a quick small pulse, great emaciation, and hectic flushes, succeeded by rigors. When I examined her left side, I found a large swelling in the situation of the spleen, and another, about the size of a walnut, between the third and fourth ribs; when I pressed upon the tumour in the situation of the spleen, that between the third and fourth ribs became enlarged, so that there was evidently a fluid fluctuating between the two swellings. Thus I found that the enlargement on the left side of the abdomen was occasioned by a descent of the diaphragm from accumulation of fluid in the chest, and I did not hesitate to advise that an opening should be made into the small and circumscribed swelling between the ribs. Case.

This being done, an immense flow of matter immediately succeeded; and when the swelling in the region of the spleen was pressed, the flow increased. After a very long continued and copious discharge, this young lady recovered, and now enjoys good health.

I attended a young lady in Seymour-street under exactly similar circumstances, and she also recovered from the same plan of treatment. These abscesses would of themselves soon have burst, but I thought it better to save the constitution by aiding the efforts of nature. Case.

It frequently happens, however, that the accumulation of pus in the thorax is not accompanied by a partial swelling between the ribs, and under these circumstances the surgeon must be guided in his judgment by the symptoms I have described. In this case, it will be required to make an incision into the thorax without any well marked circumstance in the disease, to direct the situation of the opening. The surgeon will then consider in what place the The pus does not always point externally.

wound will be the most dependent, so that the matter may readily escape.

Operation. As the patient should be in the sitting position at the time of the operation, the lower part of the chest should be selected between the seventh and eighth, or eighth and ninth ribs, and the opening should be made rather posteriorly to the side of the thorax, so as to completely avoid the diaphragm. The skin being drawn up an inch, an incision is to be made through it upon the upper edge of the rib; after which, the intercostal muscles are carefully divided; and a straight canula closed at its end like a catheter, but having holes in its sides, is then passed through the pleura, and the pus is allowed to escape through it. When the matter has been thus evacuated, the canula is removed, and the skin being let go, the external and internal wounds are no longer opposite to each other, and union is more readily effected.

The reason for making the incision upon the upper edge of the rib is to avoid the intercostal artery, which is placed in a groove in its lower margin.

Sometimes succeeds. This operation I have known succeed, although it is generally unsuccessful.

Case. A Mr. Bryant, in the city of London, had this operation performed upon him, by Sir B. Harwood, and he ultimately recovered.

Spurious empyema. Collections of pus in the thorax are sometimes partial, and then the disease is called spurious empyema.

How produced. An adhesion forms between the pulmonary and costal portions of the pleura, between which also matter becomes deposited, so that the general cavity of the chest is excluded from the accumulation. This abscess ulcerates the intercostal muscles, and breaks externally, after having been the occasion of excessive pain, dyspnœa, and cough.

Case. A boy, who had been a long time at sea, and who had been very much the subject of sea-scurvy, was sent to my house by his mother, on account of a large accumulation of matter upon the

left side of his thorax, a part of which passed to and fro between the ribs, and projected very much if he made a deep inspiration, or coughed. Seeing him in ill health, I was fearful of making an opening, but advised him, on account of his scurvy, to take bark with sulphuric acid: under the improvement of his general health which this treatment effected, the matter became entirely absorbed, and the boy perfectly recovered.

The treatment of spurious empyema is that of common abscess, viz. fomentations and poultices; and the opening is to be left to nature or performed by art, as the constitution is able or unable to bear the process of ulceration. Treatment.

LECTURE XXXVI.

OF HARE-LIP.

THIS is a congenital fissure in the upper lip, which resembles the form of the lip of the hare. Definition.

But the deficiency of the lip and palate is liable to great varieties. Many varieties

First, It is frequently a simple fissure, extending from the edge of the lip nearly to the nostril. Simple fissure.

Secondly, It is sometimes more extensive, and is accompanied with greater separation, when it enters the nostril. Entering the nostril.

Thirdly, The defect occasionally exists on each side, and extends into both nostrils. Double fissure.

Fourthly, The fissure is not confined to the lip, but extends into the superior maxillary bone, and sometimes along the whole of the superior maxillary and palate bones, and through the velum palati. Extending through the bone.

Fifthly, A fissure is sometimes seen opposite each defect in the lip, which extends through the maxillary and palate bones, leaving an insulated portion of each of these bones in the centre. Double fissure extending through the bone.

Fissure only in the palate.

Sixthly, The defect in the palate is in some cases a circular opening, either in the bone or in the velum palati only.

Cause.

As to the cause of this defect, it may be remarked that such deficiencies are more frequently observed in the median line of the body than in any other parts. The body is constituted in the greater part of two halves rather than of one whole; thus it is obvious, that the brain and nervous system of one side of the body is distinct in its functions from the other side; as for example, in cases of paralysis, the nervous defect is confined often to one half of the body.

I have seen a child born with half its face; its arm and leg on one side much larger than on the other.

With regard to the organs of sense, they are each of them double. In the organs of smell and taste, although less apparently double than those of sight, hearing, or feeling, yet the function of one half of the tongue and one half of the nose may be lost, and the other half remain perfect.

It is at the median line that the union of the two halves of the body may be said to be produced: there it is that the nerves unite, and the blood-vessels inosculate; and from deficiency in that inosculation arises the defects which are so frequent in the central line of the body, viz. the defects in the lip and in the palate; a want of the sternum; a deficiency of the linea alba to a great extent; also of integument, pyramidal muscles, and fore part of the bladder; the prepuce imperfectly formed at the frænum; an aperture in perineo in the male giving the appearance of the hermaphrodite.

Exceptions.

The exception to this rule is in the abdominal viscera, which are supplied by azygos branches from the aorta and by nerves from the ganglia.

Contrary effects.

On the other hand, the inosculation in some instances is unusually free, producing a closure of the anus, or of the pudendum in the female.

Fissure in the lip easily cured.

The congenital defect in the lip may be readily repaired by the process of adhesion, and this becomes desirable not only on account

of the disgusting deformity which it produces, but also from its influence upon the nourishment of the child, its food returning by the unnatural aperture in the attempt to swallow it. The edges of the fissure in the lip are therefore pared away, the raw surfaces are preserved in complete contact, inflammation arises, adhesive matter is infused, and vessels shooting into the adhesion produce a living union of the parts.

Proper age for an operation.

It becomes a question of importance, at what period of life the operation should be performed, whether immediately after birth, at from three to six months of infancy, or after dentition is completed.

It is undoubtedly true that adhesion is most sure to be lasting after the period of dentition, and that this operation, therefore, scarcely ever fails when performed between two years and the adult age; on the contrary, during dentition it is attended with some danger, and sometimes the adhesion is destroyed by the violent efforts of the child; soon after birth the operation often fails, and is attended with considerable danger.

Case.

Of the proof of the danger during the period of dentition, I will mention the following case. A child of a clergyman, of more than six months of age, was sent to me from the country to be submitted to this operation. I advised that it should not be performed, but the answer was that the mother could not bear to see the child with this deformity. I operated; the child became feverish, the gums inflamed, and an incisor tooth partially made its appearance; the child was attacked with purging of the most severe kind; and, on the fifth day following the operation, it died.

Danger soon after birth.

The danger, however, is much greater if the operation be performed soon after birth; the nervous system is then so exceedingly irritable, that convulsions are readily produced, and the loss of a small quantity of blood occasions a fatal influence.

Case.

I was operating, at Great Yarmouth, upon an infant with hare-lip in the presence of Dr. Girdlestone, when he said, "Have you no fears of the child's dying?" to which I replied, "I never saw one die from this operation;" he told me that he had witnessed an

operation upon a child, which was soon after seized with convulsions, and of those convulsions it died.

Case. I was requested by Mr. Price, surgeon, in Tower Street, to see a child, born the preceding day with hare-lip. I performed the operation, the infant lost but little blood; on the following day, when I called upon Mr. Price to accompany him to visit the child, he informed me that it was just dead, and that it had lived only twenty hours after the operation.

Case. An infant was brought to my house in Broad Streeet, with hare-lip. I operated upon it upon a Monday, and desired that it might be brought to me upon the Thursday; the mother called upon the Thursday to inform me that the child was dead.

Case. During the year 1824 an infant was brought to my house, with a hare-lip of the most simple kind, and its parents were determined to have the operation performed: this was done upon a Monday morning; on the Tuesday the father of the child came to my house, and said, "Sir, my child vomited very much last night, and is this morning in a state of stupor." I directed him to give the infant some calomel, and put it in the warm bath; I called at the house in the evening, when I found that the child was dead.

Thus the danger at the infantile period is considerable, and the operation also often fails when the life of the patient is not

Case. endangered. I operated, in the presence of Mr. Cline, upon an infant, the daughter of the marshal of the King's Bench, but the lip flew open when the ligatures were removed.

Case. I was requested to perform this operation upon a boy about twelve years of age, who had been operated upon in his infancy by one of the first surgeons in the city of London, yet the union had been so imperfect that a second operation was demanded.

Practical conclusions. The conclusions, therefore, as far as my own experience dictates, are these: That prior to six months there is danger of a want of union, and even of the loss of life; that from six months to two years, during the period of dentition, the operation should not be performed; that, after dentition is completed, there is little

risk of failure either as regards the union of the lip, or the life of the child.

Sometimes an early operation beneficial.

Nothwithstanding I feel it my duty to mention these adverse circumstances, yet I have known the operation performed, and have performed it myself in infancy, with very complete success; and in those cases in which a fissure has existed in the upper jaw, the union of the upper lip has, by its pressure upon the bone, led to an approximation of the edges of the fissure so as to produce considerable advantage by the early operation.

Two modes of operating.

The operation may be performed with a simple interrupted suture or with pins. Mr. Cline, who had great experience in his profession, preferred, and in his lectures recommended, the former. The truth is, that it may be very successfully performed with either; but the interrupted suture is the most simple, and, as far as I have seen, equally effectual; it has this great advantage, that it prevents the disturbance to the adhesion, which the lip receives in the removal of the pins.

Operation.

The steps of the operation are as follows: The child is to be recumbent with its head placed over a pillow, the surgeon then extends the lip from the nose, and if any adhesion to the gum prevents its being extended, such adhesion must be first divided; he next introduces a pointed and curved bistoury, at the angle of the fissure, carries it down to the red edge of the lip, and thus removes the surface from one of the sides; the removal of the opposite surface is effected from the angle of the fissure in the same way. A straight needle armed with a waxed silk is afterwards passed through each side of the lip, at the juncture of the skin with the red part, and about the eighth of an inch from the raw surface; then another needle and ligature being introduced through the integument, half way between the first suture and the angle of the fissure, the edges of the fissure are brought together by tying the portions of silk, the lower one should be secured first; and when both are tied, the ends of the silk are to be cut off above the knots, and thus the operation is concluded. There is not any necessity for applying adhesive plaster; and the more the part is exposed to the

Bleeding.

air, and the more dry it is kept, the better. The coronary artery of the lip bleeds freely in the operation, but it ought not to have a ligature applied to it, as when the sutures are tightened the orifices of the artery become sufficiently compressed to prevent hæmorrhage.

Removal of the sutures.

The general rule for the removal of the sutures is on the fourth and fifth days. On the fourth day take away the upper thread, and upon the fifth day the inferior one; but although this is the general rule, yet if there be much inflammation or tendency to suppurate about the sutures, both should be romoved on the fourth day.

After treatment.

After the removal of the sutures, it is best not to apply any plaster unless the adhesion be incomplete at any part, and then a very narrow and long strap may be carried from cheek to cheek across the lip.

Caution in giving food.

In giving the child food after the operation, it should be done in such a manner as not to disturb or moisten the lip.

Mode of using pins.

If pins are employed, they are to be introduced at the same part of the lip as the sutures, and then the ligatures are to be twisted over their ends in the figure of an ∞. The pins should be of silver or gold, with steel points, which points admit of easy removal; great care is required when taking away the silk and pins, that the adhesions may not be disturbed; this is to be done at the same period after the operation, as when sutures are used.

Fissure in the bone.

A fissure in the bone accompanying that in the lip, makes no difference in the mode of performing the operation, but renders its success more doubtful, from the want of support by bone which the lip would otherwise receive. In general also, in this case, the fissure in the lip extends into the nostril, and it requires great care on the part of the surgeon to produce a union of the upper part of the fissure without deformity.

OF THE DOUBLE HARE-LIP.

Two fissures in the lip.

If there be a fissure on each side extending through the lip,

without any imperfection in the bone, the operation is performed in the same manner as when the fissure is confined to one side, but at successive and distant periods, so as to allow time for the complete adhesion and union of one side, before the second operation be attempted.

Extending through the bone.

A fissure in the bone sometimes accompanies each fissure of the lip, and then a projection of the insulated portion of bone occurs, in some instances, almost to the extremity of the nose.

Operation.

The operation may be then performed by removing, or not removing, the projecting bone. I have successfully removed the projecting portion of bone, uniting the lip at a future period; but there was this objection to the mode of relief, that the upper lip did not project as usual from the want of that portion of the jaw and teeth, and an artificial jaw was required to form a support: it is better, therefore, to perform the operation upon each fissure of the lip, by uniting the skin upon each side, to that which remains upon the projecting bone, and to depend upon the modelling process of growth for the gradual diminution of the projection; the operation being the same as that which is necessary for the simple fissure. After the union of the lip, the diminution of the bony projection may be assisted by gentle pressure.

DEFICIENCY OF THE PALATE.

Inconvenience of.

When there is an aperture in the bony palate, the person suffers a twofold inconvenience: First, in a nasal pronunciation; Secondly, in the passing of the food, particularly liquid, into the nose.

Two modes of relief.

If the opening be confined to the bony palate, there are two modes of relief, one by the patient's wearing an artificial palate, the other by operation.

Artificial palates.

The most simple of the artificial palates was made for me by Mr. Wiess, in the Strand, which consisted of two plates of silver connected together in the centres by an axis, so that the one could

be turned upon the other by means of a key; thus when introduced, it could be easily fixed. Mr. Wiess showed me one of the same form, of elastic gum. A plate of silver, with two springs which passed through its centre, so as to expand when pushed up, would answer the same purpose. The common contrivance is a piece of silver, and a sponge connected to it by a chain or stem; the sponge being passed into the nose through the aperture in the palate, there expands by the moisture, and fixes the silver plate against the opening, but the animal fluids in the sponge soon become putrescent, and render the breath extremely offensive.

A portion of membrane from the roof of the mouth might be partially pared off, and turned over the opening, its circumference being placed in contact with the edges of the aperture so as to produce adhesion; but of this operation I have not any experience.

For a circular deficiency in the velum palati, an artificial palate of elastic gum will answer best.

Operation for division of the soft palate.

An operation similar to that for hare-lip, has been performed for a congenital division of the soft palate. Mr. Cruickshank tried it and failed; M. Roux, of Paris, and Mr. Alcock, of London, have since been successful.

CANCER LABII.

Its commencement.

This disease wears two different appearances in its commencement. It sometimes assumes the character of a warty excrescence, at others, it is an ulcerated fissure in the lip attended with surrounding hardness.

At first begins in a wart.

When it is at first a wart it is covered by an incrustation, upon removing which an elevated and ulcerated surface is exposed with surrounding hardness. A fresh incrustation forms, additional growth takes place in some parts, and ulceration in others, until at length a considerable projection is produced. When the incrustation is now removed, the surface freely bleeds, luxuriant granulations appear in some parts and deep depression in others. It extends

more upon the red part of the lip than upon the surrounding skin, though ultimately the latter becomes affected. It is very little tender to the touch, so that the patient handles it with great freedom; but it is occasionally accompanied with darting pains.

At first begins as a fissure.

When it begins as an ulcerated fissure in the lip, the surrounding part is hard, an incrustation is afterwards produced, and ultimately the disease has very much the same appearance as when it begins as a wart. It gradually ulcerates the skin towards the chin, and although beginning in a small spot, at length involves the whole lip.

Character of the sore.

The character of the sore is that of a cancerous ulcer, its edges being everted, and its surface hard; a gland under the jaw next becomes affected between the symphysis and angle, and sometimes the glands on both sides: the gland is hard and at first not painful, then the surface assumes a livid appearance and becomes occasionally acutely painful; at length it ulcerates, discharges a bloody serum, bleeds frequently, the edges of the ulcer are everted, the ulceration becomes extensive, and the surface of the sore very irregular; several other glands in the neck become affected, difficulty of breathing and of deglutition ensue, and the patient falls a victim to the disease after a long period of suffering.

Its cancerous characters.

Some persons deny that the character of this sore is cancerous, but upon what principle I cannot understand, for it is unequal upon its surface, it has irregular, callous, and everted edges, it is accompanied with lancinating pains, it extends its influence to the neighbouring absorbent glands, and when a section is made of it, after its removal, its internal appearance is truly scirrhous.

Rare in the upper lip. Or in the female.

I have seen at least two hundred cases of this disease in the under lip, and have only witnessed one in the upper. It is a very rare disease in the female; it is a complaint of age more than of youth, occurring most frequently from fifty to seventy years.

Supposed cause.

A great many of the persons in whom I have seen this disease have attributed it to the custom of smoking, believing that the tobacco pipe was instrumental in its production; but I have frequently seen it in persons in whom it could not be attributed to

that cause. It seems to be much more a local disease than cancer in most other parts of the body; the general health often appearing extremely good.

OF ITS TREATMENT.

Escharotics. In the early stages of this disease the sore may be destroyed by the application of arsenic, which occasions it to slough; it might be also destroyed by the actual cautery, but in the very earliest stages it is most prudent and judicious to remove it by the knife.

Removal by the knife. The operation should not, however, be performed if a gland under the jaw be enlarged, as the disease is then sure to return; but if the gland be not diseased, the result of the operation is much more successful than for scirrhous tubercle in the breast.

Medicine useless. No local applications short of those that destroy the part, or any form of internal medicines, are found to be useful.

Operation. The operation is performed in the following manner: An assistant puts a finger into each angle of the mouth, and stretches the under lip to its utmost extent; the surgeon then makes an incision on each side of the disease, so that a triangular portion of the lip is thus removed.

Hæmorrhage. The coronary arteries bleed freely, but do not require to be secured; but when the inferior labial artery is formed on each side, by a large mental branch, I have found it necessary to secure that vessel at the inferior angle of the incision.

Sutures. Three ligatures are then required to bring the edges of the wound together: one at the red edge of the lip, and two others at equal distances, in the remaining part of the wound. These are to be passed through the lip by means of a straight needle, as in the operation for hare-lip. Some pressure is afterwards required, to assist in the arrest of the bleeding from the coronary arteries; the patient using a sponge for that purpose.

Two-thirds at least may be thus removed, and yet a good lip be afterwards formed. The ligatures are to be removed on the fourth and fifth days, the upper ligature being left to the fifth day.

It is a folly in this operation not to encroach upon the sound rather than upon the diseased part.

OF THE OPERATIONS FOR TIC DOULOUREUX.

Nature of the morbid change not known.

Of the nature of that change in the nerve which produces this disease I have no knowledge, as I have never had an opportunity of dissecting a nerve which had been affected with it.

Appears to be an action under par.

To me it has always appeared, that it is an action under par, rather than an inflammatory action on the nerve, and for this obvious reason, that the remedies found successful in it are those of a tonic kind: large doses of bark, the free administration of arsenic, but above all, the remedy recommended by Mr. Hutchinson, of large doses of steel, are the evidences in support of this opinion. Opium, belladonna, and other narcotics, have only a temporary influence in mitigating suffering. As local applications, I have known belladonna and an ointment of the subacetate of lead beneficial.

Sometimes originates in the brain.

But this disease sometimes appears to originate in the brain itself, as I have understood was the case in my friend Dr. Pemberton, who suffered more from this disease than any individual I ever witnessed, and in whom a portion of bone was found growing on the brain.

Division of the nerve.

The operation of dividing the nerve for this disease is sometimes anxiously called for by the patient, on account of his agonizing sufferings; I have seen an old weather-beaten captain of a man-of-war cry like a child under the painful influence of this disease; and a female once said to me, after the division of the nerve, "Sir, the operating table was a bed of roses in comparison with the agony which the complaint had produced."

The nerves commonly divided.

The nerves which I have divided, have been the suborbitary, the frontal branches of the ophthalmic, the mental nerve, and the portio dura of the seventh pair, which is perhaps more frequently the seat of this disease than any other nerve in the body.

Operation very simple.

The operation is extremely simple, and is performed in the following manner upon the suborbitary nerve. The ridge at the

Division of the suborbitary.

lower part of the orbit being felt, the foramen through which the nerve passes is situated from a quarter to half an inch below the centre of that ridge. The point of a curved bistoury is then passed into the cheek three quarters of an inch below the ridge of the orbit, and to the outer side of the foramen, and is carried directly to the bone; then passing it upon the surface of the bone under the nerve, and a little obliquely upward towards the inner canthus of the eye, the point of the knife is brought to the back of the skin at the distance of an inch from where it entered; it is then kept elevated against the back of the skin as it is withdrawn, and the nerve is thus freely divided by an opening through the skin, not above half the size of that which is made in bleeding.

Pressure with the finger is for a few minutes required, to stop the bleeding from the suborbitary artery.

Division of the frontal branches.

The operation from the frontal branches of the ophthalmic is performed in a similar manner; as these branches radiate more at the upper part of the orbit, it is necessary to make the division a little more extensively than in the former case.

The eyebrow is drawn up, and the point of the curved bistoury is to be introduced under it, and carried on to the ridge of the orbit, extending to the outer side; afterwards carried inwards close to the bone towards the upper part of the nose, the point is elevated to the skin, and withdrawn close to the back of it, out of the opening by which it was introduced, by which all the branches are divided.

Division of the mental nerve.

The operation upon the mental nerve is different to the two former; the foramen in the side of the lower jaw, through which this nerve passes, is situated in a line drawn below and between the two bicuspides; and the pain of the disease in the nerve is felt in the under lip, and the lower part of the side of the face.

In this case, to divide the nerve, the under lip is drawn from the gum, and the point of the curved bistoury is introduced through the skin of the mouth close to the jaw, on the fore part of the foramen, and is then carried backwards close to the bone, dividing the skin of the mouth and the nerve as it passes out of the foramen,

the incision being about three quarters of an inch in length; pressure is afterwards required for a short time over the foramen to stop the hæmorrhage from the artery which accompanies the nerve.

Division of the portio dura.

I have only once divided the portio dura of the seventh pair of nerves for this disease. I laid bare the branches of this nerve anteriorly to the parotid gland, carefully avoiding its duct, and passing a director under the nerves, divided many of the branches, paralyzing that side of the face, the mouth being drawn over to the opposite side; a few days after the operation erysipelatous inflammation succeeded, with a very high degree of fever, of which this woman died.

Operation seldom succeeds.

In the various operations which I have performed for this complaint, I recollect but two cases in which the operation completely succeeded.

Affords temporary relief.

For three or four months the patient is relieved from suffering, but then the disease returns; and it is curious, that it is reproduced whilst the numbness of the lip consequent upon the operation still remains. I have divided the nerve a second and a third time whilst the numbness was remaining in the lip, produced by a preceding operation.

Removal of a portion of the nerve.

It has been said, that removing a portion of the nerve prevents the pain from returning; but a person who had submitted to this operation informed me, that he had caustic applied upon the extremities of the divided nerve, yet he consulted me for the returning disease.

With respect to the operation for the disease, it ought to be performed rather at the earnest desire of the patient than by recommendation of the surgeon.

AURA EPILEPTICA.

Case.

For this disease, I have only once had occasion to perform an operation. The case was sent to Guy's Hospital by Mr. Masters, surgeon, at Watford. The man had received a severe blow on his

thumb, after which he had the following symptoms, which had lasted for several months: uneasiness in the parts; pain extending up the arm in the course of the radial nerve; also to that side of the neck, accompanied, by a rotatory motion of the arm inwards; occasional loss of sense and volition, so as to occasion him to fall, but without any struggle; he remained insensible for a few minutes and then recovered, excepting that the attack left some pain in his head. As the man had recourse ineffectually to a great variety of internal remedies and to electricity, I recommended him to submit to the division of the nerve, and making an incision upon the outer side of the radius, opposite to the insertion of the supinator radii longus, I laid bare the nerve, and putting a director under it, I removed a portion, which measured, after its removal, five-eighths of an inch. The man had some slight attacks of the complaint afterwards, but on his return to Watford, Mr. Masters informed me that he entirely recovered.

LECTURE XXXVIII.

ON AMPUTATION.

Less frequent than formerly.

THE removal of constituent parts of the body becomes necessary from different causes, but such operations are much less frequently performed at present than they were thirty years ago.

Improved treatment of compound fractures and dislocations.

The improved treatment of compound fractures renders it rarely necessary to amputate a limb for those accidents. A compound dislocation of a large joint, a few years back, led the surgeon to condemn the limb to amputation, but it is now no longer generally believed to require it. There will, however, be cases in which an operation will be occasionally required for one of these accidents.

Of aneurisms and diseases of joints.

An aneurism in a limb, for which, forty years ago, amputation of the limb was frequently performed, is now, by the simple operation invented by Mr. Hunter, readily and effectually cured. The simple

chronic and scrofulous enlargements of joints were formerly often deemed to require the operation of amputation, but rest, external irritation, alterative medicines, and a nutritious diet, now generally do away with the necessity of having recourse to so direful an expedient.

Of ulcers and diseased bone.

Extensive ulceration of a limb is now much more frequently cured than formerly. The treatment of the diseases of bones is much better understood, and the result, although tedious, is rarely unsuccessful.

Natural separation of parts.

In gangrene, considerable portions of the feet, or of other parts, will separate by the efforts of nature, often producing as perfect a cure as the surgeon is able to effect by operation.

Operation sometimes necessary.

Amputation will still be occasionally necessary for the accidents and diseases I have mentioned: for laceration of limbs from machines; for the effects produced by the bursting of fire-arms; for some cases of gun-shot wounds; for chronic and scrofulous complaints, and for malignant diseases of a cancerous or fungoid nature; also for deformities which are either congenital or the result of organic change, and for exuberant growths, as tumours.

All that I wish to advance upon the subject is, that although the necessity for this operation still exists, that the number of amputations thirty years ago was much greater than of those of the present day.

Much less dangerous than formerly.

Amputation is not only much less frequent than formerly, but it is an operation of infinitely less danger. The extensive surface of wound left after the old operation, and filling the wound with charpie or flour, led to the highest degree of constitutional irritation; whilst now, the integument being brought over the wounded surface, directly produces a process of adhesion, by which the constitutional disturbance becomes lessened and the danger from the operation greatly diminished.

I shall now proceed to describe the various amputations which are required at different parts of the limbs.

The common amputating instruments are so well known, that I need not enter into any particular description of them, but I shall

mention those proper to be used in each operation, when I give an account of the mode of performing it.

Application of the tourniquet.

Of the various tourniquets, I prefer that of Petit, which is generally employed at the Borough Hospitals. In applying this tourniquet, the pad should be placed immediately under the plate to which the screw is fixed, by which the screw is made to act more effectually on the pad. That part of the limb upon which the tourniquet is to be placed should be first surrounded by a piece of soft linen to prevent the tape, when tightened, from cutting the integument. In the thigh it should be placed a little above the middle, where the artery passes nearest to the bone; and in the arm, one-third of the length of the os humeri from its head on the inner side the biceps.

Artery compressed without the aid of a tourniquet.

When amputation is required at the upper part of the thigh, the termination of the external iliac artery in the femoral is to be compressed upon the edge of the pubes by an assistant, who puts one of his thumbs over the vessel, and the other thumb upon the first, which is our usual mode. If the amputation be performed high in the arm, the assistant is either to press the axillary artery with his fingers against the head of the os humeri, or else the subclavian upon the first rib, by means of the ring of a key or a pad, passed behind the clavicle.

OF AMPUTATION OF THE FINGERS.

In removing a portion of a finger at the second or third joints, the operation is, I think, best performed in the following manner:

Instrument.

The only instrument required is a common pointed scalpel.

Operation.

The finger being extended, the integument is cut through by a circular incision about half an inch beyond the joint, and a lateral incision is to be made on each side in the direction of the lateral ligaments, extending from over the joint to the circular cut; the portions of integuments are to be raised from the flexor and extensor tendons below and above as far as the joint, making two

flaps; after which the tendons and one of the lateral ligaments are to be divided, when the joint may be easily dislocated, and the separation of the part readily completed.

Vessels.

The vessels divided in this operation seldom require the application of a ligature, the pressure from the dressings being usually sufficient to prevent any hæmorrhage.

Dressings.

The flaps of the integument should be brought together, and kept so, by a narrow slip or two of adhesive plaster passed over the extremity from the dorsal to the palmar part, and these strips should be secured by a circular portion a little above the stump. The hand and fore-arm should be supported by a sling until the stump has healed.

Another mode of operating.

The operation of amputation may be performed at either of these joints, by making a single flap from the palmar part. In doing this, the joint must be flexed, when the scalpel is carried through the integument on the dorsum of the joint, and through the joint itself, dividing the ligaments at one cut; the knife is then passed under the phalanx, which is to be amputated, and a flap of sufficient extent is separated from the palmar side.

Not always practicable.

This mode of amputating is more expeditious than that first described, but it is not applicable to those cases in which the finger is straight and the joint stiffened from disease, as the knife cannot be then introduced into the joint from the back part; there is also much difficulty in separating the flap without including part of the flexor tendons; and, upon the whole, the union of the divided parts is not so easily accomplished.

Applicable to the toes.

These operations are equally applicable to the same joints of the toes.

Amputation of a whole finger.

When it is necessary to remove the whole of a finger, I think it better to saw off the extremity of the metacarpal bone, rather than to open the joint. If the middle or ring finger be thus removed, less deformity results from the operation, as the remaining fingers approximate much more than when the extremity of the metacarpal bone is left; if the fore or little fingers are amputated in this manner, an ugly projection is prevented, which

would not be of any utility if suffered to remain. The wound also unites more readily, than that which is produced by the amputation through the joint.

Instruments. The instruments required in performing this operation are, a common pointed scalpel, and a metacarpal saw; and my metacarpal saw moves upon its axis, so that it can be made to cut in any direction.

Operation. The finger to be amputated being extended and separated from the others, two incisions are to be made through the integument, which meet at an angle over the dorsum of the metacarpal bone, at a short distance below the digital extremity, and terminate on each side of the first phalanx at the natural separation of the fingers; two other incisions of the same form and extent are to be made on the palmar side, which are to join the former between the fingers; the scalpel is then to be passed down on each side of the extremity of the metacarpal bone, so as to divide it completely from its lateral connexions, and the extensor and flexor tendons are also to be cut through at the point of the first incisions; this being accomplished, the blade of the metacarpal saw is to be introduced between the bones, and the extremity to be removed is to be carefully sawn off.

Dressing. The edges of the wound are to be brought into contact, by binding the fingers on each side of it together, when the hand and fore-arm are to be supported by a sling, as after the former operation.

Operation of the fore or little finger. In amputating either the fore or little finger, only two external incisions are required, which should begin at a point below the extremity of metacarpal bone, as in the other case, only over the centre of that side which is outermost, and extend one over the joint and the other under it in an oblique direction, so as to meet between the fingers; two flaps are then to be raised, so as to expose the extremity of the metacarpal bone; the separation of which is to be completed as before described. The edges of the wounds are to be brought into contact by the application of adhesive plaster, and the arm to be supported.

If the vessels which are divided in any of these amputations afford a troublesome hæmorrhage, which cannot be readily checked by pressure, it will be proper to secure such vessels by ligatures, before the edges of the wound are finally approximated; and after any amputation, when a ligature has been applied upon an artery, one of the ends of the silk should be cut off a little beyond the knot on the vessels, as it is perfectly useless, and, if allowed to remain, only tends to increase irritation. Application of ligatures to the vessels.

When it becomes necessary to remove any of the toes, they should be amputated at the joint in preference to separating the extremity of the metatarsal bone; because it is desirable to preserve the width of the foot and support of the body, which would be diminished by the removal of part of the metatarsal bone. Toes to be amputated at the joints.

The operation may be performed in the same way as that last described for the removal of the fingers, excepting that the incisions should not reach beyond the joint, which should be opened from the side, as in the amputations at the second and third joints. Operation nearly the same as before mentioned.

After any of these operations upon the toes, the patient should observe the recumbent posture, until union of the edges of the wound has been effected. After-treatment.

Amputation should be performed through the metacarpal or metatarsal bones, when all the fingers or toes are so much injured as to require removal; it is much better than amputating through the carpal or tarsal bones, as, in the hand, the patient afterwards derives great advantage from the use of the carpus, which is thus preserved; and, in the foot, the insertions of the tibialis anticus, with those of the peroneus longus and brevis being uninjured, the remaining part of the foot is much more useful, than when the metatarsal bones are entirely removed: in either case the wound unites sooner than when the articulations are exposed. Amputation through the metacarpus or metatarsus.

In some cases, if the injury or disease does not extend to all the metacarpal or metatarsal bones, only such as are injured or diseased should be amputated. Thus, in the hand, the thumb with its metacarpal bone alone may be removed, or all the fingers with their Portions of the hand removed.

metacarpal bones may be amputated, the thumb being allowed to remain; the middle and ring fingers, the ring and little fingers; or the middle, ring, and little fingers with their metacarpal bones, may, in like manner, be separated from the others.

Of the foot. In the foot, the great toe and its metatarsal bone may be amputated from the others, or the others from it; or the second and third, the third and fourth, the fourth and fifth; or the third, fourth, and fifth may be removed together with their metatarsal bones.

Case. In one instance I removed the middle and ring fingers with their metacarpal bones; approximating the fore and little fingers, which were not injured by bandage. The patient recovered quickly, having perfect use of the remaining portion of the extremity.

Case. I also, in another patient, amputated the thumb and the three inner fingers with their metacarpal bones, leaving only the fore finger, which was infinitely more useful than any artificial hook could have been.

Cases. The metatarsal bone of the great toe I have several times had occasion to remove; and Mr. Key has amputated the four smaller toes, with their metatarsal bones, the two outer cuneiform, and the os cuboides, sucessfully; leaving the os calcis, astragalus, navicula and internal cuneiform bones of the tarsus, with the metatarsal bone of the great toe and the toe itself.

OF AMPUTATION THROUGH THE CARPUS.

Instruments. The only instrument required is the catling.

Application of the tourniquet. Before commencing the operation, the tourniquet should be applied on the upper arm.

The patient being seated in a chair, the surgeon first makes a circular incision through the integument, just over the bases of the metacarpal bones, which should include more of the integument upon the back of the hand than towards the palm; he then dissects the skin back as far as the styloid process of the radius; the integument is held back by an assistant, whilst the surgeon takes hold of the hand he is about to remove; and, feeling for the

extremity of the styloid process of the radius, he passes the catling into the joint between the radius and scaphoid bone, by dividing the external lateral ligament; and he completes the amputation by carrying the knife through to the inner side of the carpal joint.

Vessels. It will be necessary before dressing the stump to secure the ulna and radial arteries by ligatures.

Dressing. The edges of the integument are to be brought together over the extremity, and retained in contact by means of straps of adhesive plaster, passed from the flexor to the extensor muscles, and these straps are to be confined by a circular piece, after which the arm is to be supported in a sling, or upon a pillow if the patient be confined to bed.

Amputation between the second and third row. I have known the hand amputated between the first and second row of the carpal bones, but I think it objectionable on account of the number of joints which are exposed.

OF AMPUTATION THROUGH THE FORE-ARM.

Instruments. The necessary instruments are, the catling and the saw.

Position. The patient is to be seated, and the tourniquet applied as in the former operation.

Operation. The limb being extended, the surgeon commences the operation by making a circular incision through the integument sufficiently high to avoid the numerous tendons at the lower part of the fore-arm; then he separates the integument from the subjacent parts, and turns them back to the extent of about an inch and a half; an assistant keeps this supported whilst the surgeon cuts through the superficial muscles by another circular incision, and allowing a short time for their retraction, he divides the deep-seated layer, and exposes the bones, from which he carefully separates the muscles and interosseous ligament, by passing the catling between and around the ulna and radius at the part on which he intends to apply the saw. The fore-arm is then held in such a position that the surgeon can easily saw through both bones at once, in doing

which he should make use of the whole of the cutting edge of the instrument, and employ very little pressure, as the weight of the saw itself is almost sufficient. If the ends of the bones have any sharp points projecting from them, which will sometimes happen if they have not been cleanly sawn through, these points should be carefully taken off by the bone nippers.

Vessels. After this amputation four vessels will generally require to be secured; viz. the ulna, radial, and two interosseal arteries.

Dressing. The wounds should be dressed as that after the amputation through the carpus, and the same treatment adopted.

Two flaps. This amputation may be performed by making two flaps, one formed from the posterior, and the other from the anterior part of the fore-arm.

Danger of amputating low down. I have seen two cases in which inflammation and sloughing of the tendons have followed amputation performed through the lower part of the fore-arm a little above the carpus; they both proved fatal. It is better, therefore, to avoid operating at this part, as little advantage is gained by leaving more of the bones, and the risk is greatly increased.

OF AMPUTATION THROUGH THE UPPER ARM.

Instruments. The same instruments as used in the last operation are all required.

Position. The tourniquet should be applied sufficiently high to allow of ample space for the performance of the amputation, and the patient should be seated in a low chair.

Operation. An assistant extends the arm, and the surgeon first drawing up the integument with his left hand so as to put it on the stretch, divides it by a circular cut with the catling about one inch and a half above the olecranon; he then raises it from the parts beneath to the extent of about two inches, according to the size of the limb, and turning it back, he, by another circular cut, carried close to the reflected integument, divides the superficial muscles, and subsequently the deep-seated muscles down to the periosteum,

and he finishes with the knife by cutting through the periosteum at the part on which he is to apply the saw. The integument and muscles being carefully held back, the saw is applied and the bone divided, when the amputation is completed.

Three arteries will generally require the application of ligatures, viz. the brachial, profunda, and ramus anastomoticus. Vessels.

The edges of the integument are to be brought together by the application of adhesive plaster, and the patient being placed in bed on his back, the stump is to be supported on a pillow, so as to be rather higher than the shoulder. Dressing.

If the skin be loose or the muscles flabby, a roller should be put around the limb to give support to these parts, before the patient be placed in bed. Application of a roller.

It may be necessary in some cases to amputate higher up than I have mentioned, but the steps of the operation will be otherwise the same.

OF AMPUTATION AT THE SHOULDER JOINT.

The only instrument required is a catling. Instruments.

The subclavian artery is to be compressed upon the first rib, from above the clavicle, by an assistant. The ring of a common key covered with some soft linen is a convenient instrument for this purpose. Subclavian artery compressed.

The patient should be seated on a low chair, and the arm to be removed, should be elevated a little from the side by an assistant.

The operation may be performed by making a single flap or two flaps; I prefer the former, but in some cases, on account of disease extending so as to prevent the formation of a single flap, the latter mode should be adopted. Two modes of operating.

In making the single flap, the surgeon raises the deltoid muscle with the fingers and thumb of his left hand, and introducing the catling through the integument, and under the muscle near to its insertion, he cuts upwards close to os humeri as far as the under Operation with a single flap.

part of the acromion process; the integument and larger part of the deltoid muscle are thus raised, so as completely to expose the outer part of the shoulder joint; the arm being then drawn downwards, the catling is passed into the joint at the anterior part, so as to divide the tendon of the biceps muscle, and afterwards is carried round the head of the bone to cut through the capsular ligament: the separation of the limb may be completed either by passing the knife over the head of the bone, and cutting downwards to the axilla, or by placing the knife in the axilla and dividing upwards to the joint; in either case the amputation should be finished by one stroke of the catling.

Vessels. The axillary artery is to be immediately secured by a ligature, and small branches from the circumflex arteries may be required to be tied.

Operation with two flaps. When two flaps are required, the first incision extends from just below the point of the acromion downwards, and backwards into the axilla, being curved a little forwards and passing below the insertion of the latissimus dorsi muscle; the back flap is then raised, dividing at the same time part of the deltoid, and the insertion of the latissimus dorsi; the anterior incision through the integument is begun from the same point as the posterior, but carried downwards and forwards below the insertion of the pectoralis major, into the axilla, so as to meet the termination of the first incision; this flap is then raised in part, to expose the capsular ligament, which is to be divided, together with the tendon of the biceps muscle as in the former operation; after which, the head of the bone being dislocated, and the flaps being held back, the catling is passed behind the bone, and the amputation is completed by dividing the remaining portion of the anterior flap together with the axillary vessels, nerves, &c. The artery is to be secured as before mentioned.

Dressing. After either mode of amputating, the straps of adhesive plaster, employed to keep the edges of the wound in contact, are best applied from before to behind, and should be of sufficient length to keep a firm hold.

In every instance in which I have performed the amputation through this joint, and every case in which I have seen it done, the recovery of the patient has been speedy and perfect. Operation successful.

OF AMPUTATION BETWEEN THE TARSUS AND METATARSUS.

As I think it best to saw off that part of the internal cuneiform bone, which supports the metatarsal bone of the great toe, a saw will be required, as well as a strong catling. Instruments.

A tourniquet should be applied upon the thigh, and the patient should be placed upon a low table in the recumbent posture. Position.

The leg and foot being extended, and fixed by an assistant, the surgeon divides the integument across the dorsum of the foot, commencing at the base of the metatarsal bone of the great toe, and terminating the incision about half an inch beyond that of the little toe; he then makes a lateral incision on each side, so as to enable him easily to dissect up the flap of integument as far as the joints of the four smaller metatarsal bones, and that part of the internal cuneiform which is on a level with these articulations; the extensor tendons being next divided, the four small metatarsal bones are bent downwards, and their ligamentous connexions with the tarsal bones cut through with the point of the catling, after which the internal cuneiform bone is sawn through even with the other tarsal bones: the amputation is completed by passing the catling between the separated bones, dividing the flexor tendons, &c., and forming a flap of about equal size to the superior from the integument on the sole of the foot. Operation.

The anterior tibial on the dorsum pedis, and the two plantar arteries of the sole, will most probably require the application of ligatures. Vessels.

The integument is to be brought over the extremities of the bones, and the edges of the wound kept in contact by straps of adhesive plaster, passed from the sole to the dorsum; the patient is to be placed in bed, and the foot supported by a pillow, until union has taken place. Dressing.

A single flap may be made.

Sometimes a single flap may be made from the dorsum, or sole of the foot, but it does not unite so readily as the double flap.

OF AMPUTATION THROUGH THE TARSUS.

Instrument.

A catling only is necessary in performing this operation.

Position.

The tourniquet must be applied, and the patient placed as in the former case.

In this operation, the navicular bone is to be separated from the astragalus, and the os cuboides from the calcis.

Operation.

The surgeon, having felt for the projecting point of the navicular bone on the inner side of the foot, cuts through the integument about three-quarters of an inch beyond it, straight across the dorsum of the foot, and having made two small lateral incisions, he dissects back the upper flap, and divides the extensor tendons over the articulations, which he then opens, first, by cutting through the lateral ligaments on the inner side, uniting the navicular bone to the astragalus, then the ligament on the dorsum connecting the same bones, and afterwards the ligaments between the os cuboides and calcis, above and externally; the knife being then passed down between the articulations, the inferior ligaments with the flexor tendons and muscles in the sole are divided, and the operation concluded by making an inferior flap of the integument equal to the superior.

Vessels.

The same arteries require to be secured as after the former operation, and the dressing and after position of the patient are to be similar.

Not a successful operation.

From a comparative result of this operation, with that of sawing through the tarsal bones, I am certain the latter produces less irritation and danger than the former.

OF AMPUTATION OF THE LEG BELOW KNEE.

Various modes of operating.

This operation may be performed with a circular incision, and with a single or double flap. I prefer the first, but cases may

present themselves, in which it may be proper to adopt either of the other modes.

Instruments.

In performing the operation with a circular incision, a small amputating knife is usually employed in completing the first step; but a catling is necessary to divide the soft parts between the tibia and fibula; and this, if rather larger than usual, does equally well in the commencement. A saw is also required.

Position.

The patient is to be placed in a recumbent position, on a table, and the tourniquet is to be applied upon the thigh.

Operation.

One assistant holds the leg, and supports it at a convenient height: another assistant grasps the leg just below the knee, and keeps the integument stretched by drawing it towards the thigh, when the surgeon commences his first incision over the anterior part of the tibia, about six inches below the patella, and carrying the knife round the limb, he at one sweep divides the integument, terminating the incision at the point from which he commenced; he next separates the integument from the subjacent parts to the extent of two inches or more, and turns it up, in which position it is retained by an assistant, whilst the surgeon cuts through the superficial muscles, close to the reflected integument; and having allowed these to retract, he divides the deep-seated with the interosseous ligament and the periosteum by passing the catling between and around the bones. The knee being then turned inwards, the saw is applied first upon the tibia, and when this bone has been in part divided, the saw is made to act upon the fibula also, so that the amputation is finished by sawing through the remaining portion of the tibia and the fibula together.

OF AMPUTATION WITH A SINGLE FLAP BELOW KNEE.

May be performed in two places.

This operation may be performed as low down as is possible without interfering with the tendo Achillis, when the patient is desirous of afterwards wearing an artificial leg made of cork, instead of the common wooden one; otherwise the bone should be

sawn off at the same point, as when the circular incision is made.

Instruments. A long catling and a saw will be required.

Operation. The position of the patient, and of the limb, being as when the circular operation is performed, the surgeon feels for the posterior edges of the tibia and fibula, over one of which he places the thumb, and over the other the fore finger of his left hand, the palm resting upon the anterior part of the limb; the extremity of the catling is then introduced immediately below one of these points, and steadily thrust through the calf of the leg, until it protrudes just below the other point, when the blade is carried downwards, so as to form a flap of sufficient size, from the muscles and integument posteriorly; the next step of the operation is, to divide the integument anteriorly, by making an incision commencing at the place at which the catling was thrust in, passing over the fore part of the leg, and terminating at the spot from which the catling was pushed out: the amputation is completed after this, in the same manner as in the common operation.

Operation with a double flap. A double flap is sometimes made from the outer and inner sides of the limb, when the surgeon commences the operation by an incision on the outer part of the leg, reaching from the anterior edge of the tibia to the back of the calf; and having a semicircular form with the convexity toward the malleolus externus, he then dissects back the flap of integument, and afterwards makes a corresponding flap on the inner side, commencing and terminating as the former. The flaps being held back by an assistant, the operation is finished in the usual manner.

Vessels. After either of these amputations, three vessels will have to be secured, viz. the anterior tibial, the posterior tibial, and sometimes the peroneal.

Dressing. It is best in either case to place the straps of adhesive plaster, when dressing the stump, from side to side, rather than from above to below, as, by this, pressure is avoided upon the anterior edge of the tibia, which might otherwise produce much irritation and ulceration.

The patient should be placed upon his back in bed, and the thigh being flexed towards the abdomen, a pillow should be put under the ham, and the stump be allowed to hang over it. The limb should be inclined a little to the outer side. After position.

The objections to the operation with a single flap are, that the wound does not unite so readily as that made by a circular incision; and if after-hæmorrhage occurs, which renders it necessary to open the stump, there is a greater difficulty in securing the bleeding vessels; and in debilitated persons, the disturbance of the adhesions is likely to produce a slough of the flap. The anterior edge of the tibia being also more exposed, is more likely to exfoliate, and the subsequent contraction of the flap makes the union tedious. Objections to a single flap.

When, however, the integument upon the anterior part of the leg has been destroyed, the formation of a single flap from the posterior part becomes absolutely necessary. Sometimes necessary.

OF AMPUTATION ABOVE THE KNEE.

A large amputating knife and a saw will be required. Instruments.

The patient is to be placed upon a table on his back, and the tourniquet is to be applied high enough upon the thigh to allow of ample room for the retraction of the integument and muscles. Position.

One assistant supports the leg, and another draws up the integument on the upper part of the thigh. The surgeon first cuts through the integument surrounding the limb about one inch and a half above the patella, to avoid the bursa of the rectus, beginning on the superior part over the rectus, and passing the knife round with one sweep to terminate at the same point; he then dissects up the integument for about three inches, and this is kept reflected by an assistant whilst the superficial muscles are divided by another circular cut close to it; the assistant holding the integument, then draws it upwards to assist the retraction of these muscles, after which the deep-seated muscles and the periosteum are cut through so as to expose the bone, which is lastly to be sawn through. Operation.

Vessels. The following vessels will require the application of ligatures; the femoral branches of the profunda, and sometimes the sciatic.

Dressing. The integument is to be brought over the end of the stump from side to side, and confined by straps of adhesive plaster, after which the patient is to be placed upon his back in bed, and a pillow should be put under the upper part of the thigh so as to elevate the stump.

OF AMPUTATION AT THE HIP-JOINT.

Femoral artery to be secured first. In this amputation it is decidedly the safest plan to secure the femoral artery by a ligature at Poupart's ligament, as the first step of the operation.

Mode of doing it. An incision is begun two inches above the middle of Poupart's ligament and is extended two inches below it: the femoral artery is to be laid bare, and the ligature introduced at the centre of the incision is to be tied upon the denuded vessel opposite Poupart's ligament, and above the arteria profunda.

Operation. A long catling is then used to make the inner incision through the integument and muscles. This incision is to be begun at the lower part of that which was made to expose the artery, and it is to be carried from thence on the inner side of the thigh obliquely downwards, and is then continued on the outer side of the thigh below the trochanter major to the point at which it began; in this way a larger portion of integument is left to form a covering to the stump than would be produced by a circular incision without obliquity.

In the same line a second incision is to be made to divide the muscles, but the edge of the knife is to be inclined obliquely upwards towards the joint, and the integument and muscles being drawn back, those of the latter which are inserted into the trochanter major should be cut through.

A third incision is to be made to divide the psoas and iliacus internus muscles and the forepart of the capsular ligament, when

the knee being pushed backwards and outwards, the head of the bone is dislocated as far as the ligamentum teres will permit; this being divided, the head of the bone turns completely out of the acetabulum forwards.

A last incision is made by passing the knife over the head of the bone, and behind it, so as to cut through the remaining muscles, &c.

Not the quickest mode.

I am ready to acknowledge that this is not the quickest mode of removing the limb; but securing the artery in the first instance prevents a patient, who is much reduced, from eventually sinking in consequence of the loss of a very considerable quantity of blood.

Vessels.

When the limb has been removed, branches of the obturator, ischiatic, and gluteal arteries will require to be secured. The sides of the wound are to be brought together, and, if they easily meet, by adhesive plaster only; but if there be any difficulty in their coalescence, it is best to employ a suture.

The same after-treatment is necessary as after other amputations.

Preferable to saw through the trochanter.

I am, however, of opinion, that in every case in which the amputation can be performed by sawing through the thigh-bone below the attachment of the capsular ligament, that it should be done in preference to opening the joint and removing the head of the bone from its socket.

Case.

I have only once amputated at the hip-joint, and the patient recovered, but only after excessive suppuration from the acetabulum, sloughing of portions of the cartilage, and continuance of suffering and fever, exposing him to great risk, which would have been greatly lessened, had it been possible from the state of the bone to have sawn through the os femoris at the trochanter.

Removal of the dressings.

The removal of the dressing for the first time after an amputation must depend in a great measure upon the feelings of the patient as regards the stump, and from the appearance of the discharge.

On the sixth or seventh day.

If the patient does not experience any unusual pain in the stump, the plasters should not be disturbed for six or seven days,

by which time the adhesion of the edges of the wound will have become sufficiently firm to prevent any risk from the removing the dressings, provided it be done carefully.

Part cut away. Should the patient experience shooting pain in the stump, and have other symptoms of suppurative inflammation, some portion of the plaster should be cut away from the lower part of the wound, in order to allow of the escape of any matter that may form, and a light poultice should be applied.

Plasters snipped. When a tightness is felt at any part of the stump from the pressure of the plaster, the surgeon should snip some of the straps on the side, which will generally relieve the pressure.

Mode of removing the plaster. When the stump is dressed, the straps of plaster should be taken off one by one, and care is required not to disturb the ligatures; if union of the wound be not complete, some fresh straps should be applied as the old ones are removed, by which mode separation of the edges of the wound may be greatly prevented.

Sometimes to be removed early. Should the first dressings become much loosened, or the stump be excessively painful, the plasters must be removed earlier than I have mentioned.

Separation of ligatures. If the ligatures do not come away by the fourteenth day after the operation, the surgeon should gently draw each thread when he dresses the wound, in order to expedite their separation.

END OF THE FIRST VOLUME.

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F. I. Freeland

THE

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NOW CONSULTING SURGEON TO GUY'S.

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Editor and Translator of Celsus de Medicina, &c.

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PREFACE.

In presenting the second volume of Sir Astley Cooper's Works to the public, the Editor begs to offer his sincere thanks for their kind reception of the first, and trusts that the care bestowed on the present volume will merit similar encouragement.

This second volume comprises two of Sir Astley's greatest works, Hernia, and Dislocations and Fractures, with illustrative Plates from the Drawings of the same talented Artist who executed those of the first volume. The Plates will be found to illustrate the varieties of hernia in a progressive arrangement, accompanied with anatomical descriptions. The Editor's grateful acknowledgements are justly due to R. D. Grainger, Esq., Professor of Anatomy at the Webb Street School, for an actual demonstration of the method of dissecting the parts concerned in forming hernia.

The Third and concluding Volume will contain Sir Astley's Lectures on the

Venereal Disease.

Diseases of the Eye.

Scrofula.

Diseases of the Bones.

Burns and Scalds.

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Animal and Vegetable Poisons.

A Treatise on the Use and Application of Bandages, with many wood-cut illustrations.

The Editor needs offer no apology in adding this last Treatise as a concomitant to the Surgical Works of Sir Astley Cooper, as every tyro in the profession must know that a judicious and well applied bandage will often effect a cure when every other remedy has failed.

ALEXANDER LEE.

Three Crown Square,
Southwark.

31st May, 1837.

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N.B. The reader will please to observe that the descriptions given at pages 9, 47, 62, 83, 90, 91, 125, 127, are superfluous, having been superseded by another arrangement.

THE PRINCIPLES AND PRACTICE OF SURGERY.

OF HERNIA.

LECTURE XXXIX.

GENERAL DESCRIPTION OF HERNIA.

A PROTRUSION of any viscus from its proper cavity is denominated a hernia. The protruded parts are generally contained in a bag, formed by the membrane with which the cavity is naturally lined. Definition.

Several parts of the body afford examples of this disease. A deficiency in the bones of the head will sometimes allow the protrusion of part of the brain and its membranes, from the inner to the outer side of the scull, forming a hernia of this organ. Encephalic hernia.

An imperfect state of the intercostal muscles may permit part of the lung, with its pleura, to form an external tumour, or hernia of the contents of the chest. Thoracic.

But the disease most frequently occurs about the cavity of the abdomen; and on this account, as well as from its superior importance in a surgical point of view, I shall confine my observations to this species, with its several varieties. Abdominal.

Many reasons may be assigned for the very frequent occurrence of protrusions from the abdomen. Causes of its frequent occurrence.

First: The viscera of this cavity are numerous, some of them very moveable, and others loosely connected by peritoneal attachments with the surrounding parts; and they are constantly exposed to changes of size and relative situation, from sudden or gradual distention.

Secondly: The parietes of the abdomen are composed of muscles which, when in action, contract the dimensions of this cavity, com-

press the bowels, and thus have a tendency to force them from their natural situation.

Thirdly: For the passage of vessels and nerves, these muscles and their tendons have various apertures which, though naturally only large enough for that purpose, often become so much relaxed as to allow the viscera themselves to protrude.

Lastly: The muscles are sometimes imperfectly formed, and the viscera escape through unnatural apertures.

The following are the situations in which abdominal herniæ are found.

Situations of the abdominal.

First: It appears at the abdominal rings, generally passing in the same course with the spermatic cords in the male, and the round ligaments of the uterus in the female; thence it is continued down into the scrotum in the one sex, and the labium pudendi in the other. This hernia of the abdominal ring is known to surgeons

Inguinal.

under the various appellations of inguinal hernia, bubonocele, scrotal hernia, and oscheocele.

Secondly: A hernia also penetrates under Poupart's ligament, forming a tumour at the inner and upper part of the thigh. In

Crural.

this situation it is called femoral hernia, crural hernia, or merocele.

Thirdly: Another species is formed at the navel by a protrusion through the opening which was formed in the fœtus for the passage of the umbilical cord. This has received the name of um-

Umbilical.

bilical hernia, or exomphalos.

Fourthly: Similar protrusions take place through the tendinous covering of the anterior part of the abdomen. The linea alba and semilunaris are perforated to transmit vessels passing to the common integuments: when these holes are either originally of an unusual size, or are enlarged during a relaxed state of body, herniæ

Ventral.

will occasionally be formed in them, which are then called ventral.

Thyroideal.

Fifthly: Another part, at which hernia sometimes appears, is the foramen ovale of the pelvis; it then takes the name of the aperture, and is termed hernia foraminis ovalis, obturatoria, or hernia thyroidea.

Ischiatic.

Sixthly: Sometimes, though rarely, a hernia is produced at the

ischiatic notch projecting by the side of the sciatic nerve under the glutæi muscles. This takes the name of the part, and is termed hernia of the ischiatic notch, or ischiatocele.

Seventhly: Sometimes a hernia passes between the bladder and rectum in the male, and between the rectum and uterus in the female, appearing in the perineum. It is then called hernia perinei. Perineal.

Eighthly: I have seen the vagina protruded by a descent of the viscera between the rectum and uterus, and pushed backwards by the bladder, forming a considerable external tumour when the bladder was full, which disappeared as soon as it was emptied. Vaginal.

Ninthly: I have met with a hernia protruding into the labium pudendi, passing under the ramus of the ischium with the internal pudendal artery, but continued into the pelvis by the side of the vagina. Pudendal.

Tenthly: Hernia has been known to protrude through the diaphragm, sometimes by the side of the œsophagus, sometimes accompanying the vena cava inferior, sometimes, though more rarely, by the side of the aorta, but more frequently through unnatural apertures in the muscle. Diaphragmatic.

Eleventhly: I have two preparations in my possession, of hernia occasioned by the viscera passing between the laminæ of the peritoneum; in one of these they passed into the mesentery; Mesenteric.

Twelfthly: In the other into a bag formed by a separation of the laminæ of the mesocolon, in which all the small intestines were contained. When the mesentery is imperfectly formed, openings are sometimes found in it, through which the viscera pass and become strangulated; these can scarcely be termed herniæ, as the intestine still remains within its proper abdominal cavity. Mesocolic.

That species of hernia, which, from its frequently appearing at the time of birth, is called congenita, takes the same course through the abdominal rings as the inguinal hernia; but instead of passing down upon the fore part of the spermatic process, it descends within the tunica vaginalis testis, and ought therefore to be named the hernia tunicæ vaginalis. Congenital.

There is no part of the abdomen, excepting where the parietes

are formed of bone, at which hernia may not occur; for, when the formation of the muscles is defective, it may happen even at the loins, in which case the kidney has been known to be part of the protruding substance. But of all the varieties of this disease which I have enumerated, the inguinal, femoral, and umbilical herniæ most frequently occur.

The most frequent.

Sex.

The difference in the structure and œconomy of some parts of the abdominal parietes in the two sexes, renders the one sex disposed to that kind of hernia, from which the other is comparatively exempt; thus the large size of the inguinal canal in men, causes inguinal hernia to be a very common disease among them; whilst among females, it is but rarely met with; and on the contrary, the proportions of the female pelvis and distention of the abdomen from pregnancy, together with other circumstances, dispose this sex to be the frequent subjects of crural and umbilical herniæ, which may be regarded as uncommon diseases in man.

Named from contents.

The names that have been given to different kinds of hernia, have been derived from their contents, as well as their situations. If they contain only omentum, they are called omental hernia, or epiplocele; if only intestine, intestinal hernia, or enterocele; if both omentum and intestine, entero-epiplocele; if the stomach is contained in the tumour, gasterocele; if the liver, hepatocele; if the bladder, cystocele, or hernia cystica; if the uterus, hysterocele; and the same of others; for, excepting the duodenum and the pancreas, which are too closely connected with the spine easily to change their situation, all the different abdominal viscera have occasionally been found to form the contents of a hernial tumour.

Viscera most frequently found in them.

However, the viscera usually met with in hernia are the omentum, and the ileum; the next in frequency is the colon, then the cæcum, and lastly the jejunum; sometimes the appendix cæci is the only part of the intestine found in the hernial sac.

Hernial sac.

The cavity of the abdomen is every where lined by peritoneum, which in hernia generally protrudes prior to the descent of any viscus, and thus a bag or sac is formed by this membrane, in which the protruded viscera are afterwards contained. To this there are

occasional exceptions, arising from some of the viscera being only partially covered by peritoneum in their natural state.

Its formation.

The older surgeons thought that herniæ were formed by a laceration of the peritoneum and abdominal muscles, which gave rise to the term *rupture;* but dissection has proved that such a rupture of the membrane scarcely ever happens. The peritoneum in forming a hernial sac is not dragged from its natural situation, but becomes elongated by gradual distention, and it is usually not only lengthened, but slightly thickened; for a long continued pressure of moderate force will produce an elongation and thickening of fibre, though a greater degree will bring about an entire absorption of parts. This is proved, in the first case, by the vast increase of size and thickness which the tunica vaginalis undergoes in an old hydrocele; and in the second, by the entire removal of the sternum and cartilages of the ribs in aneurism. It is by the first of these principles in the animal œconomy that a hernial sac is produced, and if the sac be compared with the peritoneum from which it originated, it will generally be found to be a more dense and compact membrane. But when the hernia becomes of very considerable magnitude, the peritoneum forming the sac becomes thinner than natural; for the extension may go beyond the degree at which pressure thickens; and from this cause it is that in old and large herniæ, the peristaltic motion of the intestines may sometimes be seen through the sides of the sac. This is also one reason why herniæ are sometimes found without sacs, for, the process of extension having ceased, the sac becomes either entirely absorbed or remains only at the orifice; and hence, over the larger part of the tumour in one species of hernia, frequently no covering is left for the protruded viscera but skin and cellular membrane.

Sometimes thinner than the peritoneum.

Thickened.

On the other hand, the sac has occasionally been observed to be so much thickened as to retain nothing of its original peritoneal texture, and to be divisible into layers. But from what I have seen of this disease, I am induced to believe that this opinion has originated from the want of sufficient distinction between the coverings of the sac, and the sac itself; for, as far as I can dis-

cover from dissection, it is the former which are extremely thickened in old hernia, whilst the latter is but little denser than the peritoneum.

Adhesion.

A hernial sac, however small, adheres to the parts by which it is surrounded, but yet can be readily drawn into the cavity of the abdomen; this I have several times done in the dead subject, and have then seen the sac lying loosely within the cavity of the abdomen, at the orifice through which it had descended. The return, however, of the sac can only be effected whilst the hernia is small, and in the most recent state; for, if it has been of long standing, or has descended far, it has always contracted such firm adhesions to the surrounding parts, that it can be separated only by dissection. At first the adhesions are few and weak, but they gradually become strong, and uniformly spread over the surface of the sac.

Shape.

The opening by which the sac communicates with the abdomen is generally its smallest part, and is called its mouth; but when it has passed a short way from the abdomen, and has quitted the tendons which surround its mouth, it enters parts more easily distensible than tendinous structure, and then dilates into a bag of a pyriform shape.

Vessels connected with it.

As the hernial sac generally passes through openings which are designed for the passage of blood-vessels, its exact situation with respect to these vessels should be attended to most carefully. Nor are those which accompany the hernial tumour the only vessels that require attentive observation; for in the two most important herniæ, the inguinal and femoral, an artery passes near the orifice of the sac, the course of which it is of the utmost importance for the surgeon to observe, as an ignorance of it must often expose the life of the patient to imminent risk in the operation for hernia when in a state of strangulation, as two cases hereafter detailed will show.

Coverings.

The coverings with which a hernial tumour is invested, will entirely depend on the nature and structure of the parts protruded before the sac; thus, in one kind of inguinal hernia, muscular fibre

is found to be a covering; in another species, the dense tendon of a muscle is the envelope; while in a third variety, we find both these coverings combined.

Several hernial sacs are sometimes found in the same subject at different parts; an instance of this is subjoined, that occasioned a difficulty in determining which was to be the subject of operation. Sometimes more than one hernia exists in the same situation. I have a preparation of two hernial sacs at each groin, with another in an incipient state on the left side; and the subject of one of the plates in this part of the work *, represents two herniæ on one side and one on the other. When this is the case, they seldom are all at the same time in a state of protrusion, and the second sac is often formed after the cure of the first, two examples of which will be hereafter related. Several sacs.

A hernial sac is sometimes burst by a blow. When this happens, its contents escape out of the sac, and become placed under the contiguous skin, so that the viscera require to be returned into the sac before they can pass into the abdomen. I attended a case of inguinal hernia under these circumstances, with Mr. Brickenden, a surgeon in Southwark: the viscera had escaped under the skin of the scrotum, through a hole in the fore part of the sac, and were obliged to be returned into the sac before the reduction of the hernia could be effected. Burst.

The protruded parts are not always, however, contained in a sac; for, when hernia arises from a mal-formation of the muscles, attended with unnatural apertures in them, these holes are not always covered by peritoneum. This was the case in a hernia protruding through the diaphragm which I met with some years ago; the colon, the viscus that had escaped into the chest, was lying upon the lung without any peritoneal sac. This exception, however, does not universally hold in the diaphragmatic herniæ, for I have known one instance in which the viscera were included in a process of peritoneum. The hernia congenita has not a peritoneal covering distinct from the tunica vaginalis testis, except in No sac.

* See Sir Astley's large Work on Hernia.

a very uncommon variety of the disease. The hernia cystica is described as being equally destitute of this membranous coat; but this is only true in the commencement of the disease.

Dr. Marshall has a preparation of umbilical hernia in which no sac appears, but the protruded parts lie in direct contact with the skin. This variety is very rare; but the possibility of such an occurrence should be known, as in performing the operation for hernia extreme care should on this account be taken, to avoid wounding any of the protruded viscera.

LECTURE XL.

ANATOMY OF THE PARTS FORMING INGUINAL AND FEMORAL HERNIA.

Five pairs of muscles with their tendons form the principal covering of the abdomen. These are, on each side, the obliquus externus, the obliquus internus, the transversalis, the rectus, and the pyramidalis. The three first of these only, however, are concerned in the production and course of the two kinds of herniæ in question.

External oblique.

The external oblique muscles, arising from the eight inferior ribs on each side, slope with an easy descent towards the lower part of the abdomen, and end in an expanded tendon, which covers the whole of the hypogastric and part of the umbilical regions.

This tendinous expansion is provided in man to defend him from the accidents to which his erect attitude would naturally subject him. In quadrupeds, to whom the horizontal position is natural, the weight and pressure of the viscera are diffused over the whole of the abdominal parietes; but in the human subject, when the abdominal muscles and diaphragm are combining their powerful efforts to fix the ribs, to enable the muscles of the upper extremity to act to the greatest advantage, the viscera being forced towards the lower part of the belly, muscular fibre would prove but a

Fig. 1.

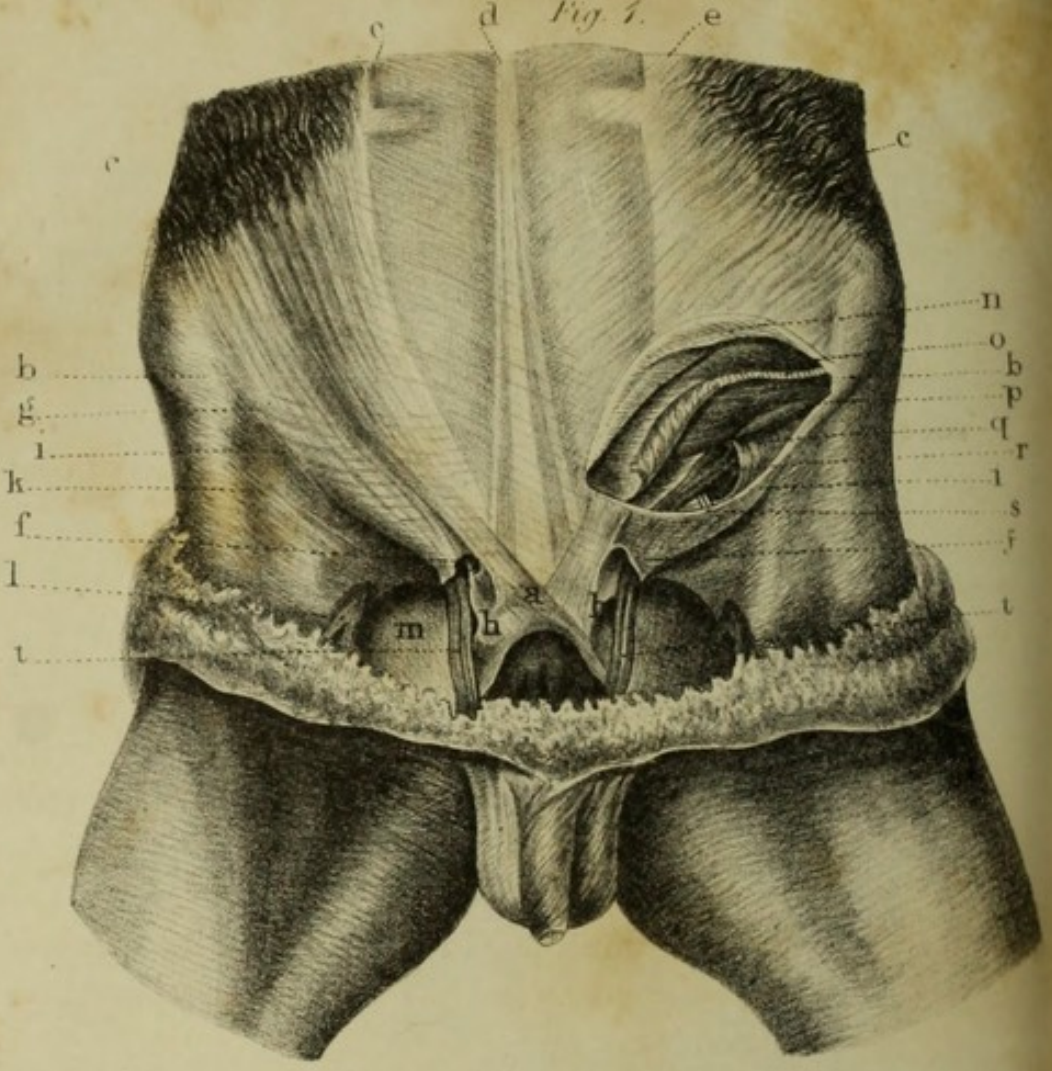
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Fig. 2.

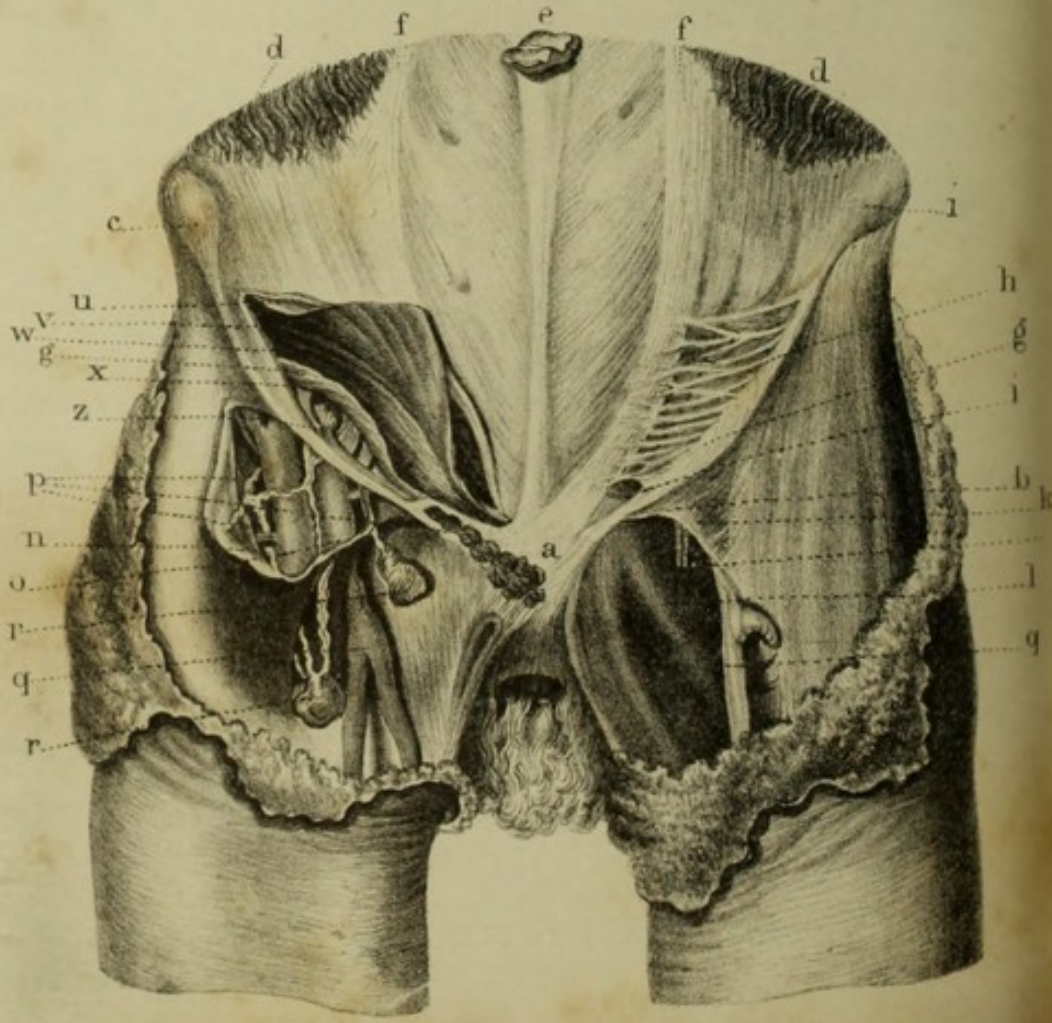
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PLATE I.

The first figure in this Plate is intended to shew the insertions of the external oblique muscles, the formation of the abdominal rings, and of two of the fasciæ which are connected with Poupart's ligament, as well as the course of the spermatic cord under the edges of the internal oblique and transverse muscles, before it reaches the abdominal ring.

Fig. 1.

a, Symphysis pubis.

b b, Anterior and superior spinous process of the ilium.

c c, External oblique muscles.

d, Linea alba extending down to the symphysis pubis, and formed by the union of the tendinous fibres of the two oblique and transverse muscles.

e e, Lineæ semilunares, formed by the union of the tendinous fibres of the external and internal oblique and transverse muscles.

f f, The abdominal rings formed by the separation of two columns of tendinous fibres; the upper inserted at *a* into each os pubis; the lower inserted into the pubes at *h*, after passing behind the spermatic cord.

g, The origin of some tendinous fibres which proceed from the anterior spinous process of the ilium, and crossing the columns of tendon, assist in uniting them above the abdominal ring.

i i, Poupart's ligament, or the crural arch, which is extended from the anterior spinous process of the ilium at *b*, to the pubes at *h*, receiving the lower column of tendon, which forms a part of the abdominal ring, and which passes behind the cord to be inserted from the spinous process to the crest of the pubes.

k, The fascia lata of the thigh, which is continued from Poupart's ligament, and seen turning in under the femoral vessels near the middle of the fore part of the thigh.

l, Is the saphæna major vein of the leg going through the fascia to enter the femoral vein.

m, Another part of the same fascia, which arises from Poupart's ligament, and joins with the fascia lata, which it assists in forming.

n, The tendon of the external oblique muscle cut open to shew the parts which are situated behind it.

o, The internal oblique muscle; its lower edge, which arises from Poupart's ligament, is raised and turned to shew the parts behind it. It is inserted into the pubes behind the upper column of tendon which forms the abdominal ring.

p, The transversalis muscle. Its lower edge also arises from Poupart's ligament, but is here raised and turned up. In its natural state it runs over the cord to be inserted into the pubes behind the abdominal ring, which it serves as a valve to close posteriorly.

q, A fascia, connected with Poupart's ligament, which runs upwards to the transversalis, and unites itself to the posterior part of the transverse muscle and its tendon, and thus prevents the bowels from slipping between the lower edge of the muscle and Poupart's ligament, or between the fibres of the muscle itself.

That portion of the fascia which is placed between the spinous process of the ilium at *b*, and the hole *r*, is strong; but that between the hole *r*, and the pubes, is often little more than condensed cellular membrane, as that part is strengthened by the tendon of the transversalis, and by the epigastric artery.

A portion of the fascia is fixed in the pubes, and another part of it passes behind Poupart's ligament to unite with the femoral vessels.

r, The place at which the spermatic cord goes into the abdomen. The fascia situated on its outer side and lower part, is of considerable density, but becoming thin upon its inner

side, so as to shew the epigastric artery and vein behind it; from the edge of the fascia a thin layer is sent off which unites itself to the spermatic cord, which fascia in this dissection has been removed.

s, The epigastric artery and vein, situated behind the fascia transversalis, at first on the inner side, and afterwards behind the spermatic cord. The epigastric artery is shewn here by cutting the fascia transversalis parallel to it.

t t, The spermatic cord, nearly two inches of which are above and to the outer side of the abdominal ring, and still not in the abdomen; it is also seen below the ring, running to the testicle.

Fig. 2. This figure is intended to exhibit a view of the abdominal rings, and of the crural arch in the female; the fascia lata of the thigh, the crural sheath, and the passage of the round ligament of the uterus, from the internal to the external ring.

a, Symphysis pubis.

b, Tuberosity of the pubes.

c, Anterior superior process of the ilium.

d d, External oblique muscles.

e, Linea alba.

g, Crural arch, or Poupart's ligament.

h, Tendinous fibres crossing the columns of the external oblique.

i, The abdominal ring on the left side.

k, That part of the fascia lata of the thigh, which proceeds from the crural arch, and which covers the muscles on the outer part of the thigh, and femoral vessels.

l, The inner portion of the fascia lata covering the pectineus and triceps muscles, and united with the outer portion of fascia behind the saphena major vein.

m, Crural sheath cut open.

n, Femoral artery.

o, Femoral vein.

p, Three absorbent vessels.

q q, The saphena major vein.

r r, Two absorbent glands.

s, Arteria circumflexa ilii.

t, Epigastric artery.

u, Tendon of the external oblique muscle laid open.

v, Internal oblique turned upwards.

w, Transversalis muscle turned upwards.

x, Fascia transversalis seen passing from the crural arch behind the transversalis muscle.

y y y y, Round ligament of the uterus descending through the opening in the fascia in the inguinal canal.

z, Course of the epigastric artery seen through the fascia transversalis.

+ Absorbent vessels on the left side entering the crural sheath, where crural hernia passes into the thigh.

feeble barrier, and herniæ would probably be the invariable consequence of muscular exertion. This tendon rarely allows an intestine to escape between its fibres; strengthened by an interlacement of texture, it supports the weight of pregnancy and of dropsical accumulations, resists the pressure arising from excessive obesity and from muscular contraction, and would altogether have exempted man from the occurrence of inguinal rupture, were it not for the existence of two openings in it about to be described.

In the lower part of the tendon of each muscle, a little above and to the outer side of the symphysis pubis, is an opening called the abdominal ring, formed for the passage of the spermatic cord to the testicle in the male, and the round ligament of the uterus in the female. The following is the mode in which these openings are produced. Abdominal ring.

The tendon of the external oblique, as it proceeds towards the pubes, splits into two columns, leaving a space for the passage of the spermatic cord: the upper broad column is attached to the symphysis pubis, and crosses its fellow on the opposite side; the lower rounded column, after being doubled under the spermatic cord, is fixed to the process of the pubes, called its spinous process, which may be felt in the living subject; from the under edge of this column, a process of tendon is sent obliquely backwards to the crest of the pubes. Thus it appears that the lower part of the tendon of each muscle has three insertions into the os pubis. First, into the symphysis, by means of the upper column of the ring: secondly, into the spinous process, by the inferior column: and, thirdly, into the crista, or linea ilio-pectinea, by means of a process of tendon called Gimbernat's ligament. *Vide Plate I. and II.*

EXPLANATION OF PLATE FIRST.

This plate is intended to shew the insertions of the external oblique muscles, the formation of the abdominal rings, and of two

of the fasciæ which are connected with Poupart's ligament, as well as the course of the spermatic cord under the edges of the internal oblique and transverse muscles, before it reaches the abdominal ring.

a. Symphysis pubis.

b b. Anterior and superior spinous process of the ilium.

c c. External oblique muscles.

d. Linea alba extending down to the symphysis pubis, and formed by the union of the tendinous fibres of the two oblique and transverse muscles.

e e. Lineæ semilunares, formed by the union of the tendinous fibres of the external and internal oblique and transverse muscles.

f f. The abdominal rings, formed by the separation of two columns of tendinous fibres; the upper inserted at *a* into each os pubis; the lower inserted into the pubes at *h*, after passing behind the spermatic cord.

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m. Another part of the same fascia which arises from Poupart's ligament, and joins with the fascia lata, which it assists in forming.

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p. The transversalis muscle. Its lower edge also arises from Poupart's ligament, but is here raised and turned up. In its natural state it runs over the cord to be inserted into the pubes behind the abdominal ring, which it serves as a valve to close posteriorly.

q. A fascia, connected with Poupart's ligament, which runs upwards to the transversalis, and unites itself to the posterior part of the transverse muscle and its tendon, and thus prevents the bowels from slipping between the lower edge of the muscle and Poupart's ligament, or between the fibres of the muscle itself.

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r. The place at which the spermatic cord goes into the abdomen. The fascia situated on its outer side and lower part, is of considerable density, but becoming thin upon its inner side, so as to shew the epigastric artery and vein behind it; from the edge of the fascia a thin layer is sent off which unites itself to the spermatic cord, which fascia in this dissection has been removed.

s. The epigastric artery and vein, situated behind the fascia transversalis, at first on the inner side, and afterwards

behind the spermatic cord. The epigastric artery is shewn here by cutting the fascia transversalis parallel to it.

t t. The spermatic cord, nearly two inches of which are above and to the outer side of the abdominal ring, and still not in the abdomen; it is also seen below the ring, running to the testicle.

These columns are united, at the point where they begin to diverge, by cross tendinous fibres, which may be traced from the anterior superior spinous process of the ilium, and from the lower boundary of the tendon called Poupart's ligament. These fibres cross from one pillar to the other, and bind them firmly together, assisted by additional bands passing between the edges of the columns. The direction of these fibres is at right angles with those of the tendon of the external oblique.

Direction.

The direction of the abdominal rings is obliquely upward and outward; for, although they have received the appellation of rings, they are far from being annular in their figure, but approach rather to the triangular form; their longest diameter, which is that from the pubes to the transverse fibres, is about an inch; while their transverse breadth from one column to the other is only half an inch: the centre of the aperture is one inch and a quarter from the symphisis pubis.

Superficial fascia.

A dense cellular fascia is found under the integuments, covering the tendon of the external oblique muscle; it adheres to the edge of the abdominal ring, and accompanies the spermatic cord in its descent into the scrotum, with which latter it is closely connected; it also descends upon the thigh; and, to distinguish it from other structures, I shall call it superficial fascia. It gives a covering to both inguinal and femoral herniæ.

No opening behind the ring.

The direct passage of the spermatic cord into the cavity of the abdomen is prevented by tendons and a fascia, which are probably intended as a guard against protrusion of the contents of the belly.

The tendons that close the opening, are those of the internal oblique and transversalis muscles.

Internal oblique.

Behind the tendon of the external oblique, the lower fibres of the obliquus internus take their course; those from the spine of the ilium horizontally towards the linea semilunaris and alba, while those which arise from the outer half of Poupart's ligament are passing obliquely towards the pubes. The lower fibres, after passing over the spermatic cord, terminate in a tendon, which is inserted into the symphysis pubis. If the finger be passed through the ring, this tendon may be felt immediately above it, and towards its inner side.

Transversalis.

The lower portion of the transversalis runs nearly parallel to the former, but arises only from one third of Poupart's ligament; passing underneath, and concealed by the internal oblique, the fibres also cross the spermatic cord, and end in a tendon, which is connected with that of the latter muscle, and is inserted into the linea alba and pubes. But the tendon of the transversalis descends much lower than that of the internal oblique; and towards the pubes and Gimbernat's ligament, forms a semilunar expansion, which is connected with a fascia presently to be described; it is more particularly by the union of these that the abdominal ring is closed behind. *See Plate II.*

The foregoing description will shew that there is no natural aperture into the abdomen behind the ring; and therefore the opening, by which the spermatic vessels quit the abdomen, must be sought for elsewhere. It will be found one inch and a half above, and to the outer side of the abdominal ring, in a line passing from the ring to the superior spinous process of the ilium. This line marks the course of the spermatic cord; and the opening, which allows its immediate exit from the abdomen, is formed in a fascia, to understand the nature of which, Poupart's ligament and its fasciæ must be more particularly described.

Poupart's ligament, or, as it is now commonly called, the crural arch, is a rounded band of tendon connected to the superior spinous process of the ilium, whence it passes down in a vaulted

form over the femoral vessels, and terminates at the pubes on the inner side of these vessels in a semicircular sweep, from whence proceeds a triangular portion connected with the spine of the pubes and continued inwards to the crista of the bone. Its insertion is best seen, as well as the parts hereafter described, by dissecting them as in plate first. If there had been no other defence to the lower part of the abdomen, than what is afforded by this arch, few persons would be exempt from herniæ; but this part is fortified by other means.

Three distinct fasciæ are connected with the crural arch, two of which pass upward to assist in supporting the abdominal viscera; and one descends upon the muscles of the lower extremity, known as the fascia lata femoris. One of these only will at present be considered.

Fascia transversalis.

When the lower portions of the internal oblique and transversalis muscles are raised from their subjacent attachments, a layer of fascia is found to be interposed between them and the peritoneum, through which the spermatic vessels emerge from the abdomen. This fascia, which I have ventured to name *fascia transversalis*, varies in density, being strong and unyielding towards the ilium, but weak and more cellular towards the pubes. Midway between the spine of the ilium and pubes, the opening will be seen, which is now generally known as the internal abdominal ring; the edges of it are indistinct on account of its cellular connexions with the cord; when these are separated, the fascia in which it is formed will be found to consist of two portions; the outer strong layer, connected to Poupart's ligament, winds in a semilunar form around the outer side of the cord, and bounds the aperture by a distinct margin, from which a thin process may be traced passing down upon the cord. The inner portion, which is found behind the cord, is attached to, but less strongly connected with the inner half of the crural arch, and may be readily separated from it by passing the handle of a knife between it and the arch. It ascends behind the tendon of the transversalis, with which it is intimately blended, passes around the inner side of the cord, and joins with

Internal abdominal ring.

the outer portion of the fascia above the cord, being at length firmly fixed in the pubes; the inner margin of the ring is less defined than the outer, the fascia transversalis being doubled inwards towards the peritoneum, to which it is firmly attached. Thus, then, it appears, that the *internal ring* is not a circumscribed aperture like the external abdominal ring, but is formed by the separation of two portions of fasciæ, which have different attachments and distributions at the crural arch; the outer portion terminating in Poupart's ligament, while the inner portion will be found to descend behind it, to form the anterior part of the sheath that envelopes the femoral vessels. The strength of this fascia varies in different subjects; but in all cases of inguinal hernia it acquires considerable strength and thickness, especially at its inner edge; and if these parts had been formed without such a provision, the bowels would, in the erect posture, be always capable of passing under the edge of the transversalis muscle, and no person would be free from inguinal hernia. *Vide Plate II.*

The fascia transversalis may be traced as high as the diaphragm; and on the inner side it passes behind the rectus muscle, where it begins to assume the character of cellular tissue.

Spermatic cord.

Through the two openings which I have described, the spermatic cord passes down to the testicle. The cord is composed of arteries, veins, nerves, absorbents, an excretory duct called the vas deferens, a membranous sheath, and the cremaster muscle.

Artery.

The spermatic artery on each side is derived from the fore part of the aorta, below the origin of the emulgent arteries. It passes down behind the peritoneum over the psoas muscle, and, crossing the ureter, arrives at the internal ring, where it forms part of the spermatic cord.

Vein.

The spermatic vein on each side arising from the testis, enters the abdomen with the cord, and accompanies the artery to the middle of the abdomen, where they separate; the right vein terminating in the inferior cava, the left joining with the left emulgent vein.

Vas deferens.

The vas deferens commences from the under and back part of

the epididymis, forming with the latter the excretory duct of the testis; it accompanies the cord to the internal ring, and there leaving the spermatic vessels, descends over the brim of the pelvis by the side of the bladder to its ultimate destination in the urethra. The duct is frequently accompanied by a small artery derived from a branch of the internal iliac.

These vessels, together with the accompanying nerves and absorbents, receive a double covering of peritoneum, which is derived from the part at which they quit the abdomen, and closely unites them together. This covering is called the tunica vaginalis of the spermatic cord. About an inch above the testis, the two layers separate to form a serous bag, which invests the gland anteriorly, and gives freedom to its motion. This bag is called the tunica vaginalis testis.

Tunica vaginalis.

Cremaster.

Between the upper and lower rings the cord receives the cremaster muscle. It arises, under the tendon of the external oblique muscle, from the edges of the internal oblique and transversalis, descends into the scrotum upon the surface of the cord, and is attached to the tunica vaginalis reflexa of the testicle. This muscle is usually accompanied in its descent into the scrotum by a branch from the epigastric artery.

It appears, therefore, that the portion of the cord between the testis and the external ring is covered by a double peritoneal coat, formed by the tunica vaginalis, next by the cremaster muscle, and lastly by a layer of fascia sent from the tendon of the external oblique; that portion included between the two abdominal rings is also covered by the cremaster and tunica vaginalis; but, besides the fascia of the external oblique, it receives an additional covering from the tendon of the muscle. Within the cavity of the abdomen the spermatic vessels receive no other covering but that which is derived from the peritoneum.

Inguinal canal.

The space which the cord occupies between the external and internal abdominal rings is now called the inguinal canal. It is formed by the following parts: the posterior boundary is formed by the union of the tendon of the transversalis muscle and fascia

transversalis. Below, the canal is completed by the crural arch, and anteriorly it is bounded by the tendon of the external oblique. This canal seems to answer the purpose of preventing the ready protrusion of the abdominal viscera; for, had the cord emerged from the abdomen immediately behind the external ring, few persons in the habit of much bodily exertion would be free from hernia; whereas, when the abdominal muscles are in action, the tendon and fascia behind the cord being pressed forward by the viscera, perform the part of a valve, and more completely shut up the passage against the descent of the viscera.

Epigastric artery.

The epigastric artery is situated so near to the spermatic cord, and is so much concerned in the operation for hernia, that a most accurate knowledge of its course is absolutely requisite. This vessel arises from the external iliac artery behind Poupart's ligament, and, after a slight inclination downwards, passes upwards and inwards. At its commencement it is situated behind the fascia transversalis, and runs along the inner edge of the internal ring, where the spermatic cord crosses it nearly at right angles; taking its course behind the edge of the rectus, it enters the sheath of the latter muscle, and ascends to inosculate with the internal mammary artery. In its course it distributes a branch to the cremaster, which descends on the cord, and also several to the abdominal muscles; it is also generally accompanied by two veins. Where the epigastric artery is crossed by the cord, it is distant about three inches from the symphysis pubis on one side, and from the superior spinous process of the ilium on the other.

STRUCTURE OF THE PARTS FORMING FEMORAL HERNIA.

In order to understand the parts directly and indirectly concerned in this intricate part of anatomy, and to comprehend the means that nature has adopted to give security to the contents of the abdomen at the upper part of the thigh, it will be necessary to describe the anatomy of the bones, and of the different fasciæ, which are formed at the groin.

Bones.

The distance between the symphysis pubis and the anterior superior spinous process of the ilium, is from five and a half to six inches, and if a line be drawn from one of these points to the other, the space beneath it will be bounded for half its length by the body of the pubes, and half by the ilium. About an inch and a quarter from the symphysis pubis, (in the dried bone,) upon its anterior and upper part, is situated the tuberosity of the pubes, or, as it has been improperly called, its spinous process. From this process a line is seen to extend obliquely backward and outwards along the upper part of the pubes, as far as its junction with the ilium; this line is called the linea ilio-pectinea, and assists in forming the brim of the pelvis.

About an inch and a quarter on the outer side of the tuberosity of the pubes, is a natural depression on the upper part of the bone, formed for the lodgement of the femoral artery, vein, and absorbents, which, upon its outer side, is bounded by a projection, marking the junction of the os pubis and ilium, and extending over the acetabulum.

On examining that part of the ilium which forms the outer boundary of the space mentioned above, it will be found, that two inches below the anterior superior spinous process, is situated another similar projection, called the anterior inferior spinous; and, that between the two, is a depression about an inch and a quarter in extent; immediately below the latter process is the acetabulum, and an inch anterior to it, is a flat surface extending to the os pubis.

It will be seen on dissecting the soft parts that fill up the space between the ilium and pubes, that they are wonderfully and beautifully adapted to the purpose for which they are designed; but it must be acknowledged, that their intricate connections render them of all parts in anatomy the most difficult to investigate, and to describe with perspicuity.

Ligament of the pubes.

The os pubis is covered by a ligamentous expansion, which forms a remarkably strong production above the linea ilio-pectinea, extending from the tuberosity of the pubes outwards, and projecting

from the bone over that line. To this ligament the third insertion of the external oblique muscle, or, as it is commonly called, Gimbernat's ligament, is attached. To obtain a clear view of it in dissection, the fascia covering the pectineus muscle, together with the muscle itself, must be cut away.

Superficial fascia.

The superficial fascia, which, in the anatomy of inguinal hernia, was described as covering the external oblique tendon, and descending into the scrotum over the cord, is found to have a very firm attachment to the lower edge of the crural arch; from thence it descends upon the absorbent glands of the groin, where it has been said to terminate; but erroneously, as it passes down upon the thigh, giving a covering to the absorbent vessels and superficial veins. The strongest fibres of this fascia are transverse; and though in its natural state it may readily escape the attention of the anatomist, yet, when it has been long pressed upon by a hernial tumour, particularly in a subject loaded with fat, it acquires considerable density. The covering which this gives to the femoral hernial sac, with the attachment it has to the edge of the crural arch, will be seen in the plates of the second part.

Fascia lata.

In a former part of the anatomical description it was mentioned, that Poupart's ligament gave origin to three fasciæ; one of the three which descends upon the thigh, and possesses great strength, is called *fascia lata femoris*. It may be said to have two distinct origins or attachments. The outer part, which is the stronger, arises from the whole of the lower edge of the crural arch, crossing the femoral artery and vein, the psoas and iliacus muscles, and the anterior crural nerve. The inner portion arises from the os pubis and the ligament of the pubes at the insertion of Gimbernat's ligament, extends over the pectineus and triceps muscles, and unites with the outer portion under the vena saphæna major. The united portions then form the fascia lata, which extends down the thigh, to envelop the muscles and support them when in action. *Vide Plate II., Fig.* 3.

When this fascia is first laid bare, the outer portion appears to

be turned in under the femoral artery and vein; but, on further dissection, is found to form a sharp crescentic edge, which has been well described by Mr. Allan Burns, and is called by him the *falciform process*. This falciform edge is connected to the fore part of the sheath containing the femoral vessels, and serves to strengthen it. When this fascia is dissected away, the muscles on each side are exposed, and the anterior crural nerve is laid bare; but the femoral artery and vein still remain enclosed in a sheath. The anterior part of this sheath appears at first sight to arise from the crural arch, but it may be readily detached from it by passing the finger behind the arch, where it will be found to be a continuation of the inner portion of the fascia transversalis. In a former part of the description it appeared, that this fascia consisted of two portions; one, arising from the whole of the upper edge of the crural arch, ascends under the transversalis muscle, and forms the outer edge of the internal abdominal ring; while the inner portion, fixed by a firm attachment to the pubes, passes behind the tendon of the transversalis muscle, with which it is blended, and forms the floor of the inguinal canal. Through the inner side of the sheath next to the pubes, pass the femoral absorbent vessels into the abdomen; in the male subjects I have seen them enter the sheath in a cluster, through a single hole in this fascia; but in both sexes the fascia is generally rendered cribriform by these vessels passing through a variety of small openings; but, nevertheless, if the sheath be clearly dissected, and the finger thrust into it from the abdomen, the cellular membrane and absorbent vessels are protruded through one of these holes which is larger than the rest; some of the absorbents also pass between the artery and vein, and in some subjects even on the outer side of the artery, entering by two small openings in the anterior part of the sheath. *Vide Plate II.*

Fascia transversalis.

OF THE PARTS WHICH SHUT THE ABDOMEN FROM THE THIGH.

When the peritoneum is dissected from the posterior surface of

the abdominal muscles, from the symphysis pubis to the spinous process of the ilium, the space between these points of bone will be found to be occupied in the following manner:—

From that part of the crural arch extending between the anterior superior spinous process of the ilium, to the outer edge of the external iliac artery, a strong fascia will be found to arise, extending upwards over the iliacus and psoas muscles; it may be traced inwards behind the femoral vessels, as far as the linea ilio-pectinea, being attached at that line to the ligament of the pubes, and to the tendon of the psoas parvus, when that muscle is present. This fascia has been particularly described by Gimbernat, and should be called fascia iliaca. If the fascia iliaca be carefully traced, it will be found to arise from the outer half of the crural arch, in conjunction with the outer portion of the fascia transversalis, the latter ascending before the peritoneum, while the former passes up behind that membrane; they unite at the outer side of the transversalis muscle, and appear as one continuous production. By the union of these two fasciæ at Poupart's ligament, and their separation to inclose the viscera, the contents of the abdomen are thus received into a blind funnel, and are prevented descending on the outer side of the iliac vessels. If the latter vessels be raised, the fascia iliaca will be seen descending behind them, as far down the thigh as the origin of the arteria profunda, thus forming the posterior part of the sheath. *Vide Plate II.*

Fascia iliaca.

Thus a sheath is formed, enveloping the femoral artery, vein, and absorbent vessels, anteriorly by the descent of the fascia transversalis, posteriorly by a similar process from the fascia iliaca: and by the union of these at the inner and back part of the sheath the bag is rendered complete. At the upper part the sheath is broad, but as it descends, it becomes more closely applied to the femoral vein and artery, giving it the appearance of a funnel, as is seen in the plate. It is at the upper and inner part of this funnel that the absorbent vessels enter the sheath, giving it, as has been already remarked, a cribriform appearance; this part of the sheath

Femoral sheath.

is much looser in its texture than the portion investing the artery and vein, which is firm and unyielding.

Contents of the sheath.

If the sheath be opened, the contents will be found separated by two membranous septa, one passing between the artery and vein, and a second, equally distinct, between the vein and the absorbents; the septum is formed by a process from the fascia transversalis passing backward, to attach itself to the fascia iliaca. The contents of the sheath differ in their attachment to the bag; the artery and vein are seen completely filling up the space in the sheath which is allotted to them; while the absorbents are loosely connected by means of cellular membrane and fat, which, not affording sufficient resistance to the pressure of the abdominal viscera, occasionally allows the descent of a hernia. *Fig.* 9. *Plate II.* It is this opening in the inner part of the sheath, occupied by the absorbent vessels and cellular membrane, to which the term *femoral aperture,* as allowing the descent of a hernia, should be strictly applied. This aperture is situated between the lunated edge of Gimbernat's ligament and the inner side of the femoral vein. When viewed from the abdomen, after the peritoneum is removed, it appears filled with cellular texture, which, being elastic, readily allows the finger to pass for an inch below the crural arch. If the finger be pressed forwards against the arch, the posterior edge of the latter may be distinctly felt; and even when Poupart's ligament is cut away, a tendinous unyielding band will be felt on the fore part of the sheath, where the latter is united to Poupart's ligament. The opening which allows the passage of the iliac vessels under Poupart's ligament is necessarily large, and can only be seen by removing the whole of the vessels, together with their sheath. The opening then appears to be of an irregularly oval shape, extending from the outer edge of Gimbernat's ligament to the junction of the fascia iliaca with the crural arch, and is bounded behind by the os pubis and its ligament, and before by the posterior edge of the crural arch. Its figure and boundaries will be seen delineated in *Plate II.*

Femoral aperture.

Epigastric artery.

The epigastric artery, in its course to the rectus muscle, is distant from the femoral aperture, by which the absorbents enter, not more than three quarters of an inch. This vessel is subject to considerable variety in its origin; for, though it generally arises near the orifice of the sheath, it not unfrequently takes its origin an inch below its usual place; and, under this variety, approaches much nearer to the mouth of a hernial sac. When the thigh is extended, this vessel is drawn down into the sheath. The spermatic cord in the male, and the round ligament of the uterus in the female, entering the internal abdominal ring on the outer side of the epigastric artery, descend obliquely along the inguinal canal; in their course the cord is separated from the femoral aperture by the fascia transversalis, which lies immediately above that opening and the crural arch. The proximity of the cord to the mouth of a femoral hernial sac should be borne in mind.

Arteria circumflexa ilii.

The arteria circumflexa ilii arises from the external iliac artery, nearly opposite to, but a little below, the epigastric artery; and passing into a groove, formed by the common origin of the fascia iliaca and transversalis, it is continued towards the inner part of the superior spinous process of the ilium.

Vena saphæna major.

The vena saphæna major enters the crural sheath about an inch below the crural arch, and terminates on the inner side of the femoral vein.

Difference of structure in the male and female.

The difference in the structure of these parts in the male and female, which chiefly conduces to the production of hernia, is well explained by Dr. Monro, Jun., in his "Observations on Crural Hernia." The oval space forming the orifice of the crural sheath is larger in women than in men. The distance from the spine of the ilium to the symphysis pubis is greater, and, consequently, the crural arch is wider. The third insertion of the external oblique muscle is not so deep in the male as in the female. The psoas and iliacus internus occupy less space in the female than in the male. I have generally found this disease in women who have a very large pelvis in whom the ilium and pubes project more than usual.

Measurement.

The following measurement of the parts I have described was

made from subjects, which appeared to be well formed; and although the precise distance will vary according to the size of the person, the relative proportion of the parts will be preserved.

Male.

	Inches.
Symphysis pubis to the anterior superior spinous process of the ilium	5 3-4ths.
—— to the tuberosity of the pubes	1 1-8th.
—— to the inner margin of the external abdominal ring	0 7-8ths.
—— to the inner edge of the internal abdominal ring	3
—— to the middle of the iliac artery	3 1-8th.
—— to the middle of the iliac vein	2 5-8ths.
—— to the origin of the epigastric artery	3
—— to the epigastric artery on the inner edge of the internal abdominal ring	2 3-4ths.
—— to the middle of the lunated edge of the fascia lata	3 3-4ths.
—— to the middle of the crural ring	2 1-4th.
Anterior edge of the crural arch to the saphæna major vein	1

Female.

Symphysis pubis to the anterior superior spinous process of the ilium	6
—— to the tuberosity of the pubes	1 3-8ths.
—— to the inner margin of the external abdominal ring	1
—— to the inner edge of the internal abdominal ring	3
—— to the middle of the iliac artery	3 3-8ths.
—— to the middle of the iliac vein	2 3-4ths.
—— to the origin of the epigastric artery	3 1-4th.

	Inches.
Symphysis pubis to the epigastric artery on the inner edge of the internal abdominal ring . . .	2 7-8ths.
——————— to the middle of the lunated edge of the fascia lata	2 3-4ths.
——————— to the middle of the crural ring .	2 3-8ths.
Anterior edge of the crural arch to the vena saphæna	1 1-4th.

[I am indebted to the kindness of R. D. Granger, Esq., Professor of Anatomy at the Webb-street School, for the following method of dissecting the parts forming hernia. Ed.]

Before proceeding to the dissection of the parts connected with hernia, it is necessary to examine the external configuration of the abdomen, and to consider how far the structure of that cavity may influence the protrusion of its contents. In making this examination reference must be had to the influence of position; for it is evident, that as the upright posture is that in which the viscera escape, we shall acquire only very imperfect ideas of the conformation of the abdomen, if the body be merely regarded when placed, as it is, for the purposes of dissection, supine. If then we observe the erect body in profile, it will be seen that in consequence of the projection of the lumbar vertebræ, the axis of the abdomen is thrown obliquely forward, whilst that of the pelvis recedes; so that the contents of the former cavity are necessarily inclined against the anterior and lower part of the parietes, or in other words, against that particular part of the abdominal walls, where, from the existence of certain apertures, the resistance is least. This natural prominence of the abdomen is remarkably increased in obesity; and this alteration is one among the other changes attendant on that state, which predisposes to the formation of hernia.

We may next remark that the division between the abdomen

and the thigh is marked out by the depression which corresponds to Poupart's ligament, (the crural arch,) which structure may be readily traced in its whole extent between the anterior spine of the ilium and the tubercle of the pubis.

In order to expose the structures more immediately connected with inguinal hernia, it is necessary to make a perpendicular incision commencing at the umbilicus and terminating at the symphysis pubis; from the upper end of this incision a second may be carried outward to the crest of the ilium, and in this manner a triangular flap will be marked out which should be carefully raised, recollecting, that, in the first instance, the skin only should be taken up, leaving the superficial fascia perfect and entire. Having thus exposed the fascia superficialis abdominis, the manner in which that important structure strengthens the lower wall of the abdomen should be observed. In common with all other parts of the body, it covers the whole surface of the abdomen; it is continued over Poupart's ligament into the groin, and an important process descends into the scrotum, covering the spermatic cord, and at length proceeding perfectly continuous with the superficial fascia of the perinæum. The superficial fascia being provided to afford an uniform support in all parts of the body, is endowed with the necessary degree of strength and elasticity; but its thickness and resistance are much greater where it covers the abdomen and thigh than elsewhere.

In those situations it is particularly necessary to remark, that it presents a laminated texture, so that, by proceeding carefully, several successive layers may be raised and divided. In this stage of the dissection the variable thickness of the fascia as to the quantity of fat contained in its substance, and its degree of resistance in different subjects, should be noticed. The superficial blood-vessels of the abdominal parietes are lodged in the substance of the fascia; they consist of the superficial circumflex of the ilium, the superficial epigastric, and the external pudic arteries. The student will observe that some of these vessels, especially the latter, are so placed with respect to the external ring, and the

saphenous opening of the fascia lata, that they are very liable to be divided in the operation for inguinal and femoral hernia, as well as in that of castration.

The superficial fascia is to be completely raised by dividing it in like manner to the skin; but as it is desirable again to examine this part, it should not be cut away, but turned down towards the groin. In raising the fascia it will be perceived that it is but loosely connected by lax cellular substance to the tendon of the external oblique, excepting around the margins of the external ring and in the course of Poupart's ligament, in which situations a firm connection is established by means of some processes of fascia.

Tendon of the external oblique.

The surface of the external oblique muscle being thus exposed, it will be seen that it consists of an expanded sheet of tendon, which covers the whole anterior and lower part of the abdomen. The fibres which run obliquely downwards and forwards, begin to separate a short distance below the anterior spine of the ilium into two fasciculi, of which the upper passes to be inserted into the anterior and superior part of the pubic symphysis, and the lower into the tubercle of the pubis. The opening left between these two fasciculi is the external abdominal ring, and the fasciculi themselves are called the pillars or columns of the ring.

External ring.

The external ring is then nothing more than an opening in the tendon of the external oblique placed between the symphysis and tubercle of the pubis, which in the male transmits the spermatic cord, and in the female the round ligament of the uterus. Its borders, formed of the above mentioned fasciculi, offer considerable resistance when an attempt is made to separate them, not only on account of their thickness, but in an especial manner in consequence of their being firmly united by a structure which is called the *intercolumnar fascia*. In order to strengthen the walls and to prevent the separation of the parallel fibres of the external oblique, it will be observed, that at the lower part of the abdomen additional tendinous fibres are provided, which pass across the former in a semicircular manner from above Poupart's ligament towards the linea alba. Now where these fibres ap-

Intercolumnar fascia.

proach the outer angle of the external ring, they assume the form of a fascial membrane; and this membrane interposed between the pillars of the ring, and joining them firmly together, is the intercolumnar fascia.

External spermatic fascia.

When the superficial fascia is first raised, the borders of the external ring are not distinctly seen, in consequence of a process of fascia being continued from the pillars of the ring on to the surface of the spermatic cord, called the *external spermatic fascia*. This structure extends into the scrotum, where it is lost in the expansion of the cremaster. It is desirable to leave this fascia entire on one side of the subject, and to remove it on the other, in order to examine more carefully the form and relations of the external ring.

External ring is closed towards abdomen.

Before the tendon of the external oblique is divided, it is very important to ascertain how the external ring is closed towards the abdominal cavity, or in other words how the direct protrusion of the viscera, is prevented. If the student endeavour to push his finger through the ring towards the cavity, he will find that it is obstructed by a firm ligamentous structure. This consists, 1. Of the *fascia pyramidalis*, a small portion of fascia, which is derived from the tendon of the opposite external oblique, and is inserted into the os pubis behind the external ring. 2. Of the united tendon of the internal oblique and transversalis, which is attached to the linea-ilio-pectinea. It is also necessary to remark that behind this common tendon, there is the fascia transversalis; so that the viscera are supported at the external ring—by 1. the common integuments, consisting of the skin and superficial fascia; 2. the external spermatic fascia; 3. the pyramidal fascia; 4. tendon of internal oblique and transversalis; 5. fascia transversalis.

The next stage of the dissection consists in dividing the tendon of the external oblique in the same way as the integuments, taking care that the perpendicular incision is continued completely down to the symphysis pubis; this will allow the triangular flap to be sufficiently turned towards the groin to expose the parts beneath.

Internal oblique and transversalis.

The internal oblique is now seen proceeding from the outer half or even two-thirds of Poupart's ligament in a curved direction downwards and inwards towards the pubis, where behind the external ring it is inserted. In this course the muscle describes an arch, principally formed of fleshy fibres, although on the inner part it is tendinous. This arch crosses the spermatic cord at the distance of about an inch on the iliac side of the external ring; and is so disposed that whilst the internal oblique, at its attachment to Poupart's ligament, is anterior to the cord, the part of the muscle towards its insertion in the pubis, is behind the cord.

The transversalis observes very nearly the same disposition, excepting that its origin is confined to about the outer third of Poupart's ligament.

Cremaster.

The student will now observe the cremaster muscle, investing the cord. The fibres pass off partly from the muscular arch of the internal oblique, partly from Poupart's ligament, and partly on the inner side, from the tendon of the internal oblique behind the external ring. The cremaster thus arising by a long external and a short internal origin, consists of pale brownish fibres, which, with their connecting cellular tissue, constitutes a kind of sheath around the spermatic cord. This investment is continued into the scrotum, where, in a favourable subject, the fibres may be seen to open, and describe large curves over the testicle, being more especially inserted into the prolongation of the fascia transversalis. If the body be thin and emaciated, the cremaster is very indistinct, particularly at its insertion.

Having proceeded thus far, the internal oblique and transversalis are to be detached from Poupart's ligament, but it is important to bear in mind that the muscular arch across the cord and the insertion behind the external ring, are to be left intact. In performing this part of the dissection, care must also be taken not to disturb the fascia transversalis, which, from its connection with the common tendon of the two muscles, is very liable to be divided.

Fascia transversalis.

We now arrive at that ligamentous membrane which, beneath

the muscles, lines the whole interior wall of the abdomen; it is named the *fascia transversalis.*

We shall in this place merely consider the relations of the fascia transversalis with the parts of inguinal hernia; deferring its connections with the fascia iliaca and crural sheath, till the anatomy of femoral hernia is described. The fascia transversalis is attached to the whole length of Poupart's ligament, that is to say, from the anterior superior spine of the ilium, as far as the tubercle of the pubis. It then passes upwards, beneath the transverse muscle, over the peritoneum, as far as the cartilage of the ribs, thus covering the whole anterior wall of the abdomen; but being much stronger below, where the greatest support is required, than above, where, indeed, it degenerates into cellular tissue, but still preserving the form of a membrane, it may by care be dissected from the peritoneum as a separate and distinct layer, as high nearly as the diaphragm.

Internal ring.

At the distance of nearly an inch from the crural arch, it will be observed that the spermatic cord is connected with the fascia; this connexion, which is very intimate, has been variously described by writers. Sir A. Cooper, who first discovered this fascia as a separate part of the abdominal parietes, has, in his splendid plates, represented it as consisting of two portions—an outer or iliac portion, and an inner or pubic; between these two parts an elliptical shaped opening being left, called the *internal abdominal ring.* A careful examination will show, however, that there is no actual opening or perforation of the fascia transversalis at the internal ring; on the contrary, it is evident that at the point where the spermatic cord quits the abdominal cavity to pass through the parietes, it carries with it a tube-like process of the fascia, which process, wide above and becoming contracted below, so as closely to embrace the cord, extends with that structure into the scrotum; and there, again enlarging, it completely invests that covering of the testicle which is called tunica vaginalis reflexa. What, then, is known as the internal ring, is in fact

nothing else than the mouth of that infundibular process of the fascia, which accompanies and surrounds the cord. The internal ring is situated, according to Sir A. Cooper, midway between the anterior superior spine of the ilium and the symphysis of the pubis; but it appears in general to be placed in the mid space between the precise point of the tubercle of the pubis. It is rather less than two inches to the outer or iliac side of the external ring, and about an inch above Poupart's ligament, and is covered towards the external surface by the integuments, the tendon of the external oblique, and by the fleshy origin of the internal oblique and transverse muscles, whilst behind or towards the abdominal cavity, it is closed by the peritoneum.

Fascia spermatica interna vel propria.

That process of the fascia transversalis which accompanies the spermatic cord, has received various names; it has been called *fascia canalis inguinalis* and *f. infundi triliformis;* but as it immediately invests the cord, it may be properly called *f. spermatica interna, vel propria.* The structure thus constituting a sheath around the cord, must necessarily be separated from that part by the descent of an oblique hernia; and as the sheath extends into the scrotum, the hernial sac will be closely covered in its whole extent by this prolongation of the fascia transversalis; and thus it happens that in old and voluminous hernia, as well as in recent protrusions, there is no difficulty, by a careful dissection, in separating from the true peritoneal sac, the fascial investment to which we have been referring.

It is necessary to remark, that the fascia transversalis not only furnishes a sheath, accompanying the spermatic cord into the scrotum; but it likewise sends a process on the spermatic blood-vessels into the abdominal cavity.

Inguinal canal.

The space which extends from the internal to the external ring, is named *canalis inguinalis;* this passage, which runs obliquely downwards, inwards, and forwards, is hollowed in the substance of the abdominal walls, being bounded on the fore part by the skin, the superficial fascia, the tendon of the external oblique, and by the fleshy origin of the internal oblique and transver-

salis; whilst, on the back part, it is bounded by the united tendon of the internal oblique and transversalis, and by the fascia transversalis. Its length is about two inches. In considering the parts which form the walls, it is most important to take into the account the internal, oblique, and transversalis; because those muscles are so disposed as to form the inguinal canal into a true muscular passage, by which means the viscera of the abdomen are supported at the internal ring, at the precise time when support is required, namely, during great muscular exertions.

Spermatic cord.

The student should now notice the courses and relations of the cord. This important structure quits the abdominal cavity at the internal ring; it passes downwards and forwards, following the course of the inguinal canal, in which it is lodged, till it reaches the external ring; it passes through the outer part of that opening, and then turning suddenly down, it runs into the scrotum. In this course it will be found that having, at the internal ring, received the covering of the fascia spermatica interna, it next passes beneath the fleshy arch, formed by the internal oblique and transversalis, where it receives the fibres of the cremaster muscle. As it passes through the external ring, it acquires the fascia spermatica externa, and also the covering of the fascia superficialis and skin.

Epigastric arteries.

By cautiously dividing the fascia transversalis, just on the pubic side of the internal ring, the epigastric blood-vessels will be brought into view, surrounded by a quantity of lax cellular tissue and fat, and lying on the peritoneum. These consist of the artery placed in the middle, and of two accompanying veins, of which the one next to the pubis is usually the largest. The epigastric artery, arising from the external iliac muscle, first of all runs downwards, but very soon altering its course it passes upwards and inwards, towards the edge of the rectus muscle, so as to describe an arch around the great cul de sac formed by the peritoneum in the neighbourhood of the crural arch. In the course described, the vessel passes behind the inguinal canal and spermatic cord, nearly at a right angle, being separated from those parts by the fascia transversalis; it is placed between the two ab-

dominal rings, being on the iliac side of the external ring, and on the pubic side of the internal ring.

Course and coverings of oblique inguinal hernia.

We are now prepared to trace the course and relations of the oblique inguinal hernia. This, which is by far the most common species of rupture, passes, in the first instance, through the internal ring, and as that part is closed towards the abdomen by the peritoneum, it is evident that the latter structure must be protruded before the viscera, so as to form the envelope or *sac* in which they are contained. At the internal ring the hernia separates from the cord on which it descends, the internal spermatic fascia; it then passes beneath the muscular arch of the internal oblique transversalis, and in this place it detaches the fibres of the cremaster from the surface of the cord; continuing to descend, the protrusion escapes from the inguinal canal by passing through the external ring, where it gets the coverings of the external spermatic fascia, the superficial fascia, and the skin. The hernia subsequently continues its descent, until it has passed completely into the scrotum. In this course, enumerating the parts, according to the order in which they are divided in the operation, the hernia will be covered by 1st, the skin; 2dly, superficial fascia; 3dly, external spermatic fascia; 4thly, cremaster muscle; 5thly, internal spermatic fascia. It is proper to remark, that although these several layers can be distinctly demonstrated to exist, yet that after the protrusion has occurred some time, they are generally, in consequence of the process of chronic inflammation that is set up, so much thickened and blended together, that they are separated with difficulty; and especially it happens that the external spermatic fascia becomes blended with the cremaster, and the internal fascia with the peritoneal sac.

Direct inguinal hernia.

We have already pointed out the means adopted by nature to prevent the direct protrusion of the viscera at the external ring. Now although the support thus afforded is in the great majority of cases efficient, yet it occasionally happens that a hernia is formed, which, passing neither through the internal ring nor the inguinal passage, emerges directly through the external ring; such

a protrusion is therefore called a direct inguinal hernia. The opportunity of dissecting this species of rupture but seldom occurring, our knowledge of its exact anatomical relations is in some respects imperfect. It is certain, however, that the sac passing forward, carries before it the internal or pubic part of the fascia transversalis; and that then it either pushes in front of it the united tendon of the internal oblique and transversalis, or that tendon gives way, and thus allows the hernia to pass through its substance. In two specimens of this hernia which I have dissected, the protrusion appeared to have passed beneath the united tendon; and from this circumstance, joined to the fact that the lower part of that tendon is occasionally deficient, I am inclined to think that in most, if not in all of those cases in which it has been stated that the tendon was ruptured, the hernia had in reality passed under the tendon. The rupture subsequently takes its course through the external ring, having the end on the outer side; it then descends into the scrotum. The coverings of the direct hernia are, 1. the skin; 2. the superficial fascia; 3. the external spermatic fascia; 4. occasionally, but seldom, the cremaster muscle; 5. sometimes, yet not constantly, the united tendon of the internal oblique and transversalis; 6. the fascia transversalis.

Relation of the epigastric artery to the two varieties of hernia.

From the account which has been given, it is evident that as the epigastric artery is placed between the two abdominal rings, that is to say, on the iliac side of the external, and on the pubic side of the internal ring, it must happen that this important blood-vessel is situated on the inner side of the mouth of the sac in the oblique hernia, and on the outer side of the mouth of the sac, in the direct hernia.

THE DISSECTION OF FEMORAL HERNIA.

Femoral hernia.

In order to expose the parts connected with the anatomy of femoral hernia, it is necessary to make two superficial incisions,—one commencing at the spine of the pubis and extending about

four inches in a perpendicular direction downwards; the other commencing at the anterior superior spinous process of the ilium, and terminating at the upper extremity of the former. On dissecting back the flap thus formed, you expose to view the fascia superficialis; which structure, after covering the abdominal muscles, descends over Poupart's ligament to invest the muscles of the lower extremity. In the groin this fascia is stronger than where it covers the abdominal muscles, and may be divided into two layers, which are separated from each other by lymphatic glands, and the superficial inguinal blood-vessels. It is attached firmly to Poupart's ligament, and also to the border of the saphenous opening of the fascia lata. The blood-vessels that are contained between the layers of the superficial fascia, are the external pudic, the external epigastric, and external circumflex arteries, and some small veins; these vessels exert an important influence on the course of femoral hernia, which, after it has passed through the saphenous opening, owing to the resistance afforded by these superficial blood-vessels, bulges forwards, inwards, and upwards.

Fascia superficialis.

Dissecting off the superficial fascia, the boundaries of the inguinal or superior crural region are now more accurately defined. The inguinal region is a triangular space, having its base placed superiorly, its apex inferiorly; it is bounded superiorly by Poupart's ligament, inferiorly by the approximation of the sartorius and adductor muscles; on the outer side, which is round and very prominent, it is bounded by the sartorius, iliacus rectus, and other muscles, all covered by the fascia lata: and on the inner side, which is somewhat flattened, by the adductors and pectineus, also covered by the fascia lata. Between the fascia lata and fascia superficialis, are situated about a dozen inguinal lymphatic glands, together with a variable portion of fatty matter, especially in females, together with several small blood-vessels and the saphena vein. The glands may be divided into a superficial and deep set; the former are more numerous, and are arranged in two rows; the superior row are four or five in number, and small, lying parallel

Boundaries of the inguinal region.

Inguinal glands.

with Poupart's ligament, some above, others below it; the inferior are two or three in number, larger, and placed perpendicularly or parallel to the saphena vein; and frequently one is placed posterior to this vessel; the deep inguinal glands, in number about three or four, lay beneath the fascia lata, and are closely connected to the sheath of the femoral vessels, chiefly to its inner side: one or two very constantly occupies the femoral ring.

Adipose tissue.

Having raised the fascia superficialis, it will be observed, that a particular depression, more or less distinct, according to the quantity of fat, is brought into view. This hollow, which requires to be especially noticed, inasmuch as it lodges the tumour of femoral hernia after the protrusion has cleared the saphenous opening, is placed on the inner side of the groin, below Poupart's ligament, and in front of the pectineus muscle. In fat persons, and particularly in females, this depression is filled up with a large quantity of adipose substance.

Fascia lata.

The fascia lata, which is the common investing membrane of the lower extremity, presents externally a smooth glistening appearance, and forms an uninterrupted sheath until it comes within about an inch of Poupart's ligament. In this situation the fascia splits into two portions, which leave between them an opening for the transmission of the superficial vessels. The saphena vein and superficial lymphatic vessels, after continuing their course throughout the whole extent of the lower extremity on the surface of the fascia, at length pass through this opening to communicate with the deep seated vessels. The fascia lata may in general terms be said to be united to the spine of the ilium, to Poupart's ligament throughout its whole length, to the spine of the pubis, and to the linea innominata: it is more convenient, however, to examine each portion separately. The outer or iliac portion, ascending from the external surface of the thigh, is attached superiorly to the spine of the ilium, and to the whole length of Poupart's ligament, and being continued in front of the femoral vessels, where

Iliac portion of the fascia lata.

it is closely connected with the sheath, it at length turns rather upwards, and terminates by being inserted into the linea innominata, where it becomes attached to the base of Gimbernat's ligament.

The iliac portion of the fascia lata, being thus attached, then passes downwards, and becomes united underneath the vena saphena major, with the internal or pubic portion of the same structure.

Pubic portion of the fascia lata.

The pubic, or inner portion of the fascia lata, covers the adductor muscles on the inside of the thigh. It is attached internally to the ramus of the ischium and pubis, anteriorly to the ligament of Gimbernat, superiorly into the linea ileo-pectinea. Passing down, it soon divides into two portions, a superficial and deep; the former continuing to pass downwards, unites under the saphena vein, as before stated, with the iliac portion of the fascia. The deep portion passes behind the femoral blood-vessels and their sheath, as far as the border of the psoas muscle; it there splits into two processes; one passes beneath the psoas tendon, and becomes attached to the capsular ligament of the hip joint; whilst the other, lying more superficially, passes over that tendon and becomes continuous with the fascia iliaca.

Saphenous opening.

Between the iliac and pubic portions of the fascia lata, an opening is usually described as being left, called, from the circumstance of its transmitting the vena saphena major, the *saphenous foramen*. This opening is placed about half an inch below Poupart's ligament, and in front of the femoral vein. It is surrounded by the inner margin of the iliac portion of the fascia lata, which margin has received the name of *falciform process*.

Falciform process.

This important structure presents a concavity which looks downwards and inwards. The upper course of this arch extends as far as the crural ring and Gimbernat's ligament; whilst the lower course is lost under the vena saphena, by uniting with the pubic portion of the fascia lata.

Some difference of opinion exists concerning the exact disposi-

tion of the fascia lata at the saphenous foramen. If the falciform process be raised by the forceps, it will be observed that it does not abruptly terminate; but that it sends a membranous prolongation down to the femoral sheath, with which structure it appears to become continuous. According to some anatomists, however, the iliac portion of the fascia, is actually continued across in front of the femoral sheath, and reaching the inner side of the femoral vein, it is said to become continuous with the pubic portion of the fascia.

Cribriform fascia.

Whichever of these accounts is correct, it is certain that extending across the saphenous foramen, there is a layer of membrane, much thinner than the fascia lata, and placed between the inner surface of the superficial fascia, and the outer surface of the femoral sheath, from both of which it appears to be distinct. This structure is perforated by the vena saphena major, by the small superficial blood-vessels of the groin, and by many lymphatics, and it is owing to this circumstance that it has received the denomination of *fascia cribriformis*.

Anatomy of the parts in the pelvis.

It is necessary now to proceed to the consideration of those parts which are connected with the abdominal cavity. In order to expose these parts, the anterior wall of the abdomen should be divided, and the viscera situated in the neighbourhood of the iliac fossa removed. The peritoneum lining the abdominal and iliac muscles, is then to be raised, which, in consequence of the laxity of the sub-serous cellular tissue, is easily accomplished without disturbing the connexions of the adjacent parts. This having been accomplished, it will be observed that the fascia transversalis, lining the abdominal walls on the fore part, and the fascia iliaca lining the walls on the back part, became united with each other at the deep or abdominal edge of Poupart's ligament, from the anterior superior spinal process of the ilium, as far as to the outer border of the external iliac artery; but it is found that where the iliac blood-vessels pass under the crural arch to reach the thigh, the two fasciæ are prolonged with them (the fascia transversalis

on the fore part, and the fascia iliaca on the back part) in the form of a tube, which is flattened from before backwards; this tube is the *femoral* or *crural sheath*. It is particularly necessary to remark, that whilst the fascia transversalis on the outer side of the iliac blood-vessels, descends almost vertically into the thigh, and is closely applied to the side of the artery, that on the inner side, turning around the concave edge of Gimbernat's ligament, it is not immediately applied against the inner surface of the iliac vein. In consequence of this disposition, the femoral sheath assumes on its upper and inner side an infundibular form. Femoral sheath.

The sheath thus formed contains on the outer side the femoral artery, in the middle the femoral vein, and on the inner side a few lymphatic vessels; but it is proper to remark, that, in consequence of there being two septa passing from the anterior to the posterior part, each vessel is contained within a special division of the sheath. Contents of crural sheath.

If we endeavour to push the finger from the abdomen underneath Poupart's ligament into the thigh, it will be found that the junction of the two fasciæ prevents this being done on the outer side of the iliac artery; and that, in front of the blood-vessels, although the part is more yielding, yet the two septa just described offer a degree of resistance which is sufficient to prevent any descent of the viscera taking place in that situation. But on making pressure on the inner side of the iliac vein, the finger instantly sinks into a hollow, and, if the pressure be considerable, it passes completely under Poupart's ligament into the thigh. This hollow is the *crural* or *femoral ring*, and as this is the precise point where femoral hernia invariably protrudes, it is desirable carefully to consider its relations. The crural ring is situated in that part of the femoral sheath, which is placed between the external iliac vein and the concave border of Gimbernat's ligament. It is bounded in front by Poupart's ligament, behind by the body of the pubis, on the iliac side by the external iliac vein, and on the pubic side by Gimbernat's ligament, whilst placed closely above Crural ring.

it, we observe in the female the round ligament of the uterus, and in the male the spermatic cord.

Epigastric artery.

The epigastric artery is situated on the iliac side of the ring, the exact distance of the vessel depending on its mode of origin; if it proceed separately from the external iliac trunk, the artery may be placed at the distance of three-quarters of an inch, or even one inch, but if, as very often happens, the epigastric arises in common with the obturator, then that vessel is brought close to the outer margin of the crural ring. The obturator artery, which usually arises from the internal iliac trunk, not unfrequently takes its origin from the external iliac in common with the preceding; in this case, the vessel passes on the outer side and behind the crural ring. It occasionally, but very rarely happens, that the obturator artery, arising with the epigastric, passes upwards and inwards in such a manner, as to run above, and indeed almost surround, the crural ring.

Obturator artery.

Septum crurale.

On carefully examining the crural ring, and this is best done by completely dividing Poupart's ligament, leaving, however, the crural sheath entire, it will be seen that it contains one or two lymphatic glands, and a membrane which is perforated by the absorbent vessels, ascending into the abdomen from the thigh; this membrane is called the *septum crurale*. The crural ring also in general contains some adipose substance, which is situated on the outer surface of that portion of the peritoneum which lines this part of the abdominal wall. This fatty matter is occasionally accumulated in considerable quantity, so as to constitute a distinct projection; and as it is sometimes contained in a kind of capsule formed of condensed cellular tissue, it may be mistaken for the omentum during an operation.

Before describing the course of the femoral hernia, it is necessary to state, that when the ligament of Poupart is cut through, which ought to be done in order to examine the formation of the femoral sheath, it will be observed, that underneath the ligament and closely connected with it, there is a dense ligamentous

tissue, which serves to unite the fascia transversalis, where it descends to form the anterior part of the femoral sheath, with Poupart's ligament itself. This structure has been much noticed of late, because from its position, stretching across the upper and fore part of the femoral sheath, it must in many cases, doubtless, assist in forming the stricture, when the hernia becomes strangulated.

Course of femoral hernia.

From the preceding account, it will be perceived that the only place at which the viscera can escape from the abdomen into the thigh, is at the crural ring. The hernia passing through that aperture enters the inner or wide part of the crural sheath, and descends beneath Poupart's ligament and the superior extremity of the falciform process, as far as the saphenous opening of the fascia lata. In this situation the hernia bulges forwards, passes through that aperture, and thus reaches the hollow placed at the upper and inner part of the groin; and if the protrusion acquires any considerable bulk, it then turns upwards and rather outwards over Poupart's ligament, so that the external swelling in these cases is situated in some degree on the lower part of the abdomen. The peculiar course of the femoral hernia is determined by the anatomical connexions already pointed out; thus, when the tumour has reached the saphenous opening, it necessarily passes forwards through it: first, because the inner wall of the femoral sheath, which above is separated from the vein, in this situation becomes closely applied to that vessel, and thus opposes the further descent of the hernia; and, secondly, because at the saphenous foramen there is less resistance than elsewhere. The ascent of the hernia towards Poupart's ligament is principally owing to the resistance of the superficial blood-vessels of the groin.

If we wished, for the sake of illustration, to institute a comparison between the anatomy of inguinal and femoral hernia, we should say, that the crural ring, at which the protrusion first quits the abdomen, corresponds to the internal abdominal ring;—the short passage beneath Poupart's ligament, and the falciform pro-

cess, which may be named the *crural canal*, is analogous to the inguinal canal, and the saphenous opening, by which the hernia reaches the surface of the body, resembles the external ring.

Coverings of crural hernia.

The coverings of femoral hernia are, first, the skin, then the superficial fascia, below that the cribriform fascia, then the femoral sheath, and lastly, a little fatty cellular membrane, which, in old herniæ, becomes very much thickened, and readily separates into several layers, that has by some been called the *fascia propria.*

Seat of structure.

The seat of stricture in femoral hernia is either the upper part of the femoral sheath, the neck of the sac, or the falciform process of the fascia lata. In dividing the stricture, it is necessary to consider the position of the surrounding vessels. Immediately above the ring is situated, in the male the spermatic cord, in the female the round ligament; to the outer side, the epigastric artery; and sometimes, though very rarely, the obturator artery is situated on the anterior and inner side of the sac; in that case the ring would be almost surrounded by blood-vessels; this, however, is of very rare occurrence. Considering the *usual* relative position of the different vessels to the ring, the safest mode of dividing the stricture is *upwards and a little inwards.*

LECTURE XLI.

ON HERNIA.

Importance of the subject.

This, of all the diseases to which the human body is liable, demands, upon the part of the surgeon, a large share of anatomical knowledge, great promptitude and decision, and the utmost skill and dexterity in the performance of an operation, when it is rendered necessary, by a defeat of the means employed for its reduction. In other important cases, consultations may be held, or the patient be sent to a distance to obtain the advantage of the best opinions; but in hernia the fate of the patient is decided almost upon the instant, and an hour's delay may turn the scale of

PLATE II.

This Plate contains views of the anatomy of the groin and upper part of the thigh.

Fig. 1. Shews the crural sheath.

a, Pubes.

b, Ilium.

c, Abdominal muscles drawn up.

d, Transversalis muscle.

e, Its tendon.

f, Seat of the posterior edge of the crural arch.

g g, Fascia transversalis.

h, Interior portion of the same fascia.

i, Fascia iliaca.

k, Femoral sheath.

l, Femoral artery.

m, Femoral vein.

n, Saphena major vein.

o, Anterior crural nerve.

p, Fascia lata turned back.

q, The tendon of the external oblique muscle drawn down.

Fig. 2. Crural hernial sac removed to shew the opening by which it descends in the female.

a, Seat of the pubes.

b, Crural arch extending towards the ilium.

c c, Abdominal muscles.

d, Crural arch.

e e, Fascia lata.

f, Semilunar edge of the fascia lata.

g, Third insertion of the external oblique.

h, Femoral artery.

i, Femoral vein.

k, Femoral sheath.

l, Abdominal ring.

m, The orifice by which the crural hernia descends, formed on the outer side by the crural sheath, on the inner by the semilunar insertion of the tendon of the external oblique, and above in part by the crural sheath, and in part by the semilunar edge of the fascia lata. The division in crural hernia is made at the upper and inner part.

Fig. 3. Posterior view of the external oblique muscle, of the external iliac artery and vein, and of the fascia iliaca.

a, Symphysis pubis.

b, Spinous process of the ilium.

c, Linea ileo-pectinea of the pubes.

d, External oblique muscle and its tendon.

e, Superior column of the tendon of the abdominal ring.

f, Insertion of the inferior column of the ring into the tubercle of the pubes.

g, Third insertion of the external oblique into the ligament of the pubis, from whence it is extended towards the symphysis.

h, Abdominal ring.

i, The fascia iliaca extending over the iliacus internus and psoas muscles.

k, The junction of the fascia iliaca with the posterior edge of the crural arch.

l, External iliac artery.

m, External iliac vein.

n, Posterior edge of the crural arch, extending from the pubes to the ilium.

o, Thyroideal foramen.

Fig. 4. Anterior view of the arch, a hernial sac having been removed to shew the orifice by which it descends.

a, Symphysis pubis.

b, Crural arch.

c c, Fascia lata.

d, Semilunar edge of the fascia lata.

e, Crural sheath.

f, Abdominal ring.

g, Spermatic cord.

h, Femoral artery.

i, Femoral vein.

k, Anterior column of the crural sheath, which requires division in the operation for crural hernia.

l, Lower column of the same opening.

m, The opening in the side of the sheath by which the crural hernia descends.

Fig. 1.

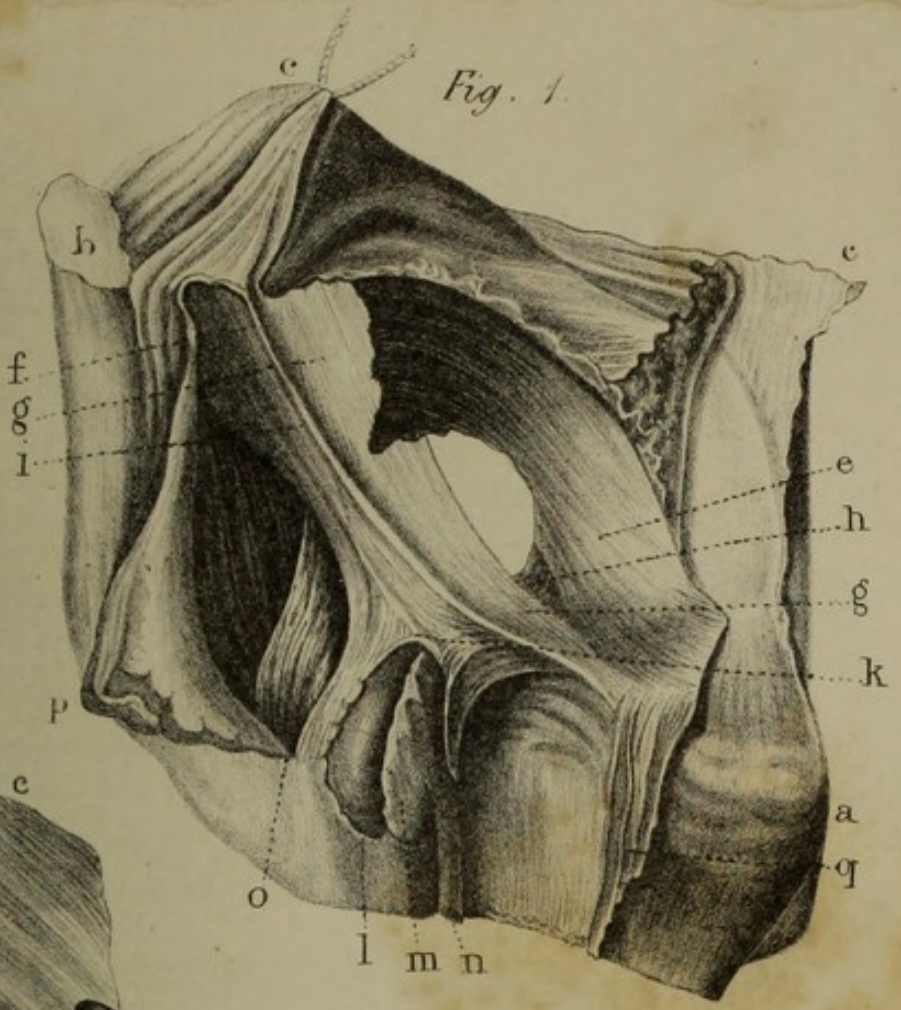


Fig. 2.

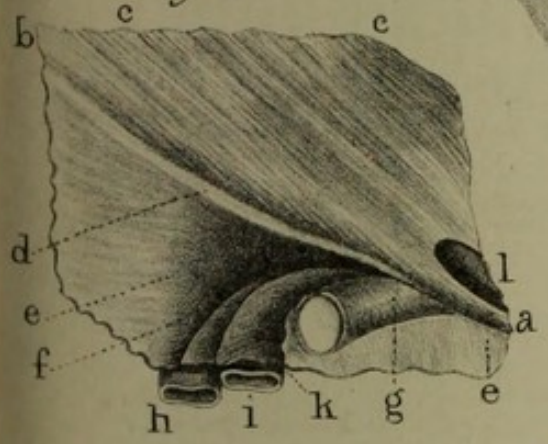


Fig. 3.

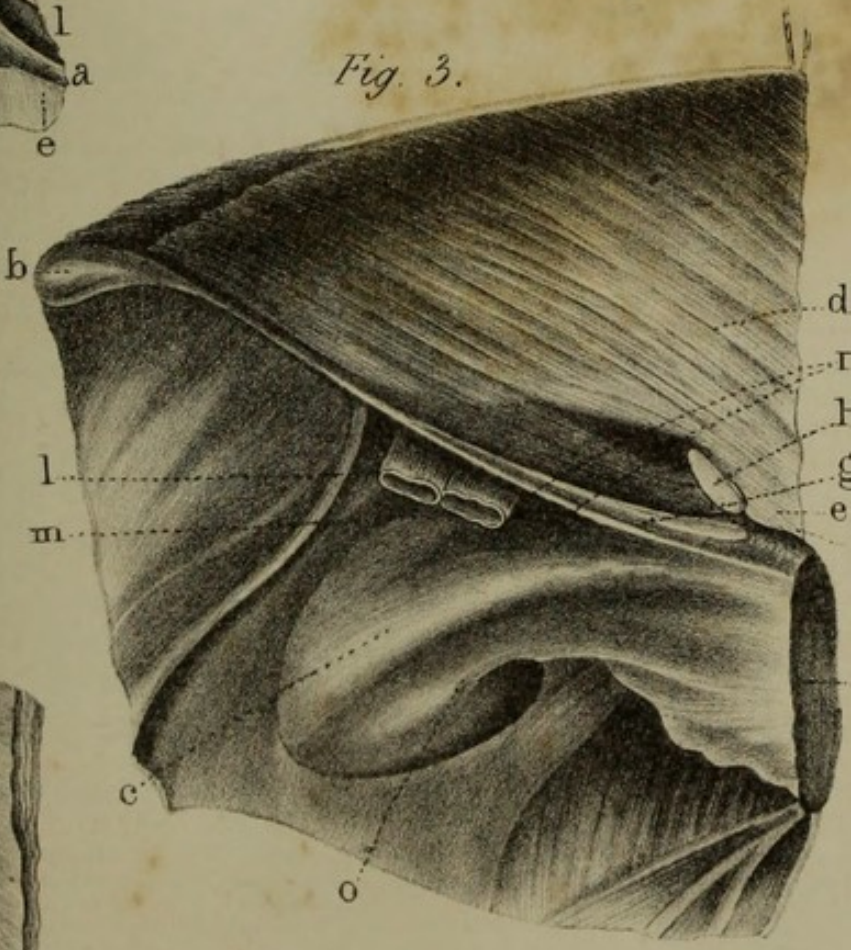


Fig. 4.

success against the surgeon, and destroy the prospect of safety on the part of the patient.

A hernia is a protrusion of any viscus from its proper cavity; but the term is principally applied to the protrusions of the abdominal viscera, to which it is at present my intention to confine my description. Definition.

The abdomen is particularly liable to such protrusions, on account of the moveable state of its viscera, of the natural openings from it to give passage to blood vessels, and unnatural apertures from deficiency of structure, and from the great changes in bulk to which the omentum and mesentery are subject; so that instead of being surprised at the frequency of its occurrence, it might be expected, from a knowledge of anatomy, that it would occur in many more instances than it does. Abdomen particularly liable to such protrusions.

There are several genera of abdominal herniæ; four of which, however, are more frequent than the others; viz. the inguinal, the femoral, the umbilical, and the ventral; but beside these, there is a hernia through the ischiatic notch, one through the foramen ovale, a pudendal, a perineal, a vaginal, occasionally a protrusion takes place through the diaphragm, the kidneys have been found in a swelling in the loins, and the small intestines have been seen between the laminæ of the mesentery and mesocolon: but, to the two latter, the term hernia is scarcely strictly applicable. Kinds of hernia.

OF INGUINAL HERNIA.

Of this hernia, there are four different species:— Of inguinal hernia.

1. The oblique, taking the course of the spermatic cord. Oblique.

2. The direct, descending from the abdomen immediately through the external abdominal ring. Direct.

3. The congenital, or a protrusion into the tunica vaginalis. Congenital.

4. The encysted hernia, composed of a bag and protrusion suspended in the tunica vaginalis. Encysted.

Before any hernia is formed, unless in wounds, laceration, or deficiency of structure, a bag of peritoneum precedes the pro- Contained in a sac.

truded viscera, and forms a sac in which they are contained, and which is usually called the hernial sac. This protrusion is somewhat thicker than the natural peritoneal lining of the abdomen, the pressure of the viscera leading to an interstitial deposition into the membrane; it is not placed loosely in the parts into which it is protruded, but it adheres by cellular tissue to all the surrounding structures.

OF THE OBLIQUE INGUINAL HERNIA.

Synonymes.

This is also called bubonocele when seated in the inguinal canal; and, when it further descends, is named scrotal; as it takes the course of the spermatic cord, it might well be denominated spermatocele.

Before I describe the course and dissection of this hernia, it is necessary that I should say something on the structure of the inguinal canal, and of the course of the spermatic cord.

Structure of the inguinal canal.

The spermatic cord first quits the abdomen mid-way between the anterior superior spinous process of the ilium and the symphysis pubis; it here passes between two layers of the fascia transversalis, the anterior layer of which is fixed in Poupart's ligament, whilst the posterior layer descends behind Poupart's ligament, and assists in covering the femoral artery and vein, and in forming the crural sheath; above the passage of the spermatic cord, the two planes of this fascia unite, and form a lining to the transversalis muscle, extending as far as the diaphragm. As the cord penetrates between these two planes, which form the internal ring, a thin layer of fascia unites it to the edge of each.

No part of importance is situated between the anterior superior spinous process of the ilium, and the point at which the spermatic cord passes through the fascia transversalis; but between the latter place and the pubes, the epigastric artery takes its course.

Epigastric artery.

This artery is situated from one-fourth to one-half an inch upon the inner side of the internal abdominal ring, or passage of the spermatic cord, from the abdomen, and it passes to the inner

part of the rectus muscle. The external iliac artery and vein are directly behind this internal abdominal aperture, and this opening is the beginning of the inguinal canal, in which the spermatic cord is next continued.

Boundaries of the inguinal canal.

The inguinal canal is bounded anteriorly by a superficial fascia, from the abdominal muscles, and by the tendon of the external oblique; posteriorly, by the fascia transversalis, and by the tendon of the transversalis muscle; above, by the edges of the internal oblique and transversalis muscles, and below by Poupart's ligament; the canal is about two inches in length, and terminates at the external abdominal ring.

External ring.

The external abdominal ring is formed by two columns of the tendon of the external oblique muscle united by fibres from Poupart's ligament; the upper column is inserted into the symphysis pubis, the lower column into the tuberosity of the pubes, the pubes bound the opening below; between these columns the spermatic cord passes; and from the edge of the ring, as well as from the surface of the tendon of the external oblique muscle, a thin fascia descends, uniting the cord to the edges of the opening, and passing down upon it to the tunica vaginalis; this fascia is then situated between the skin and the cremaster muscle; which muscle arises within the inguinal canal from the internal oblique muscle; it descends with the spermatic cord, and passes through the external abdominal ring; spreading over the fore and lateral parts of the cord as far as the tunica vaginalis, into which it is inserted.

Spermatic cord.

Behind the fascia and cremaster muscle the spermatic cord is found passing to the testis; it is covered by the tunica vaginalis, and is composed of the spermatic artery and vein, absorbents, and nerves, with the vas deferens and an artery accompanying it.

Origin and course of the hernia.

The oblique inguinal hernia first enters the upper opening of the inguinal canal, or internal abdominal ring, so that at its commencement it is placed just mid-way between the anterior superior spinous process of the ilium and the symphysis pubis, and close above Poupart's ligament; it has the spermatic cord behind it, and the epigastric artery to its inner side: when in the inguinal

canal it is about two inches in length, and is covered anteriorly by the superficial fascia of the external oblique muscle and by the tendon of that muscle, the inferior edges of the internal oblique and transversalis muscles form an arch over it; the cremaster muscle covers it partially; it has a thin slender covering from the edge of the internal ring; the fascia transversalis, strengthened by the tendon of the transversalis, is situated behind it, and to its inner side; and Poupart's ligament is placed below it.

Appears at the external ring.

Having descended through the inguinal canal, it next emerges at the external abdominal ring, and it is then usually denominated scrotal hernia.

Increases more rapidly.

Its increase being then much less restrained than before, it descends on the fore part of the spermatic cord to the testicle, at the upper part of which it usually terminates.

Dissection of the hernia.

Upon dissecting this hernia below the external ring, there is found covering it;—first, the fascia of the spermatic cord, derived from the external oblique tendon and the edge of the abdominal ring; this substance is dense, and forms a strong covering, which has often been mistaken for the hernial sac; when this has been divided, the cremaster muscle becomes exposed, covering the fore and lateral parts of the hernial sac. The cremaster muscle is thicker than the fascia of the cord, and its muscular texture is easily distinguished in the living body. On cutting through this muscle, and a dense cellular tissue, the hernial sac is laid bare, united on the fore part to the cremaster muscle, and on the posterior part to the spermatic cord, resting below upon the tunica vaginalis of the testicle.

Usual contents of the sac.

The usual contents of the hernia are either intestine or omentum; if the former, it is called enterocele; if the latter, it is denominated omental, or epiplocele. In the young, omental hernia is rarely met with, it being generally intestinal, for this obvious reason, that the omentum in the young subject covers only the superior abdominal viscera.

EXPLANATION OF PLATE V.

In this plate a common inguinal hernia is shewn upon the left side, taking its course through the abdominal ring on the outer side of the epigastric artery, between that artery and the spine of the ilium. The hernia upon the right side is that variety of the inguinal hernia which passes from the abdomen on the inner side of the epigastric artery, or between that artery and the symphysis pubis.

a. Symphysis pubis.
b. Anterior superior spinous process of the ilium.
c c. The spine.
d d. The acetabula.
e e. The tuberosities of the ischia.
f f. Abdominal rings.
g g. Poupart's ligament.
h. Linea alba.
i. Aorta.
j. Bifurcation of the aorta.
k k. Iliac and femoral arteries.
l. Origin of the epigastric artery on the right side.
m m. Course of the epigastric artery on each side, marked by dotted lines: the left passing on the inner, the right on the outer side of the hernial sac.
n. Vena cava inferior.
o o. Spermatic arteries.
p p. Spermatic veins.
q q. Spermatic cords.
s s. Testes.
t. Oblique hernial sac upon the left side, situated upon the outer side of the epigastric artery.
v. Direct hernial sac upon the right side, placed upon the inner side of the epigastric artery.
w. The spermatic cords passing on the outer side of the direct hernial sac, whilst it is seen on the posterior part of that on the opposite side.

VARIETIES OF OBLIQUE INGUINAL HERNIA.

Varies in size.

From the description which I have given of this hernia, it is clear that it may vary in length, from the upper ring to the testicle, and consequently that it is sometimes seen occupying only the inguinal canal.

Sometimes very large.

In some cases the hernia is so large as nearly to reach the knee, but in general it does not exceed two fingers' breadth, and barely reaches to the upper part of the testicle; its bulk depends considerably upon the time which it has existed, upon the degree of relaxation of the patient, and upon his inattention to the disease.

Unusual protrusions.

I have seen the pylorus descend to the mouth of the hernial sac. The urinary bladder is also occasionally situated within it; and we have an excellent specimen in the collection at Guy's Hospital, of an inguinal hernia in the female, where the ovarium and Fallopian tube are protruded into the hernial sac.

Usual situation of the spermatic cord.

The spermatic cord is usually situated behind the hernial sac; but in one of the preparations in the Museum at St. Thomas's Hospital, the cord is divided, the vas deferens passing upon one side, and the spermatic artery and vein upon the opposite side. I have seen also the spermatic artery and vein passing over the fore part of the sac, while the vas deferens passed behind it.

SYMPTOMS OF INGUINAL HERNIA.

Distinction from other diseases.

It is discriminated from other diseases by the following marks:—it gradually descends from the abdomen in the course of the spermatic cord: it usually protrudes in the erect, and retires when the patient is in the recumbent posture: it dilates upon coughing, and upon all exertions of the abdominal muscles: flatus may be often felt in it when it is intestinal, and it retires with a gurgling noise: when omental it has a doughy feel, is much less elastic than the intestinal hernia, and retires into the abdomen more slowly; the intestinal is accompanied with costiveness, and with pain across

the abdomen; the omental rarely produces any disturbance of the abdominal functions, when in the reducible state; the hernia of the bladder is distinguished by the diminution of the swelling during the evacuation of the urine.

The following are the principal marks of distinction from the diseases with which it is most likely to be confounded.

From hydrocele. From hydrocele, by that disease beginning below, and gradually ascending, by its transparency, by its fluctuation, its pyriform shape, its involving the testicle, and by the want of dilatation from coughing; however, there is an exception to this, if the hydrocele enters the upper part of the scrotum, when it sometimes dilates upon coughing, and the only means of distinction are in its history, its transparency, and its fluctuation.

From hydrocele of the cord. From hydrocele of the spermatic cord, it is with great difficulty distinguished, unless the hydrocele emerges from the external ring, when its transparency indicates its true nature.

Hernia and hydrocele sometimes combined. Hydrocele and hernia are sometimes combined in the same individual, of which there is a beautiful specimen in the collection at St. Thomas's Hospital; a case of this kind occurred to Mr. Thomas Blizard, on which he operated, and a similar one to Mr. Henry Cline; in each case the water was in the first instance discharged, and then the hernial sac became exposed behind the tunica vaginalis.

Hydrocele is also connected with hernia, when there is water in the abdomen; and I have tapped a hernial sac in ascites for the discharge of the accumulated water, and it is the best mode of operating in such a case, when it is quite certain that neither the omentum nor intestine is descended, and that you can decide by the transparency.

From hæmatocele. Hernia is known from hæmatocele, by the latter being usually the result of a blow, and by the ecchymosis which at first accompanies it, by its not extending to the inguinal canal, by its not dilating upon coughing, by the bowels being undisturbed, and by its not returning into the abdomen.

From diseased testicle. Hernia is little liable to be confounded with disease of the tes-

ticle; the history of the swelling, its form, the distinctness of the spermatic cord, the want of intestinal obstruction, the absence of dilatation on coughing, and its not returning into the abdomen, are sufficient marks of the latter disease.

Hernial sac connected to the spermatic cord.

I have seen, however, diseased testicle complicated with hernia, and have twice been under the necessity of dissecting the hernial sac from the spermatic cord, during the extirpation of the diseased testicles. In one case I opened the sac unintentionally in the operation, but it did not prevent the patient from doing well.

Acute inflammation of the testicle, mistaken for hernia.

The acute inflammation of the testicle is the only state which I have known confounded with hernia; the tenderness of the part, the swelling extending up the cord, and the vomiting accompanying the disease, led to a doubt which could only be removed by a knowledge of the history and progress of the complaint.

From varicocele.

The disease with which hernia is most frequently confounded is varicocele, or enlargement of the spermatic veins; this is a very common complaint, it occurs most frequently upon the left side, and is supposed to be founded in the termination of the left spermatic vein, at right angles with the emulgent. It sometimes dilates upon coughing; it appears in the erect, and retires in the recumbent position. It is distinguished from hernia by its feel, (which resembles that of a bag of large worms,) by its being unattended with intestinal obstructions, by placing the patient in the recumbent posture, and emptying the swelling into the abdomen; then pressing the finger upon the external ring to prevent any visceral descent, by which the free return of blood by the spermatic vein is obstructed, and the swelling re-appears when no hernia could escape.

Truss applied for varicocele.

I have more than once known a truss applied for this disease, and in one instance to the son of a medical man, by his father.

This hernia most frequent on the right side.

Inguinal hernia occurs more frequently upon the right side than the left, probably because the greatest exertions are made of the right side, from the preference we give to the use of the right arm: two thirds of inguinal herniæ are upon the right side.

CAUSES OF HERNIA.

All the causes of hernia usually alleged may be resolved into two kinds: those which diminish the resistance of the abdominal muscles, and those which increase the pressure of the viscera. The cause most generally predisposing to this disease is debility; by occasioning relaxation of fibre, it produces a dilatation of the apertures through which the spermatic vessels pass, and thus affords a passage for the protrusion of the viscera. The same cause also operates in elongating the attachments of the viscera, rendering them thereby more extensively mobile, and, consequently, more liable to be displaced from their natural situation.

Debility.

If a person debilitated by fever, returns to a habit of violent exertion before his strength is fully re-established, a swelling of the groin will often occur, which proves to be a hernia. Old age also, from the general relaxation it produces, is so frequently attended with this complaint, that I have been surprised to find but few old men entirely exempt from it. Having neglected no opportunity of procuring specimens of this disease, and inspecting the bodies of old people, I have scarcely ever been disappointed in finding either inguinal or femoral hernia. The subjects which I have examined, however, have principally been old persons who have been obliged to labour for their subsistence after their strength became unequal to great exertions.

After fevers.

Frequent in old age.

Those who work hard, and live more on fluid than solid food, are also very subject to hernia; whence its frequency among the poor of this town, who work to the utmost of their strength, and subsist very much upon liquids.

Heat of climate and seasons, warmth of clothing during the day, and warm covering at night, must also be reckoned as predisposing causes of this disease. Herniæ, though frequent in England, are much less common here than in the South of Europe or in Africa. A gentleman thus writes from Malta: "This is the place where hernia should be studied; for, from the extreme

More common in warm climates.

relaxing heat of the climate, assisted by the constant exertions which the inhabitants are obliged to make in passing their rocky paths, few persons escape the disease, and it is often of an enormous size."

Frequency of hernia in Egypt.

In Egypt, too, we have the testimony of medical men who attended the late expedition, that herniæ are extremely common there, and often of an unwieldly bulk. Of this, Sir Robert Wilson mentions the following instance: "I saw a man who had a belly hanging down from his navel to his ancles, a blue skin contained his bowels, but which seemed so thin, as to be liable every moment to burst. The weight was enormous, and the size appeared much larger than an ox's paunch. The unfortunate wretch was otherwise in good health, and crawled about gaining his bread by begging."

From obesity.

There are also causes which diminish the resistance of the muscles and tendons. Thus, a person naturally fat, who has become suddenly lean, is, in consequence, generally the subject of hernia; for the fat which had loaded the spermatic chord, and had extended the apertures to and from the abdomen, being suddenly absorbed, room is left for the viscera to supply its place. In some

From hereditary conformation.

respect it appears to depend on hereditary conformation of the parts of the groin; for I have frequently been consulted by fathers, themselves wearing trusses, for more than one of their sons afflicted with the same complaint. A gentleman applied to me with his two sons, all labouring under the disease. The father had a right inguinal hernia, the eldest son an umbilical, and the youngest a ventral hernia, between the ensiform cartilage and umbilicus, from a deficiency in the linea alba. Dr. S., his grandfather, and great grandfather, had an inguinal hernia brought on by the same cause—violent efforts while out shooting. In such cases as these, I have found by attentive examination the abdominal ring very imperfectly formed; so that instead of the ring extending an inch in length, it could be traced nearly half way to the ilium. Hence it would seem, that in these persons the tendon which strengthens the superior angle of the ring, either does not

exist at all, or is at least very imperfect; for, whoever is in the frequent habit of dissecting the abdominal ring will find it varying both in extent and in the firmness with which it is closed, being in some subjects carefully shut by the transverse tendon from the ilium, while in others, this tendon is very small or even entirely wanting. In such persons the slightest cause is sufficient to produce hernia.

Hernia produced by blows.

Hernia is often suddenly produced by blows. A gentleman consulted me concerning a tumour which had appeared in his groin after he had been thrown from his horse in hunting. He fell upon the post of a gate, which struck against his groin, and he immediately felt great pain, and found a swelling in the part, which proved to be a hernia. A young gentleman from America, who had a hernia, told me that it appeared immediately after having received a kick from his schoolmaster. Neither of these, however, was oblique inguinal hernia, but a variety that will be hereafter described, produced, I believe, by a laceration of the tendon of the internal oblique and transversalis muscles.

From coughing.

Violent actions of the abdominal muscles, by the pressure which they exert upon the viscera, become frequent causes of hernia. It is in this way that coughing produces this disease. Children have occasionally been brought to me with this disease during hooping-cough. Few persons who have been long afflicted with asthma are free from it, and those who play upon wind instruments are more subject to it than others.

From lifting heavy weights.

But of all the causes of hernia, the most frequent is the lifting of heavy weights, an action which strongly exerts the abdominal muscles at the time the body is bent. In this position the lower part of the abdomen is not contracted to the same degree as the upper, the viscera are forced downwards by inspiration, and compressed by the abdominal muscles above, whilst the openings of the groin are relaxed by the posture of the body.

I am informed that few persons are more subject to hernia than the men who work in our dockyards: the great weights which they

are in the habit of lifting, and the stooping position in which they often work, will, I think, sufficiently account for this circumstance.

From habitual costiveness.

Persons who suffer under habitual costiveness, are not only subject to hernia, but have the symptoms of strangulation often brought on whilst at stool, owing to the strong pressure made on the abdominal muscles during the difficult expulsion of fæces. Hence it is right to caution persons subject to hernia to avoid every cause of constipation.

From urethral stricture.

Strictures in the urethra appear to be a very frequent cause of this disease, as the difficulty in passing urine must necessarily call for more powerful action of the abdominal muscles. In the body of a man who had a stone in the urethra, which I opened with Mr. Weston, surgeon in Shoreditch, we found several hernial sacs. A man was lately in the accident ward of Guy's Hospital, who had an inguinal hernia appear soon after he began to labour under disury from enlarged prostate gland.

From the viscera becoming too large.

There are causes of this disease that principally affect the viscera, and in which the abdominal muscles may be said to be nearly passive. Thus the viscera become too large for the cavity of the belly in an extreme degree of obesity, which loads the omentum and mesentery with fat, and they are compelled to protrude through any opening that presents itself. If the fatness comes on very rapidly, it seldom fails to produce this disease, as the abdominal muscles cannot immediately accommodate themselves to the enlargement of the belly.

From external pressure.

The same effect is produced by constant external pressure, which tends to diminish the cavity of the abdomen, the size of its contents remaining the same. It is thus that hernia is brought on by wearing the breeches very tight about the waist, which pinch up the belly, and do not leave sufficient room for the variations that occur in the size of the viscera after taking food, or from exertions of different kinds. Mechanics who are in the habit of using the implements of their trade against their abdomen, bring on the complaint by pressing the viscera to the inguinal regions.

Plate III

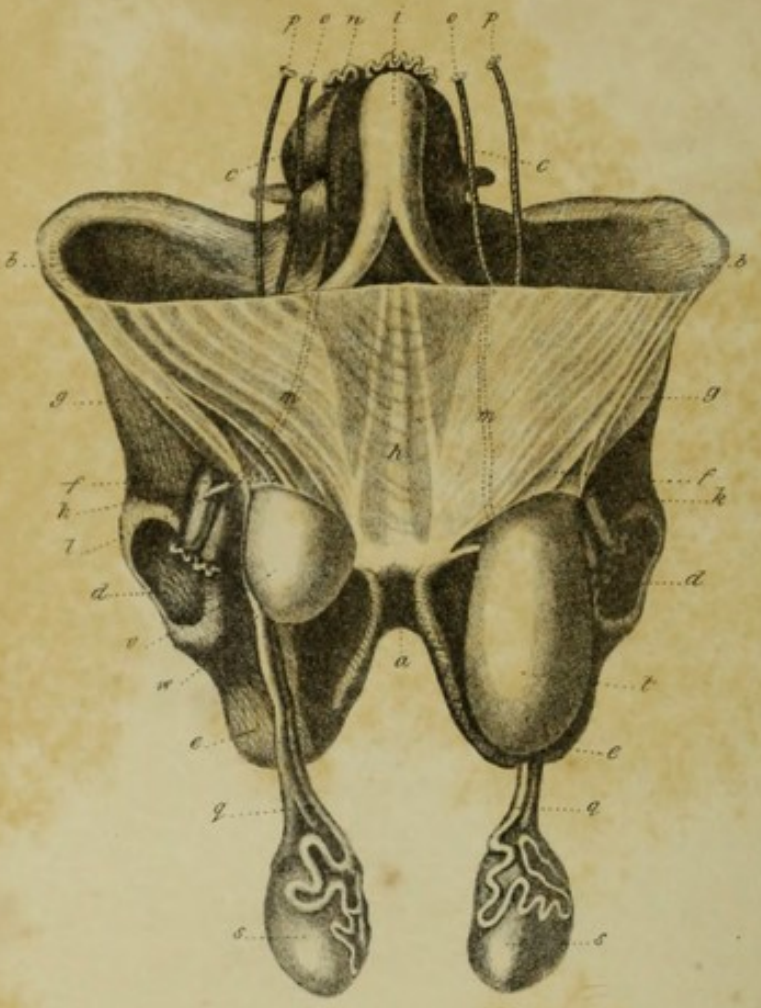


Fig. 1.

Fig. 2

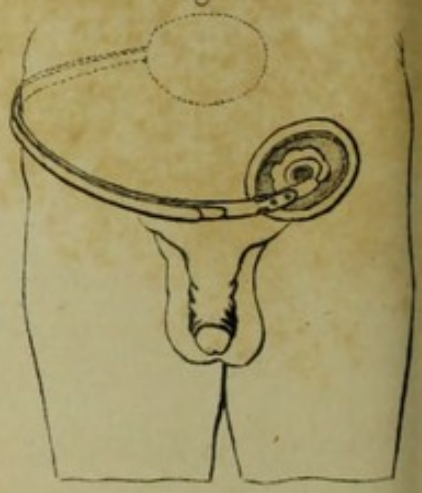


Fig. 3.

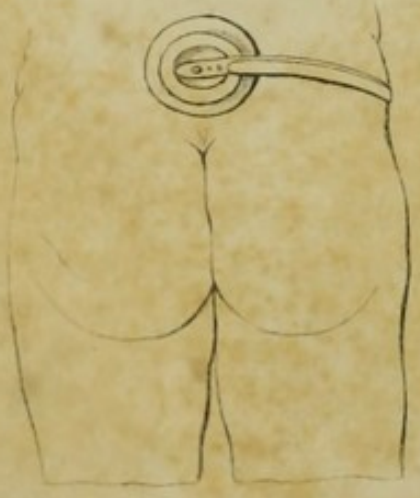


Fig. 4.

Fig. 5.

PLATE III.

Shews trusses of different constructions for the support of inguinal and femoral hernia.

Fig. 1. Salmon and Ody's self-adjusting truss. The right pad moves by means of a ball and socket, and is applied to the hernia; the hip pad is of a more rounded form, and is intended for the sacrum. They are connected by a strong steel spring.

Fig. 2. Is an anterior view of the same truss applied to a left inguinal hernia. The spring embraces the opposite side to that on which the hernia is seated, and crosses the pubes to fix the pad upon the rupture; it is hence called the opposite-sided truss.

Fig. 3. Posterior view of the same truss: the mode of applying the pad to the lower part of the spine is shewn. In this truss no circular or thigh strap is required.

Fig. 4. Represents the two apertures through which an oblique hernia descends, and the situation of the epigastric artery; below Poupart's ligament, on the left side, is pointed out the part on which a truss should be applied for a femoral hernia.

Fig. 5. Oblique hernia passing through the inguinal canal upon the right side, and appearing through the external ring as a scrotal hernia. On the left side is seen a direct inguinal hernia which passes on the inner or pubic side of the epigastric artery, and protrudes only at the external ring. The oblique course of that on the right side, shews the necessity of wearing a truss that makes pressure on the inguinal canal, especially in the incipient state of a hernia.

Fig. 6. In this figure a common inguinal hernia is shewn upon the left side, taking its course through the abdominal ring

on the outer side of the epigastric artery, between that artery and the spine of the ilium. The hernia upon the right side is that variety of inguinal hernia, which passes from the abdomen on the inner side of the epigastric artery, or between that artery and the symphysis pubis.

a, Symphysis pubis.

b, Anterior superior spinous process of the ilium.

c c, The spine.

d d, The acetabula.

e e, Tuberosities of the ischia.

f f, Abdominal rings.

g g, Poupart's ligament.

h, Linea alba.

i, Aorta.

j, Bifurcation of the aorta.

k k, Iliac and femoral arteries.

l, Origin of the epigastric artery on the right side.

m m, Course of the epigastric artery on each side marked by dotted lines, the left side passing on the inner, the right on the outer side of the hernial sac.

n, Vena cava inferior.

o o, Spermatic arteries.

p p, Spermatic veins.

q q, Spermatic cord.

s s, Testes.

t, Oblique hernial sac upon the left side, situated on the outer side of the epigastric artery.

v, Direct hernial sac upon the right side, placed upon the inner side of the epigastric artery.

w, The spermatic cord passing on the outer side of the direct hernial sac, whilst it is seen on the posterior part of that on the opposite side.

The enlargement of the uterus in pregnancy sometimes occasions hernia, but less frequently the inguinal than the other species. Distention of the stomach operates in a similar way. A frequent and forcible pressure or shaking of the viscera downwards, as happens in riding in rough carriages, is a common cause of this complaint. In the town of Yarmouth, where I formerly lived, I knew many persons who had this disease brought on by riding in the small carts peculiar to that town, and which, from being constructed without springs, were rough and uneasy, and shook the rider in a very severe manner. Coachmen who are much upon, and persons who ride rough going horses, are for the same reason liable to this complaint. The cavalry are much more subject to it than the infantry; and I have known children in whom it has been produced by frequent riding in company with older persons, and constantly going a pace uneasy to them.

Jumping operates in the same way, often suddenly. I have known many persons, after much of this exercise, complain of a pain in the groin, which was soon followed by hernia. In these and every other cause of the complaint, an upright posture of the body strongly contributes to its formation, by keeping up the pressure of the viscera on the lower part of the abdomen.

LECTURE XLII.

OF THE REDUCIBLE INGUINAL HERNIA, AND USE OF TRUSSES.

Herniæ are found in the three following conditions, reducible, irreducible, and strangulated.

Reducible inguinal hernia.

The reducible is that state in which the protruded parts may be returned into the cavity of the abdomen; and as it is attended with no immediate danger to the patient, frequently induces in his mind a false idea of security. A person under these circumstances lives in continual danger, as numerous accidental causes may produce strangulation of the prolapsed intestine, the conse-

quence of which will be fatal unless early and well directed skill be employed.

To prevent this accident a constant pressure should be applied at the part where the hernia opens into the abdomen, to close the mouth of the sac, and thus oppose an effectual resistance to the protrusion of its contents.

Trusses.

For this purpose, bandages of different kinds and elastic trusses have been invented; but, generally, the instrument that can be most safely relied on, is a truss of steel; other bandages often afford only a false security, more dangerous even than a total omission of this kind of support, since they encourage the patient to take violent exercise without apprehension of the probable consequences. An elastic steel truss, if properly made and well applied, ensures the security of the patient during any degree of moderate exercise, and is no hinderance to any of the common occupations of life.

The pad of a steel truss is composed of a supporting piece of iron, and stuffed so as to take a form on the one hand not too conical, and on the other not too flat. The former occasions pain by an unnecessary degree of pressure, while the latter does not effect the purpose of preventing protrusion. The pad is rivetted on a long flat piece of steel tempered to a great degree of elasticity, and curved to the shape of the lower part of the body, which it embraces like a belt. The length of this steel should be sufficient to pass from the hernia round the region of the groin to about an inch beyond the spine behind, forming somewhat more than a semicircle, but compressed. Both the pad and truss are quilted with leather. A strap of leather proceeds from the hinder end of the truss, which passes round the opposite side of the body, completing the circular belt by fastening upon the pad.

An understrap is sometimes added, which passes down from the back part of the truss between the patient's thighs, and is brought up to the fore part of the pad, to which it is fastened by a stud; this prevents the truss slipping upwards. However, if the pelvis is well formed, that is, standing outwards, or the abdomen is large,

this understrap is not necessary; but when the pelvis inclines towards the abdomen, the truss will slip from its proper position unless retained by the strap.

Many surgeons, and almost every surgeons' instrument maker, have thought proper to vary the form of the truss, and to prescribe different rules for the direction and force of the pressure; but almost all were formerly agreed in determining that the pressure should be made on the external abdominal ring.

Defect of old trusses.

This is precisely the circumstance, however, in which they were all defective, and, indeed, it is the frequent failure of the purpose for which they are designed that has led to such variety in the mode of their construction.

Object of applying a truss.

The object in applying a truss, is to close the mouth of the hernial sac, and destroy its communication with the abdomen, and this object can never be perfectly fulfilled by any truss which is applied on the external abdominal ring, and extending from it upon the os pubis.

In this case, the cure must be incomplete, because a considerable portion of the hernial sac remains uncompressed towards the abdomen, which portion is that situated between the abdominal ring and the opening into the cavity of the abdomen. Nor is this all the mischief that attends this practice, for the pressure of the spermatic cord by the truss against the os pubis, frequently occasions great pain, to relieve which the patient is constantly shifting its situation and destroying its effect, and often the testes themselves become wasted by the interruption of the blood along the spermatic vessels.

Obliteration of the mouth of the sac.

The proper method of obliterating the mouth of the hernial sac is to apply the truss not only on the external abdominal ring, but also on the aperture at which the spermatic cord, and with it the hernia, first quit the abdomen; for the descent of a hernia cannot be entirely prevented, or a cure be effected, but by making pressure on the internal abdominal aperture and on the inguinal canal.

The effect of wearing a truss on this part, is to approximate the sides of the mouth of the sac, and thus to prevent any future de-

Effect of wearing a truss.

scent into the same cavity. If the pressure be long continued, adhesion takes place at the origin of the sac, and interrupts the communication between the abdomen and the cavity of the sac, which being no longer distended by the descent of any viscus contracts in dimensions, and at length becomes entirely obliterated.

When a hernia has been returned by the surgeon into the abdomen, he should lay his fingers obliquely above, and to the iliac side of the ring, and direct his patient to cough, and the furthest part from the ring towards the spine of the ilium where the hernial sac is felt to protrude, is the point which should be noted for the application of the pad of the truss, and the instrument made accordingly.

Manner of measuring for a truss.

Measurement is taken for making the truss by laying one end of a piece of string upon the spot, and carrying the other round the pelvis, midway between the trochanter major and the spine of the ilium, till it meets the fixed point at first determined, and completes the circle. This will be the proper length for the truss. In the above manner I have been in the habit of measuring persons for trusses, excepting when the hips projected unusually, then it is advisable to substitute for the string a piece of iron wire, which, by retaining the precise outline of the patient's hip, serves as a necessary direction for the instrument maker to copy.

Position of the pad.

It will be found that the pad of the truss must be applied proportionally nearer to the abdominal ring in large than in small hernia. When the protrusion is small, the pad may be fixed midway between the symphysis pubis and the spine of the ilium; but as the dimensions of the hernia increase, the mouth of the sac moves gradually nearer the abdominal ring, and the artificial pressure must, in some degree, be regulated accordingly; always remembering, however, that the truss should never be brought on the pelvis, as the pressure on the outer and upper part of the ring will still be sufficient to keep the viscera within the abdomen.

Double trusses.

It happens frequently that hernia appears on both sides of the body. When this takes place, a double truss, or one with two pads and springs must be worn, made of materials similar to the

single truss. To make them sit easy and fit properly, they should buckle behind, and be made longer or shorter at pleasure. This is done by constructing them in such a manner, that one spring will readily slide upon another. The principle of application, and the degree of pressure required, are to be regulated as the single trusses.

As it is an object of importance to the patient to use the bath whilst he is wearing a truss, I have directed the spring to be covered with oil-skin, for the patient should on no account remove it while he is making so considerable an exertion as that of swimming. A truss when first applied, produces some uncomfortable feelings for about a week, after which they wear off, unless the pressure is unnecessarily great, in which case the spring must be weakened, as it frequently brings on inflammation of the testicle. On the contrary, if the hernia ever come down whilst the truss is properly applied, a stronger spring must be provided. The best made truss will chafe at first, however well put, but this inconvenience of a few days may be lessened by interposing a piece of linen between the pad and the skin which generally puts a stop to the uneasy chafing.

How long a truss ought to be worn.

It is usual for the patient to enquire how long his truss must be worn. This is difficult to be determined. I have known a hernia to be completely cured by wearing a truss only nine months, and instances are not at all uncommon, of the truss being left off at the end of the year without any relapse of the complaint. But I would at all events advise it to be worn at least two years, even by young persons, in whom alone this complaint is curable by this method.

As to elderly persons, they must continue to wear it for the remainder of life, for in them there is no probability of such change taking place in the mouth of the sac.

I have never known them long omit its use without experiencing some relapse; during growth, parts will readily accommodate themselves to pressure, extending or diminishing according to circumstances; but in adults and in the old this process is much more

tardy. The truss should be worn even during the night, lest any unexpected occasion should call the patient from bed unprepared for the sudden change of posture; for if the hernia once descend during the wearing of the truss, the cure must be considered recommencing from that moment. A patient should be provided with two trusses, in order to guard against the effects of accidents which may render one useless, and he will also experience great comfort in changing his night truss before he rises in the morning. A hernia will remain apparently cured for a considerable time, and return on some sudden exertion. This arises from the adhesions of the orifices of the sac being imperfect, and yielding to the pressure of the viscera. A gentleman, aged twenty-five, applied to me with a return of a left inguinal hernia, which had originally appeared at the age of seven years. He had worn a truss for it till within two years of its second descent, a period of sixteen years, and during the last two years had remained free from any descent of his rupture.

A hernia that thus re-appears is much more liable to strangulation than a recent hernia, on account of the thickening produced in the neck of the sac by the pressure of the truss, which also renders the replacement of the protruded intestine a work of greater difficulty.

There is one circumstance which will always render a prudent surgeon guarded in promising a complete cure of hernia from wearing a truss: it is, that although the original sac may be completely shut at its mouth by adhesion, or perfect contraction, it is possible that another sac may be formed contiguous to the first. In such a case two hernial sacs were found side by side, one open and capable of receiving the bowels when protruded, the other contracted to the size of a goose's quill. In the latter, therefore, the disease was cured, but remained in the former.

Application of truss to infants.

Steel trusses are equally applicable to infants as to the adult; indeed, less unequal pressure is made by them than by the common inelastic bandages applied round the pelvis. The scrotum of

an infant should be carefully examined to ascertain whether the testicle has descended through the external ring, as the non-descent of the testicle forbids the application of a truss; the sac in such cases is formed by the elongation of the tunica vaginalis, and any pressure made upon it will necessarily prevent the descent of the testicle into the scrotum. The application of a truss should therefore be deferred until the testis has fairly descended below the external ring. The nature of this hernia will be described under the subject of hernia congenita.

When a hernia has been cured by adhesion, as the peritoneum which forms the sac is a secreting membrane, an accumulation of water sometimes collects in it, for a species of hydrocele. The treatment of this disease should be similar to that of hydrocele from other causes.

During the application of a truss it is proper that every part of the protruded contents should be carefully returned, so that no compression be made on them; and if the patient should find that any part has again descended, he should place himself in a recumbent posture, take off the truss, push back the hernia with his hand, and again apply the truss. A person obliged to use a truss, who allows of the descent of a portion of the hernia whilst this instrument is worn, is in greater danger of strangulation of the part than if he wore no truss at all. For when unprotected by this bandage he always feels his danger, and is ready to guard against it; but a bad truss gives the idea of security without ensuring its reality.

Cautions necessary in discontinuing a truss.

When it is clearly ascertained that adhesion of the neck of the sac is effected, the use of the truss may be discontinued; but as this will generally be a matter of uncertainty, great caution must be used before the truss is laid aside. At first the patient may discontinue it at night, taking care to replace it before he rises from bed; he may afterwards remove it, when he is not called upon to make any violent exertion; but before it is wholly laid aside the surgeon should make a particular examination of the abdominal rings, to ascertain if, on coughing or other sudden action of the ab-

dominal muscles, any descent or tendency to protrusion exist at the internal ring.

EXPLANATION OF PLATE VI.

Shews trusses of different constructions for the support of inguinal and femoral hernia.

Fig. 1. Salmon and Ody's self-adjusting truss. The right pad moves by means of a ball and socket, and is applied to the hernia; the hip pad is of a more rounded form, and is intended for the sacrum. They are connected by a strong steel spring.

Fig. 2. Is an anterior view of the same truss applied to a left inguinal hernia. The spring embraces the opposite side to that on which the hernia is seated, and crosses the pubes to fix the pad upon the rupture; it is hence called the opposite-sided truss.

Fig. 3. Posterior view of the same truss: the mode of applying the pad to the lower part of the spine is shewn. In this truss no circular or thigh strap is required.

Fig. 4. Represents the two apertures through which an oblique hernia descends, and the situation of the epigastric artery; below Poupart's ligament, on the left side, is pointed out the part on which a truss should be applied for a femoral hernia.

Fig. 5. Oblique hernia passing through the inguinal canal upon the right side, and appearing through the external ring as a scrotal hernia. On the left side is seen a direct inguinal hernia which passes on the inner or pubic side of the epigastric artery, and protrudes only at the external ring. The oblique course of that on the right side, shews the necessity of wearing a truss that makes pressure on the inguinal canal, especially in the incipient state of a hernia.

Fig. 6. Common inguinal hernia truss. Its spring encircles half the body, the circle being completed by a strap which is fastened to one of the studs on the long pad. This truss is well calculated for the working classes ; and may be rendered still more secure by a thigh strap to prevent the pad rising, as is seen in Fig. 10.

Fig. 7. Double truss of the same construction.

Fig. 8. Represents a posterior view of the common truss, Fig. 8, as worn for an inguinal hernia.

Fig. 9. Anterior view of the same truss, applied to an inguinal rupture. When required for femoral hernia, the common truss is made with a somewhat larger pad, and the extremity curved downwards so as to reach below Poupart's ligament.

Fig. 10. Anterior view of the common truss, applied to a double inguinal hernia. Egg's truss differs from the common truss in having a nearly circular spring, and is well calculated to keep up large ruptures which are capable of bearing strong pressure.

Fig. 11. Represents Coles's single truss for inguinal hernia on the right side.

Fig. 12. Represents a double truss of Coles's, constructed on the same principle, for inguinal hernia on each side.

Fig. 13. Represents Coles's half truss for umbilical hernia.

Fig. 14. Is a representation of the spiral springs forming the pads, and covered with proper materials.

These three last described trusses are capable of every modification, and are certainly the best calculated to prevent the descent of a hernia under any circumstance whatever. The spring is formed with a view to combine the greatest degree of elastic power in the smallest space, and the spiral springs entering into the construction of the pads, gives them a decided superiority over every other truss yet offered to the public. Ed.

ON IRREDUCIBLE HERNIA.

When a hernia is incapable of being returned into the abdomen by outward pressure, it is termed irreducible.

The following are the causes which induce this condition of the protruded parts :—

Causes.

First,—When they are suffered to remain long down, they increase so much in size as to be incapable of reduction.

Secondly,—Membranous bands form across the sac, and thus entangling its contents, prevent their free motion.

Thirdly,—The protruded parts become closely united by an adhesion to the sides of the sac, sufficiently firm to render them immoveable.

Danger of irreducible hernia.

By whatever cause a hernia becomes irreducible, the patient is rendered subject to many inconveniencies and dangers. The principal danger is of strangulation of the protruded parts; however this is certainly less in the irreducible hernia than in one that descends only occasionally; for in the former, the sac is already nearly full, and cannot readily admit of any great increase of its contents. But the patient is liable to danger from other causes, as will readily be seen by the following case.

Case.

A man was brought into Saint Thomas's Hospital who had fallen from a ladder, and his scrotum, in which was a large hernia, struck upon the edge of a piece of wood. After complaining of violent pain and tension in his abdomen, in four hours he died. On examining his body after death, a portion of the ilium which had formed a part of the hernia, was found ruptured.

Ulceration.

Another danger incurred by irreducible hernia is that of ulceration. This may happen when any pointed body is swallowed, and follows the course of the food down the intestinal canal into the hernial sac; when arrived in this place, it has been known to make its way out by ulceration, leaving a passage for the fæces.

An irreducible hernia sometimes becomes of a most enormous size when it has remained entirely unconfined, and it then produces

various other inconveniences, of which the case of Mr. Gibbon, the celebrated historian, furnishes a striking example, who had a tumour of such magnitude, as required to be concealed by a peculiar dress. And the penis was deeply sunken into it, so that the urine could only escape by trickling over the surface of the scrotum, which kept it constantly excoriated. Consequences such as these result from a neglect of proper bandages in hernia.

Besides these inconveniences a very large hernia produces a disease of the scrotum itself; an abscess is formed, which is kept fistulous by the constant distension of parts, and can hardly ever be healed without confining the patient to his bed.

When the contents of hernia have become so large and encumbered with fat as to render the disease at that time irreducible, it has been recommended previous to any attempt at reduction to make the patient undergo a course of extraordinary fasting, accompanied with cathartic medicines, and every means to be employed to keep up a copious perspiration. It is scarcely to be doubted, that such a plan would, after a considerable time, be attended with ultimate success; but I have never met with any one who would submit to such a severe regimen to free himself from a disease which only gives a present inconvenience, and does not alarm the patient for the future event.

Application of a bag truss.

A more easy and equally effectual method is, to apply a bag-truss to support the scrotum, to lace in front. In this way a considerable pressure is steadily kept upon the parts, which effects a gradual absorption of the adipose matter of the protruded hernia: and thus, after some days' confinement, the tumour becomes very much diminished, and at last may be returned.

Hernia sometimes becomes irreducible, as I have before stated, from the formation of membranous bands across the sac, which entangle the protruded parts.

They appear to be produced in the following manner: during the reducible state of the hernia, inflammation takes place, both in the contained parts, and in the inner surface of the sac; but by using proper means, the protruded parts are reduced, and the sides of the

sac collapse and adhere together. However, while the adhesions are still recent, a fresh descent takes place from the abdomen, and the hernial contents again disunite the surfaces of the sac everywhere, except at the points of union of these inflamed parts, the cementing lymph of which, instead of bursting asunder elongates with the fresh pressure, and forms those membranous bands which are seen passing from one side of the sac to the other. Between these the intestine and omentum get entangled, a circumstance which adds so much to the difficulty of reduction, as to make it, in general, considered as impracticable; but unless the hernial contents themselves adhere, there appears no reason why the means already pointed out may not here also prove successful. After all there is scarcely a possibility of detecting by the feel this variety of the disease in the living subject.

Irreducible from hour-glass contraction.

They also become irreducible, though rarely, from a contraction in the sac, which I have seen take place in its middle, so as to produce an hour-glass appearance, and a portion of omentum has been confined below and above the contracted part.

Irreducible from adhesion.

Herniæ are irreducible from adhesion having taken place between the contents of the tumour and the sides of the sac; they are sometimes universal, but more commonly partial; they exist most frequently at the lower part of the sac, but sometimes at its mouth only, and must remain unreturned for the rest of life, unless it be expedient or necessary to undertake an operation. The cases in which such an operation may be proper and necessary will be mentioned in a future place.

Treatment of irreducible hernia.

All that can be done in an irreducible intestinal rupture is, to apply a bag truss of the size of the tumour, which, by affording a constant pressure, will check the increase of the disease. But if the hernia be omental only, its increase and the subsequent descent of the intestine may be safely prevented by a spring truss. There is so much difficulty, however, in these instances, in the living subject, in determining the precise nature of the hernia, and deciding whether or not some small convolution of intestine may be descended, that the spring truss should only be fixed after the

most careful examination, the spring itself weak, and it should be entirely thrown aside if it produces any pain or interrupts the functions of the bowels.

In an old irreducible hernia the omentum often becomes diseased. I have seen it affected with schirrus, that is not the schirrus which terminates in cancer, but forming a large and very firm tumour. A specimen of this form of the disease is preserved in the Museum of Saint Thomas's Hospital. Hydatids have been known to be produced in it, but I have never seen an instance of it. Diseased omentum.

When suppuration occurs, it produces an external abscess. An instance of this happened in a woman who had an abscess in the omentum which had arisen from an old irreducible omental hernia.

STRANGULATED HERNIA.

This form of the disease consists, not only of an irreducible state of the intestine or omentum, but of such a compression of the blood-vessels as to excite inflammation, and totally to interrupt the passage of the fæces through the strangulated portion. The symptoms are, considerable pain in the tumour, and a sensation as if a cord were tied tight around the upper part of the abdomen, or sometimes only around the navel. To these succeed frequent eructations and vomiting, and presently, as an antiperistaltic motion is established through the intestine, bilious matter is brought up. Indeed, when the strangulation has taken place in the colon, I have seen fæculent matter discharged by vomiting, a circumstance which is accounted for, when it is considered that the valve at the end of the ilium is often imperfect, and especially that an antiperistaltic motion will reverse the operation of this valve as well as of the rest of the intestinal canal. I have seen this symptom so often, that I can entertain no doubt on the subject. Symptoms.

An obstinate constipation attends the vomiting, so that no stools First stage.

can be obtained, except from the portion of intestine below the strangulation by means of glysters. The pulse is quick, and at the beginning of the complaint, hard. If effectual relief be not obtained, the tumour becomes red and painful, and when handled, the mark of each finger is left in a white hollow impression, as occurs on pressure of a dropsical limb. This indicates an effusion of fluid into the cellular membrane covering the hernial sac, produced by the continuance of the inflammation. The abdomen now becomes slightly tense and sore upon pressure, the vomiting very frequent, and the whole body is bedewed with sweat. The constipation remains obstinate, and instead of eructation, hiccough comes on, whilst the countenance shews great anxiety, and the pulse now becomes extremely small and thready, so as to lead those unaccustomed to the disease, to think the patient dying. These symptoms, however, are subject to exacerbations: they are for a time very violent, and described by the patient as spasmodic, after which the patient becomes comparatively easy, so that the surgeon is flattered with hopes that the means he has employed have been successful, till the symptoms again return with more than their former severity.

Second stage.

After having suffered acute pain throughout the first stage of the complaint, the patient becomes suddenly easy, and expresses great satisfaction at this change. The tumour, which still continues, generally assumes a purple or leaden colour, and gives a crackling feel owing to air being contained within the cellular membrane. The abdomen becomes more tense, the hiccough more violent, a cold sweat covers the body, and the pulse, though now fuller and softer than before, if attended to for a little time, is found to be intermittent; but still the patient remains perfectly sensible, and generally continues full of hopes till death, which now speedily puts an end to the complaint. So remarkably strong is this delusive feeling of amendment, that I have known a patient at this extremity insist upon rising and expire in the very act: and another who sat up in bed, called for something to drink, and died as he was putting it to his lips.

If the tumour be examined after death, a quantity of clear serum will first be found under the skin.

Post mortem appearances.

The hernial sac contains a quantity of bloody serum of coffee colour, the intestine is of a chocolate brown, with here and there a black spot, which easily breaks down on being touched with the finger. A coat of coagulated lymph of the same colour of the intestine may be peeled from its surface, and adhesions of no great strength are to be found extending from the intestine to the sac. At the particular part where the intestine is strangulated by the constricting membrane, it is either ulcerated through, or readily separates under slight pressure. If the inflammation have been very extensive, there is a quantity of air in the surrounding cellular membrane.

Inflammation peculiar to hernia.

The inflammation which takes place in strangulated hernia is different from almost every other species. In most cases it is produced by an unusual quantity of blood sent by the arteries of the part, which become enlarged, but still the blood returns freely to the heart, and the colour of the inflamed part is that of arterial blood: whilst in hernia, the inflammation is caused by a stop being put to the return of the blood through the veins, which produces a great accumulation of this fluid, and a change of its colour from the arterial to the venous hue. This venous appearance which the intestine assumes ought to be distinctly understood, that it may not be mistaken for mortification, which shews itself either in an appearance of discoloured spots dispersed over the bowel, or in a more complete disorganization of texture, arising from entire loss of vitality, and a consequent putrefactive process.

Post mortem abdominal appearances.

On dissection, three or four convolutions of intestine are found lying across the abdomen, so enormously distended as to exclude the other viscera from view, and agglutinated slightly together by an effusion of adhesive matter; the track of adhesion is marked by red lines formed of the inflamed vessels which furnish the secretion. These distended convolutions consist of the portion of intestine immediately above the seat of stricture, and owe their state of extreme distension in part to a collection of fæculent

matter, but chiefly to flatus in the cavity of the intestine. The portion of intestine below the structure is, on the contrary, remarkably contracted in diameter, and free from every appearance of inflammation.

Strangulated omental hernia.

In strangulated omental hernia, the symptoms are much less violent than in the intestinal species. The vomiting is not so frequent, the pain in the tumour inconsiderable, the tension not so great over the abdomen, and the constipation by no means so complete; for stools can, in general, be procured during the whole duration of the disease, both by glysters and by cathartics, until the peritoneal covering of the intestines participates in the inflammation. The hiccoughs are violent and constant from the dragging effect on the stomach, and the pulse, though small and frequent, is not so remarkably small and thready as in the intestinal hernia. In this species inflammation occasionally takes place on the skin, though more rarely than in intestinal hernia; and when an extensive slough is thrown off, it is attended with much less constitutional irritation.

Post mortem appearances.

On examination after death from strangulated omental hernia, the omentum is found scarcely changed from its natural appearance, its colour is a little, and but a little, darker than usual. I have found it in some cases, even during the operation, extremely offensive to the smell. There is scarcely any fluid in the sac; though the cavity of the abdomen is inflamed, and the intestines slightly adhering to each other, they never appear to have suffered so much as from intestinal hernia.

Seat of stricture.

On examining the seat of the strangulation in inguinal hernia, it will sometimes be found at the abdominal ring, which from its unyielding nature has operated like a tight cord upon the protruded omentum or intestine, when more of these abdominal viscera have passed down than the aperture would readily admit or allow to return. This is the principal point of strangulation in old and large hernia; but it is more commonly seated at the internal ring, at the place where the spermatic cord first quits the abdomen. The strangulating pressure is here made by the internal oblique

and transversalis muscle and its tendon, which pass over the hernial sac in a semicircular direction, and by the fascia transversalis arising from Poupart's ligament, the semicircular border of which passes under the sac, and which has been mentioned in the anatomical description of the parts, is represented a preparation of a hernia thus strangulated by pressure above the ring. Hereby may be explained the opinion which some surgeons have entertained of the spasmodic nature of the stricture, a state which it was difficult to account for when the seat of strangulation was supposed to be confined to the external ring, as this tendinous aperture possesses no muscular action, and therefore cannot assume the state of spasm. But when the strangulation is at the upper ring, a portion of intestine protrudes under the edge of the internal oblique and transversalis muscles, compressing them, which in their turn, being excited to contraction by the irritation of this pressure, re-act upon the intestine with a force sufficient to produce a strangulation, accompanied with spasmodic symptoms. If then the surgeon, during the operation for hernia, examine accurately into the seat of the strangulation, he will find that, except in large herniæ, cutting through the external ring is insufficient to release the protruded parts, but he must proceed with his knife obliquely outward, before he can return the swelling. For the truth of this assertion I would appeal to those surgeons best acquainted with the structure of the parts, who have performed the operation most frequently and with the greatest attention.

The mouth of the hernial sac, when it becomes the seat of stricture, has been thickened on the inner part by the pressure of the tendons of the internal oblique and transversalis muscles, and if a truss has occasioned much pressure on its outer side, the whole circle of the sac becomes thickened in consequence. Thus the cause of stricture at the mouth of the sac is occasioned by parts external to it. Moreover, though the abdominal ring be dilated with freedom, the hernia will in many cases still retain its colour of strangulation and remain as irreducible as before; but if the sac

be traced up with the knife about an inch and a half obliquely outward, the stricture will there be found, and when this is divided the intestine can be readily returned.

Strangulated hernia mostly fatal unless reduced.

Strangulated hernia is almost always fatal unless the tumour is reduced, but now and then an instance will occur of the parts sloughing off, and a fistulous opening remaining for life through which the fæces are constantly escaping. This dreadful termination of the disease leaves the patient constantly offensive, incapable of considerable exertion, and renders life itself a loathsome burden.

Strangulation terminating in sloughing.

In young persons, where the powers of life and reparation are vigorous, a hernia will sometimes slough and the aperture be closed by a natural process. Whenever any medical attendant is called to a person suffering under the symptoms which I have described above, he should carefully enquire whether his patient had any tumour descend during the day and return in the recumbent posture during the night, in the groin or in any other known seat of hernia; and he should not be content with mere enquiries, as persons are sometimes unconscious of this disease, and sometimes unwilling to acknowledge it, but he should himself carefully examine the abdomen with his hand, to discover if possible any tumour to which these symptoms may be attributed.

Cause of strangulation.

The cause of strangulation is the descent of an additional portion of intestine and omentum into the hernial sac; it might be thought that the mere protrusion of a greater length of a single fold of intestine would not increase the stricture at the narrow ring of compression; but the reason that it does so is, that a proportionally larger quantity of the mesentery descends along with the bowel, and thus increases the pressure made by the stricture upon the blood-vessels of the hernial contents.

The same causes which produce hernia renders them strangulated; such as distension of the abdominal viscera, exertion of the abdominal muscles, particularly in positions which compress the bowels on the upper part of the abdomen, and leave the lower part relaxed and the apertures unguarded; violent exertions in ex-

PLATE IV.

This Plate shews the different construction of trusses for the support of inguinal and femoral hernia.

Fig. 1. Common inguinal hernia truss. Its spring encircles half the body, the circle being completed by a strap which is fastened to one of the studs on the long pad. This truss is well calculated for the working classes; and may be rendered still more secure by a thigh strap to prevent the pad rising.

Fig. 2. Double truss of the same construction.

Fig. 3. Represents Coles's single truss for inguinal hernia on the right side.

Fig. 4. Represents a double truss of Coles's, constructed on the same principle, for inguinal hernia on each side.

Fig. 5. Represents Coles's half truss for umbilical hernia.

Fig. 6. Is a representation of the spiral springs forming the pads, and covered with proper materials.

The three last described trusses are capable of every modification, and are certainly the best calculated to prevent the descent of a hernia under any circumstances whatever. The spring is formed with a view to combine the greatest degree of elastic power in the smallest space, and the spiral springs entering into the construction of the pads, gives them a decided superiority over every other truss yet offered to the public. Ed.

Fig. 7. This figure represents on the right side a small oblique inguinal hernia, making its appearance at the internal ring, on the outer side of the epigastric artery; and on the left side a scrotal hernia, with its coverings displayed by dissection.

a a, Fascia superficialis coming from the external abdominal ring, and forming the external investment of the hernia. At its upper part the transverse fibres of the external ring are seen.

b b b, Cremaster muscle thickened—seen descending under the

margin of the external ring, and lost upon the tunica vaginalis at *d*.

c, Hernial sac.

d, Testicle.

e, Spine of the ilium.

f, Tendon of the external oblique muscle reflected to show the inguinal canal.

g, Abdominal ring.

h h, Poupart's ligament.

i, Internal oblique muscle.

k, Rectus.

l, Femoral artery.

m, Femoral vein.

n, Margin of the internal oblique muscle turned upward to expose the hernial sac, and epigastric artery on its inner side.

o o, The Spermatic cord is seen emerging from the internal abdominal ring behind the hernia, and taking its course through the external ring into the scrotum.

p, An incipient hernia, appearing at the inner ring, midway between the spine of the ilium and symphysis pubis.

Fig. 1.

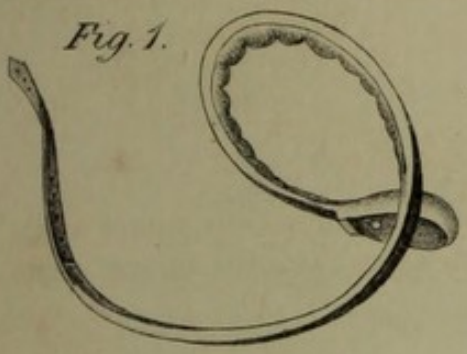


Fig. 2.

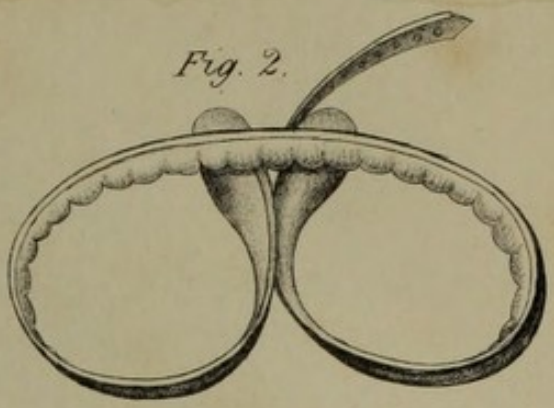


Fig. 3.

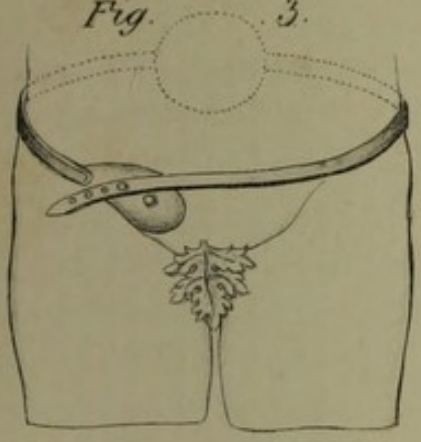


Fig. 4.

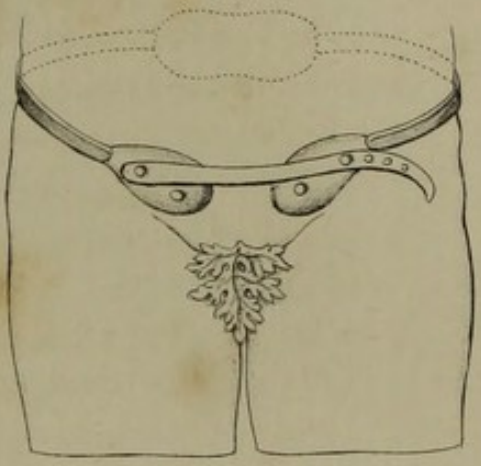


Fig. 5.

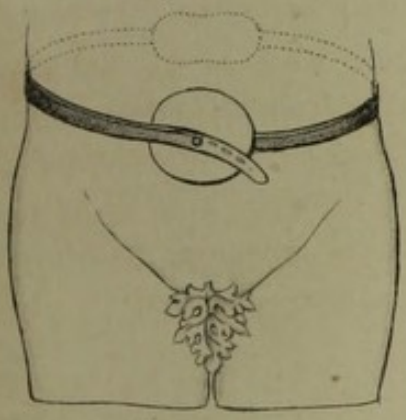


Fig. 6

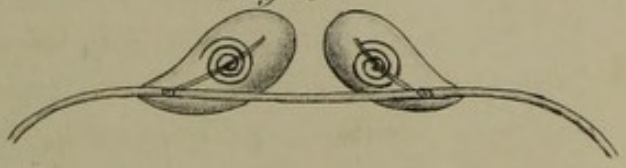
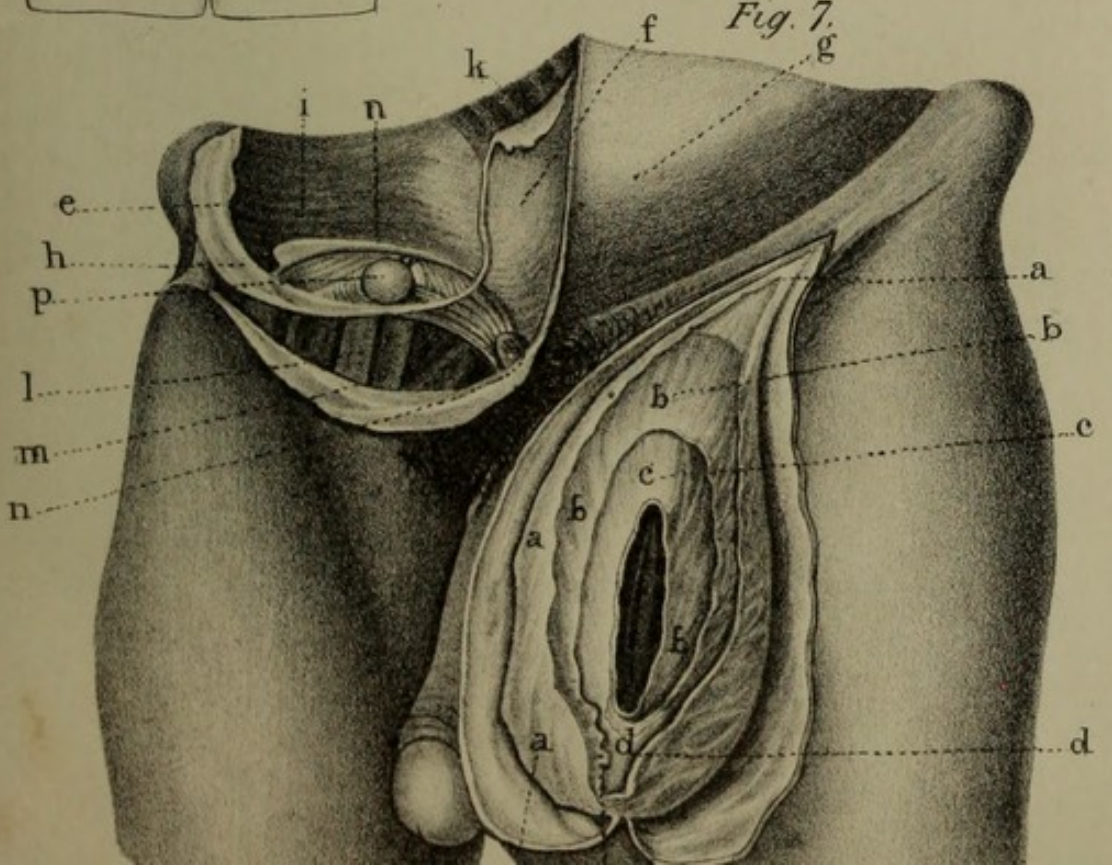


Fig. 7.



pelling the fæces, raising a heavy weight from the ground when the body is stooping, straining to reach a great height, coughing, sneezing, and the like. Eating flatulent vegetable food, is peculiarly apt to induce strangulation. This latter cause operates by distending the intestinal canal, causing it to occupy more space than before in the abdomen, and consequently pushing out part of the viscera into the hernial sac.

Small hernia more easily strangulated.

A small hernia is more easily strangulated than a large one, the pressure on the contents being more violent, and the symptoms are much more urgent, as the stricture acts with more effect upon a single knuckle in stopping its circulation than when the contents of a hernia are large and voluminous; and a hernia which appears suddenly is more liable to this accident than one of long standing, which has been in the habit of frequently coming down, the aperture which admits of the descent of the latter being enlarged from repeated protrusion, while in the former it is proportionally contracted around the intestine.

LECTURE XLIII.

TREATMENT OF STRANGULATED HERNIA.

As all the symptoms which have been described in a preceding part originate from the compressed state of the protruded parts, it must be the surgeon's object to return them as soon as possible into the cavity of the abdomen, and he is only wasting time by any attempts to alleviate the violence of the symptoms independent of this principal object.

Taxis.

The return of the part is first to be attempted by what is termed the Taxis. This is done by making pressure with the hands upon the tumour, and at the same time placing the patient in that posture which gives as much room as possible in the abdomen and relaxes its muscles and apertures. The best position for this pur-

Position of the patient.

pose is the supine, with the body moderately incurvated. This is effected by laying the patient on his back, and putting one pillow under the pelvis, and another under the shoulders, which will cause the loins to sink between them both, the thighs should be elevated to a right angle with the patient's body, and the knees should be brought so close together as only to admit of the surgeon's arm between them.

This last is a most essential point, since it relaxes the fascia of the thigh, and consequently the apertures through which the hernia quits the abdomen, which, as we have before described, is intimately connected with this fascia. The patient should also be desired to void his urine, and then to keep himself as quiet as possible.

The surgeon then places himself on the patient's right side, and embracing the tumour with his right hand, he presses it towards the abdominal ring so as to keep it from receding, then applying the finger and thumb of his left hand upon the neck of the tumour, at the part where it enters the abdomen, he gently presses it from side to side, thus endeavouring to disengage it and get a small portion of it within the abdomen. If any part can be forced up the rest generally follow without any difficulty. The pressure may sometimes be more effectually made by having some counter-force to prevent the patient's body receding.

Period of time proper for the continuance of the taxis.

The pressure should be maintained from a quarter to half an hour. I have known it succeed after a trial of twenty minutes, and it should not therefore be hastily abandoned. The degree of force should be but moderate, as the chief dependence should be placed on continuance rather than violence of pressure, the latter being sometimes known to produce a laceration of the protruded parts.

The longer the hernial tumour has been strangulated, the more dangerous is it to use any considerable pressure for its reduction, as the parts have then a much less power of resistance than in their natural state. The force of the pressure should be directed towards the anterior and superior spinous process of the ilium, in

the course which the tumour takes, obliquely upwards, and not towards the abdomen immediately behind the abdominal ring.

If the attempts at reduction in the posture which I have described do not prove successful, it has been recommended to sling the patient by his knees, with his head dangling downwards over the shoulders of an assistant. This position, however, does not provide for that relaxation of the abdominal muscles which is so desirable, and it is altogether painful to the patient, and renders it difficult for the surgeon to apply proper pressure upon the tumour. From frequent experience of it by my own trials, and by witnessing those of others, I can affirm that I have never found it answer, where the other method fully and fairly performed has previously failed.

The sudden relaxation of the abdominal muscles during a fit of coughing, by taking off pressure from the viscera, together with the ascent of the diaphragm in the act of coughing, will sometimes assist in its reduction. A patient was brought into Guy's Hospital, who, during the attempt to reduce it by my dresser, Mr. Workman, was seized with a violent fit of coughing; the pressure being continued during the paroxysm, he felt the hernia suddenly recede into the abdomen.

Intestinal hernia more easily reduced.

The intestinal hernia will be found more easy of reduction than the omental. The former goes up suddenly with a gurgling noise; the latter returns gradually, excepting the last remaining portion, which does indeed rapidly slip up from beneath the fingers, but unaccompanied with any noise. If from want of elasticity in the hernia the surgeon is clear that it is merely omental, the force used for reduction may be much greater than it would be safe to employ for the intestinal species.

Reduction by venesection.

If a fair trial of the plan which I have just mentioned should not prove successful, other means should be resorted to. One of them is venesection, the object of which is, first, by the general languor which it occasions, to produce a relaxation of the strictured part, and next, to prevent the local inflammation from running so high

as to occasion mortification, which would render the case fatal though the protruded parts were returned.

The quantity of blood to be drawn should be from fourteen to twenty ounces, according to the strength of the patient's constitution. So much should be taken away as to bring on a degree of faintness, in which state of general relaxation the attempts at reduction should be repeated. A surgeon unaccustomed to the small thready pulse of a person suffering under strangulated hernia, feels apprehensive of taking away blood, conceiving the patient's strength to be fast sinking; but this fear is groundless, as the pulse becomes larger and fuller after this evacuation.

Employment of the warm bath.

If this fail of success, the patient is usually put into the warm bath, and indeed I generally employ the warm bath immediately after the bleeding, before the second attempt at reduction by the taxis. The first heat of the bath should be one hundred degrees of Fahrenheit, and it should be gradually raised till the patient faints, or feels disposed to do so, which usually takes place in fifteen or twenty minutes. The attempt at reduction is then to be repeated.

Extreme depression produced by strangulation.

The depression produced by the strangulation of an intestine is sometimes so great, that very slight causes will induce a state of syncope, from which the patient is with difficulty roused.

The patient scarcely ever fails to express feeling much less pain after the bleeding and warm bath than before, at the same time that it too often happens that no advantage is gained in the essential point of reduction.

The two remedies on which, so far as my observation goes, a firmer reliance may be placed, are the tobacco clyster, and the application of cold; and if these fail I should be little inclined to await the trial of any other remedy.

Tobacco clyster.

Tobacco has been used in hernia both in form of smoke and as a liquid clyster. To use the smoke with any effect requires a complicated apparatus, and consequently it is often very badly managed; it is besides uncertain in its effects, and hence its use

has long been discontinued in the hospitals of the Borough, and in the private practice of their surgeons.

Mode of administration.

The tobacco clyster, which is by far the most convenient, is made by infusing a drachm of tobacco in sixteen ounces of boiling water for ten minutes, after which it is fit for use. But as the effect of this potent remedy varies very much in different constitutions, and perhaps according to the quality of the tobacco, it is best to inject only half that quantity at first, and the remainder half an hour afterwards, if the portion has not proved sufficient. To those who have commonly heard of two drachms being thrown up at a time without bad consequences, this may appear an useless precaution, but instructed by personal observation, I can venture to assert, that whoever practises this often will meet with effects which will lead him to repent his rashness.

I once saw a man with whom the tobacco clyster had been used in the quantity of two drachms, without a reduction of the tumour, who about half an hour afterwards was put upon a table to have the operation for hernia performed; when his pulse was found so low, his countenance so depressed, and his body covered with cold sweats, that he was ordered back to bed, and on carrying him thither, he expired.

Danger of the tobacco clyster.

A girl who laboured under strangulated hernia, and who was sent to Guy's Hospital by Mr. Turnbull, surgeon, had a single drachm of the tobacco in infusion injected. It produced most violent pain of the abdomen, with vomiting, in which was thrown up a quantity of matter which smelt strongly of tobacco, and she died in thirty-five minutes after the clyster had been administered, and most evidently from its effects.

These are my reasons for advising the above cautious manner of using this remedy; but at the same time it should be observed, that there are some persons on whom even the quantity of two drachms produces little effect.

Effects of the tobacco clyster.

When the tobacco acts in the manner to be desired, it produces extreme languor, a weak and quick pulse, a cold sweat, and such universal relaxation, that the patient has not the power to exert

any of the voluntary muscles of the body. In this state the hernia will often return into the abdomen with a very slight pressure, though it had previously resisted a considerable degree of force. I have felt a hernia, which had been previously tense, under the operation of the tobacco clyster become perfectly soft and relaxed, which state was produced, not by any partial return of its contents, as no pressure had been used, but simply by the temporary removal of the force of circulation from the protruded intestine. In some cases I have observed that the warm bath has rendered the tumour more tense, and increased its volume; probably by increasing the heart's action, determining a larger quantity of arterial blood to the intestine than the compressed veins were able to return. It is from the opposite effect that the benefit of the tobacco enema is derived; it so depresses the force of the heart, that the pulse at the wrist can scarcely be felt; and this temporary suspension of the force of circulation relieves the distended vessels of the gut, and, by diminishing its bulk, assists in its reduction.

Application of cold.

The other powerful method of assisting the reduction of hernia is the application of cold. To produce it, brandy and vinegar, vinegar and sal ammoniac, or simply dashing cold water upon the naked abdomen and tumour, have all been employed. The most simple and effectual, however, where it can be procured, is to

Ice.

apply ice. For this purpose it should be broken in small pieces, and put into a small bladder so as to half fill it, which, being tied up and wiped dry, is to be laid upon the hernia, and to cover the inflamed and swollen parts. Its effect is almost immediately to diminish the pain, to contract the skin over the tumour, and by the pressure thus produced to compel the return of the protruded contents. Another great advantage of this remedy is, that it arrests for a length of time the progress of the symptoms, so that it may be continued for several hours upon the part without incurring the risk of losing too much time. If after a trial of about four hours the symptoms become mitigated, and the tumour lessens, this remedy may be persevered in some time longer, but if they con-

tinue with unabated violence, and the tumour resists every attempt at reduction, no further trial of the ice should be made.

Mode of applying the ice.

It is improper to apply the ice to the part wrapped up between folds of cloth, as is often done, as the melted portion constantly keeps the patient's bed wet and uncomfortable; and besides, if long continued, it produces a frost bite, and the part sloughs off. An instance of this kind occurred to Mr. Sharp and Mr. Cline, in a case which they attended in February, 1780. They directed ice to be applied to a strangulated hernia, which being continued for thirty-six hours, occasioned the integuments to freeze to the extent of four inches. The part was white and hard, but when the ice was removed, it thawed, becoming again red and warm, and soon after the hernia was reduced. The integuments which had been frozen continued red and inflamed for ten days, when they became livid, and sloughed as far as they had been frozen, but the ulcer afterwards healed without difficulty.

Substitutes for ice.

As ice cannot be procured in many situations, some substitute for it must be had. The most convenient is a mixture of sal ammoniac and nitre, first finely powdered and mixed in equal proportions. Sixteen ounces of water being put into the bladder, ten ounces of the mixed salt is to be thrown in, and the bladder then tied up and laid upon the tumour. The degree of cold produced by this mixture is lower in the hottest weather than the freezing point of water, and if the water be previously cooled, the cold will be greater.

Nitrate of ammonia and water, in equal parts, produces a still greater intensity of cold; but as this salt is not used in medicine, it is not easily procured. Vinegar and sal ammoniac, and vinegar with spirit of wine, generate too slight a degree of cold to be much depended on for this purpose.

Opium to allay the vomiting.

In addition to the means hitherto described, it is proper to give opium to allay the violence of the vomiting. After copious bleeding opium is of particular service, and much assists the subsequent attempts at reduction.

Cathartics.

With respect to cathartics, the most drastic kind were formerly

employed, but they have so repeatedly been found not only ineffectual in this complaint, but positively injurious, that their use is now entirely laid aside, excepting when the symptoms are very slight. If the strangulation has produced vomiting, purgatives only increase it, for the stomach is so irritable that the medicine is rejected as soon as swallowed, and hence cannot have a purgative effect, whatever be the extent of strangulation in the intestine; and if the hernia be omental, little advantage could be derived from purgatives.

Where the symptoms are but slight, aperient medicines may be given, if there is either no vomiting or only at distant intervals. In such cases, I have known opium, joined with calomel and cathartic extract, produce stools and relieve the patient.

Fomentations.

In slight cases, fomentations and poultices may be applied with advantage; but still, even in the less urgent cases, I think them much inferior to the application of cold. In one case, in which the tumour was tense, and the scrotum much inflamed, I found the application of leeches, and the subsequent application of fomentations, occasion a return of the protruded parts.

OPERATION FOR STRANGULATED INGUINAL HERNIA.

When necessary.

When the means I have recommended have been tried, without enabling the surgeon to reduce the hernia, or relieve the strangulation, it becomes necessary that an operation should be performed, to liberate the strangulated viscus.

But little danger.

There is but little danger attending this operation, if the person upon whom it is to be performed be free from other disease. The cause of persons who have undergone this operation so frequently dying, is not to be attributed to the operation, but to the degree of mischief which has taken place previously to its being performed.

Gangrene.

When strangulation has existed for a long time, the contents of the hernia either become gangrenous, or in a state so nearly approaching to it, that they do not recover their proper functions,

otherwise inflammation extends from the strictured portion to the viscera, within the cavity of the abdomen, and thus the surgeon has to combat with a severe disease after the removal of the strangulation. The danger is therefore in the delay, and not in the operation.

Very frequently much time is unnecessarily lost, before an operation is proposed; and too much cannot be said in condemnation of such practice. A patient is submitted again and again to the taxis, and the swelling is rendered extremely tender, by being so often compressed, in the hope of avoiding an operation, until at length the rapid increase and urgency of the symptoms point out the impropriety of such delay; and an operation is performed when but little prospect of success remains. Danger of delay.

It is extremely important that the operation should, if possible, be performed before the abdomen becomes tender under pressure. Distension of the intestines from flatus, often produces tension of the abdomen, soon after strangulation has occurred; but still the patient can bear pressure without experiencing pain; but when he does complain of pain under pressure, it indicates the extension of inflammation to the cavity of the abdomen, which is likely to be much increased by the operation.

In this state there is peritoneal inflammation to contend with, which, unfortunately, the operation itself, though the only method of removing the stricture, is calculated to increase; so that on opening the cavity of the abdomen, this inflammation spreads through its cavity and destroys the patient. Peritoneal inflammation.

Therefore as soon as bleeding, the warm bath, the tobacco clyster, and topical cold, have been fairly tried, and have proved unsuccessful, if the abdomen is becoming affected, the operation should be no longer delayed; and, indeed, if the warm bath cannot be conveniently and quickly procured, it is better to omit it altogether, than to endanger the patient's life by further delay. Symptoms indicating the necessity of an operation.

This soreness upon pressing the abdomen is a much better criterion than the time which has elapsed since the occurrence of the first symptoms of strangulation, for there is the utmost variety in

the time that elapses between these symptoms and a fatal termination. There is a drawing of a large intestinal and omental hernia in the museum at St. Thomas's Hospital, which Mr. Ede used to state in his lectures proved fatal in eight hours from the first appearance of strangulation; under these circumstances death is not occasioned by mortification, but by the constitutional irritation which the inflammation of so large a surface occasions. On the other hand, I have known the operation successfully performed at the end of eight days after the accession of the symptoms of strangulation, although death generally happens on the sixth or seventh day from the commencement of the symptoms. I have known an instance of fatal termination within three days from the descent of the rupture.

Some judgment may be formed from the pulse, and from the patient's general appearance; if the pulse be so small as to be scarcely perceptible, and the countenance anxious and sunken, no time is to be lost; but even under these circumstances, and with hiccough superadded, I have known the operation succeed.

Indeed there is scarcely any period of the symptoms which should forbid the operation; for even if mortification has actually begun, the operation may be the means of saving life by promoting the ready separation of the gangrenous parts, and relieving the distended intestine.

Patient's assent to an operation.

It will be said that it is difficult to obtain the patient's consent to an early operation; but this I have never found, where the precise state of the case was represented. The almost certain fatal consequence of delay, and the inconsiderable degree of pain which is inflicted in this, compared with many other operations, seldom fail to gain the patient's consent of submitting to the only remaining method of relief from his sufferings and his dangerous situation.

Progress of inflammation varies.

The progress of inflammation, and extent of mischief, are not always in proportion to the time that strangulation has existed, for the period between the commencement of the symptoms, and the fatal termination, varies exceedingly.

A large hernia when completely strangulated, is more quickly fatal than a smaller one; but the latter more frequently requires the performance of an operation, on account of the greater firmness of the stricture. Small herniæ more frequently require operation.

A hernia containing a portion of strangulated intestine alone, is more rapidly fatal than one containing omentum only; and that containing both intestine and omentum, takes a middle course between the two above mentioned. Intestinal hernia most dangerous.

When a hernia has existed for a long time, and becomes strangulated, the attempts at reduction will be more likely to succeed than if it were of recent formation; in the first instance, the parts are more easily relaxed, having been accustomed to repeated dilatation; while in the latter case, the powers of resistance are much greater. Old herniæ most likely to be reduced.

Also in very young, or very old persons, strangulated herniæ are more frequently reduced, than when they occur at the middle period of life, during which the fibrous structure is firmer, and the muscular strength greater than at any other period. In very old persons, also, the strangulation is not so rapidly fatal; as long a period as twenty days has been known to elapse between the commencement of the symptoms, and the death of the patient. Also in very old or young persons.

EXPLANATION OF PLATE VII.

This Plate represents on the right side a small oblique inguinal hernia, making its appearance at the internal ring, on the outer side of the epigastric artery; and on the left side a scrotal hernia, with its coverings displayed by dissection.

a a. Fascia superficialis coming from the external abdominal ring, and forming the external investment of the hernia. At its upper part the transverse fibres of the external ring are seen.

b b b. Cremaster muscle thickened—seen descending under the

margin of the external ring, and lost upon the tunica vaginalis at *d*.

c. Hernial sac.

d. Testicle.

e. Spine of the ilium.

f. Tendon of the external oblique muscle reflected to show the inguinal canal.

g. Abdominal ring.

h h. Poupart's ligament.

i. Internal oblique muscle.

k. Rectus.

l. Femoral artery.

m. Femoral vein.

n. Margin of the internal oblique muscle turned upward to expose the hernial sac, and epigastric artery on its inner side.

o o. Spermatic cord is seen emerging from the internal abdominal ring behind the hernia, and taking its course through the external ring into the scrotum.

p. An incipient hernia, appearing at the inner ring, midway between the spine of the ilium and symphysis pubis.

OF THE OPERATION FOR INGUINAL HERNIA.

Preparatory steps.

Previous to the operation, the patient should be directed to empty his bladder, and the integument upon the tumor and surrounding parts, must be cleansed from the hair usually covering it.

Position of the patient.

The patient is then to be placed upon a table, about three feet six inches in height, on his back, the shoulders should be raised, and the thighs a little flexed towards the body, so as to relax the abdominal muscles; the hams are to be brought to the edge of the table, so that the legs may be allowed to hang over it.

Operation.

The surgeon should now place himself between the patient's thighs, and grasp the tumor with his left hand, so as to put the integument covering it upon the stretch, and then having a scalpel in his right hand, he should commence the operation by making an incision through the skin, on the anterior part of the swelling, which incision should be begun opposite the upper part of the external abdominal ring, and carried down to the inferior part of the tumor, unless the swelling be of a large size. Besides the skin and cellular substance, the external pudendal artery may be divided by this incision, as it always crosses the sac near the abdominal ring. The hæmorrhage from this vessel may usually be stopped by pressure; but if very troublesome, it will be necessary to put a ligature upon it.

Fascia of the cord exposed.

By this incision the fascia of the cord becomes exposed, which generally forms the thickest covering of the hernia. This must be carefully cut through in the centre, so as to admit the entry of a director which is to be passed under the fascia, upwards to the ring, and downwards to the extent of the external incision, that the fascia may be safely divided upon it.

Cremaster exposed.

Thus the cremaster muscle is brought into view, forming the next covering, which must be opened and divided in the same manner as the fascia, and with equal care, and the cellular tissue beneath must be cautiously cut through.

Hernial sac exposed.

When this has been completed, the hernial sac itself is laid bare, and the surgeon must proceed with the utmost caution to open it in the following manner. He first nips up a small portion of the membrane on the anterior and inferior part of the tumour, between his fore-finger and thumb of the left hand, and slightly rolling the membrane between them, he easily distinguishes if any intestine or omentum be included; and if so, he raises a fresh portion. Being satisfied that he has only a part of the sac raised, he is to place the edge of the knife horizontally against it, and make an opening of sufficient size to admit the end of a director, which is then to be introduced, that the sac may be opened upon it.

Caution in dividing the coverings.

In dividing the different coverings, a very cautious operator will

make more layers than I have described, being fearful of doing mischief which might be irreparable.

Appearance of the sac.

When the hernial sac is exposed, it has usually a bluish tint, and is semitransparent. If the contents be not adherent to the sac, it generally contains a quantity of fluid, and a sense of fluctuation may be usually perceived at the inferior and anterior part of it, for which reason this part should be first opened, as the intestine is there in the least danger.

Escape of fluid.

Immediately the sac is opened, this fluid escapes. If the strangulation have not existed long, it is occasionally of a serous colour, but more frequently of a darker, or coffee colour, and sometimes it has an offensive smell.

Quantity of fluid.

This fluid is most abundant in intestinal hernia, and is in quantity in proportion to the bulk of intestine strangulated. If, however, the hernia be omental, or if the intestine adhere to the interior of the sac, little or no fluid is found, so that it must not always be looked for as an indication of the sac being opened.

Sac opened.

The sac being opened, the surgeon is enabled to see its contents, which he must attentively examine. If both intestine and omentum have been strangulated, the latter is found above and anterior to the former; in some instances covering the gut partially, in others completely.

Appearance of omentum or intestine.

If the hernia has not been long strangulated, the omentum has much of its usual character, being only a little darker than natural, and having its veins distended; but the intestine is found covered with a thin coat of adhesive matter, and is of a red colour. When the strangulation has existed for a long time previous to the operation, or when the stricture has been unusually tight, the intestine presents a dark brown chocolate colour.

Seat of stricture ascertained.

The surgeon should now pass his finger into the hernial sac, and examine accurately the seat of the stricture, which he will find in one of the three following situations:—

First.—At the internal abdominal ring, in the mouth of the sac.

Second.—In the inguinal canal, an inch, or an inch and a half within the external ring.

Third.—At the external ring.

At the internal ring.

The most frequent seat of stricture is at the internal abdominal ring, from an inch and a half to two inches above, and outwards from the external ring, and it is occasioned by the pressure of the internal oblique and transversalis muscles upon the mouth of the hernial sac, which becomes thickened, more especially on its pubic side.

How exposed.

Should the stricture be situated at this part, it has been thought necessary to divide the external ring, and to slit up in part the inguinal canal, by dividing a portion of the tendon of the external oblique muscle, in order to give the operator a distinct view of the protruded parts, and to enable him to divide the stricture without danger to his patient. This may be done by passing the finger into the sac, through the external ring, as far as the seat of stricture, and then introducing a curved bistoury with a probed extremity between the upper part of the finger and the sac, and cutting through the tendon, superficial fascia, and integument, forming the anterior boundary of the inguinal canal.

Having thus exposed the contents of the hernial sac as far as the seat of stricture, the operator should insinuate the point of his finger, or a director, under the stricture, between the sac and its contents at the upper part, carefully keeping the latter from turning over the finger or director. He should then pass the knife for dividing the stricture upon the finger or director, under the stricture, and by a gentle motion divide the stricture in a direction parallel with that of the linea alba, and to an extent sufficient to allow the finger to be easily passed into the cavity of the abdomen. The knife should then be withdrawn in a careful manner. In this case I have adopted with advantage the following plan:—The sac being opened to the external ring, I have put my finger into it, and hooked down the sac; I have then directed an assistant to draw up the tendon of the external oblique at the ring, and have thus been able to bring the stricture into view without cutting the tendon of the external oblique to the upper ring.

Division of the stricture.

Knife for dividing the stricture.

The knife best adapted for dividing the stricture is blunt at its

extremity for about a quarter of an inch, sharp for half an inch, and then again blunt, only cutting so far as is necessary to divide the stricture, without endangering the neighbouring parts.

I have occasionally practised, and have for some time recommended in my lectures, the following mode of dividing the stricture without including the sac. The tendon of the external oblique having been divided a little above the external ring, the sac is gently drawn down, while the muscles are drawn up by an assistant. In this way the stricture is brought into view, and can be divided without risk, and without including the peritoneum. I was led to adopt this by the result of a case, in which I had reason to doubt whether the aperture in the intestine was not caused by the knife; when the stricture is not in view, the intestines cannot be completely secured from danger; the knife is passed blindly upon the finger as a guide, and in dividing the stricture has been known to wound the intestine.

An advantage is derived from dilating the stricture without cutting the sac itself, for there is no danger of injuring the intestine with the naked edge of the knife, which I have twice known to happen when the stricture was divided from within the sac; in one case the patient died from the contents of the intestine escaping into the abdomen, in the other the intestine was obliged to be retained in the sac to allow of the escape of the fæces by the external wound. An additional advantage is derived from this method of dilatation, viz. that if by any mistake of the operator the epigastric artery is cut, as the peritoneum is undivided, the flow of blood would be immediately perceived, and then the vessel might be secured; whereas if the sac is included in the incision, the artery would bleed into the abdomen, and the consequences might be fatal, without the cause being known but by dissection.

Stricture in the inguinal canal.

The second seat of stricture is in the inguinal canal, and is formed by the sac itself in the following way:—a person becomes the subject of oblique inguinal hernia, and the pressure on the neck of the hernial sac at the internal ring, creates a thickening of

Fig. 1.

Fig. 3.

Fig. 2

Fig. 4.

PLATE V.

Fig. 1. Shews a sac taken from the body of a person who laboured under an inguinal hernia.

a, Its mouth.

b, The course of the vas deferens behind it.

Fig. 2. This gives a view of a hernial sac, which has passed no further than the abdominal ring, so that the whole of the sac is included between the abdominal ring, and the place at which the spermatic cord quits the abdomen.

a, Abdominal ring.

b, Poupart's ligament.

c, Iliac artery.

d, Femoral artery.

e e, Epigastric artery passing behind the mouth of the sac.

f f, Spermatic cord passing behind the sac, and through the abdominal ring, to the testis.

g, The testis.

h, Mouth of the hernial sac.

i, The fundus of the sac, which just reaches the abdominal ring.

Fig. 3. Shews two sacs, one by the side of the other; the one contracted by wearing a truss so as to be no longer capable of receiving the viscera; the other larger, and forming by the side of the first.

a, The peritoneum.

b, Mouth of a newly formed sac.

c, Its fundus.

d, Contracted mouth of an old hernia.

e, Its fundus.

Fig. 4. An omental and intestinal hernia, irreducible from adhesion; and membranous bands extending across the hernial sac.

a, Abdominal ring.

b b, Columns of tendons forming the ring.

c, Transverse tendinous fibres passing to the two columns.

d, Tunica vaginalis.

e, Epidydimis.

f, Testis.

g g, Fascia coming from the abdominal ring to cover the hernial sac.

h h, Hernial sac.

i i, Membranous bands crossing the sac.

k, A piece of whalebone to keep the sac extended.

m, Intestine adhering to the sac.

n n, Omentum also adhering to the sac.

the sac at this part. From any sudden exertion or straining, which occasions a further protrusion, this part of the sac is forced into the inguinal canal, and when the patient is in the recumbent position, part or the whole of the contents of the sac being returned into the cavity of the abdomen, the portion of the sac which had been previously situated at the internal ring, and had been thickened, again takes its former position. This occurs again and again; but at length the sac becoming elongated, the thickened portion, which had been originally placed at the internal ring, no longer returns to this situation when the contents of the sac are reduced; but it remains in the inguinal canal, and may here at any future time be the cause of strangulation.

How exposed and divided.

When the stricture is thus formed, the surgeon should freely expose the contents of the hernial sac as far as the stricture, and then divide it in the same manner, and in the same direction as before described.

Stricture of the external ring.

Sometimes, but rarely, the seat of stricture is at the external abdominal ring, in which case the same plan of dividing the stricture should be adopted; but it is not necessary to make so large an opening.

If the hernia be direct, it is to be remembered that the spermatic cord is placed on its outer side. It is covered by the fascia of the cord, by the cremaster partially, and is contained in a sac formed by the tendon of the transversalis muscle, assisted by the fascia transversalis, besides a peritoneal sac, as in other hernia.

Best direction for dividing the stricture.

The division of the stricture directly upwards is then applicable to every common case of strangulated inguinal hernia, whether oblique or direct; it is equally safe with any other division that has been proposed, and the operation is by it more simplified than by adopting a different mode of dividing the stricture for each variety.

EXPLANATION OF PLATE VIII.

Fig. 1. Shews a sac taken from the body of a person who laboured under an inguinal hernia.

a. Its mouth.

b. The course of the vas deferens behind it.

Fig. 2. This gives a view of a hernial sac, which has passed no further than the abdominal ring, so that the whole of the sac is included between the abdominal ring, and the place at which the spermatic cord quits the abdomen.

a. Abdominal ring.

b. Poupart's ligament.

c. Iliac artery.

d. Femoral artery.

e e. Epigastric artery passing behind the mouth of the sac.

f f. Spermatic cord passing behind the sac, and through the abdominal ring, to the testis.

g. The testis.

h. Mouth of the hernial sac.

i. The fundus of the sac, which just reaches the abdominal ring.

Fig. 3. Shews two sacs, one by the side of the other; the one contracted by wearing a truss so as to be no longer capable of receiving the viscera; the other larger, and forming by the side of the first.

a. The peritoneum.

b. Mouth of a newly formed sac.

c. Its fundus.

d. Contracted mouth of an old hernia.

e. Its fundus.

Fig. 4. An omental and intestinal herniæ, irreducible from adhesion; and membranous bands extending across the hernial sac.

a. Abdominal ring.

b b. Columns of tendons forming the ring.
c. Transverse tendinous fibres passing to the two columns.
d. Tunica vaginalis.
e. Epidydimis.
f. Testis.
g g. Fascia coming from the abdominal ring to cover the hernial sac.
h h. Hernial sac.
i i. Membranous bands crossing the sac.
k. A piece of whalebone to keep the sac extended.
m. Intestine adhering to the sac.
n n. Omentum also adhering to the sac.

EXPLANATION OF PLATE IX.

Different views of preparations of inguinal herniæ, intended to shew the mode of operating on each variety.

Fig. 1. *a a a.* Tunica vaginalis.
b. Testis.
c. Spermatic cord.
d. Hernial sac within the tunica vaginalis.
e. Mouth of the sac, which has been produced by an adhesion of the tunica vaginalis, opposite the abdominal ring.
f f. Intestine.

Fig. 2. *a.* Strangulated intestine, the sac cut open.
b. The adhesions of the tunica vaginalis to the mouth of the sac.

Fig. 3. Common inguinal hernia.
a. Abdominal ring.
b. Poupart's ligament.
c. Femoral artery.
d. Epigastric artery.
e. Hernial sac below the ring.
f. Hernial sac above the ring.

g. The sharp part of the knife introduced between the ring and the sac, with its side placed towards the sac; its edge is to be turned forwards to divide the ring.

Fig. 4. Hernia on the inner side of the epigastric artery.

a. Abdominal ring.

b. Poupart's ligament.

c. Femoral artery.

d. Epigastric artery.

e. Internal oblique and transverse muscles passing over the sac.

f. Tendon of the transverse muscles passing under it.

g. Fascia from Poupart's ligament, from which the cord has been withdrawn, to shew the place through which it passes.

h. Hernial sac.

i. Hernial sac above the ring.

k. Knife introduced to shew the manner of dilating the stricture, which is to be always done forwards and upwards opposite to the middle of the mouth of the hernial sac, in all the varieties of inguinal hernia, excepting when the spermatic cord is on the anterior part of the mouth of the sac, when the division should be made outwards.

Cutting upwards is necessary in the variety shewn in Fig. 4, as dividing outwards towards *e* would divide the epigastric artery.

LECTURE XLIV.

Examination of viscera.

After having sufficiently divided the stricture, the surgeon should carefully examine the protruded intestine, particularly that part which has been immediately under the stricture, and ascertain whether the circulation becomes restored, which he may do by

employing pressure to empty the vessels, and then observe if they be again immediately filled.

Should the circulation be free, he should then gradually and very carefully return the intestine by small portions at a time, until the whole is reduced. At this time the patient should be placed much in the same position as when the taxis is employed.

Adhesions.

When adhesions have taken place between the intestine and sac, great care is required in opening the latter, as little or no fluid exists in it, to separate it from the intestine, which may be in consequence easily wounded. The sac being opened, if the adhesions be found long, and not very numerous, they may be divided to allow of the return of the protruded part. Sometimes these adhesions are only found at the mouth of the sac, or are otherwise partial; in either case they should be carefully separated, that the hernia may be completely reduced; but the division of such adhesions, particularly at the mouth of the sac, is attended with considerable danger. Sometimes the sides of the fold of intestine which has been strangulated are found glued together: in this case it is best to separate such adhesion, if it can be easily done, as the free passage of the fæces is afterwards interrupted, if the intestine be returned doubled back into the abdomen with such adhesion remaining.

Symptoms of gangrene ending in artificial anus.

Should the intestine be gangrenous, it will be indicated both by the constitutional symptoms of the patient, and the change which the hernial tumour itself undergoes. The pulse becomes fuller and softer than during the inflammatory stage, but is often intermittent; the hiccough and tension of the abdomen still continue, but the vomiting is less frequent. The patient expresses himself comparatively free from pain, and leads the unwary practitioner to consider his symptoms as more favourable; the glassy eye is also a general attendant upon gangrene. The tumour, which was tense and elastic, becomes soft and doughy; the skin, which was at first red, assumes a purple hue; the cellular membrane of hernial coverings becomes emphysematous, and gives a crackling sensation under the fingers. The hernia will now sometimes return into the

cavity of the abdomen with little or no effort on the part of the surgeon, which dooms the patient to a speedy death. Sometimes the integuments slough and ulcerate, the intestines give way, and the fæcal contents escaping from the opening, the symptoms of strangulation cease. An artificial anus thus becomes sometimes established, through which, frequently during the remainder of the patient's miserable existence, the fæces are discharged.

Treatment when sloughing takes place.

With respect to the treatment that is required for these cases of sloughing hernia, I believe that very little more can be done than to hasten the process of separation by fomentation and poultices, and to support the strength of the patient by generous diet and tonic medicines; and, that any attempt to lead the fæces into their natural passage before the sloughing process is completed, will only irritate the parts, interfere with the regular process of separation, and endanger the life of the patient.

Intestine sometimes ruptured by violence.

So much violence, is not unfrequently used, in the attempts to reduce the hernia, that the coats of the intestine give way under the taxis, and the operator, on opening the sac, discovers an aperture, from which fæcal matter issues. A small wound may be inflicted upon the gut, by the knife of the operator, from want of caution in dividing the stricture, or from neglect of the advice which I have given, namely, to bring the stricture into view, by drawing the sac gently down while the abdominal muscles are held up by an assistant. When this accident occurs, and the aperture in the gut is very small, the surgeon is to employ a different mode of treatment from that required for gangrened intestine; the indiscriminate use of one kind of treatment would subject the patient in the present case to the risk of a fæcal fistula, which by the following expedient, may be altogether avoided. The aperture, with a small portion of the surrounding gut, should be pinched up with a pair of forceps, and a fine silk ligature being passed around it, should be secured so as to include the ruptured spot; the intestine should then be returned to the mouth of the sac.

Application of a ligature.

Appearance of

It will sometimes happen that the intestine may appear, during

the operation, free from the usual marks of gangrene, and yet in a few days the fæces will be discharged from the wound; this will occur when the strangulation has gone so far that the intestine cannot recover its circulation after being returned into the abdomen; it is advisable, under such doubtful circumstances, to replace the intestine at the mouth of the sac, that the fæces may be readily evacuated at the wound as soon as the gangrenous portion begins to separate by the ulcerative process.

the intestine may deceive.

Should the intestine be in a state of gangrene, it will have a fœtid smell, the peritoneal surface will have lost its brilliancy, and be of a dark port wine colour, with greenish spots on it; it will not possess any sensibility, and will easily give way under slight pressure.

Intestine gangrenous.

Under these circumstances, the stricture should be divided in the manner I have described, after which, a free incision should be made into the gangrenous intestine, to allow of the escape of its contents, and then it should be returned to the upper part of the sac, the wound should be left open, and a poultice applied; but if the portion of intestine which has descended be not large, it should not be disturbed from its adhesions to the sac.

Treatment of gangrenous intestine.

I was requested during the absence of Mr. Chandler, to operate upon a woman who had been admitted into St. Thomas's Hospital, under his care, with strangulated hernia. From the examination of the part, and from the history of the case previous to my seeing the patient, I imagined that gangrene had commenced, and I soon found this opinion to be correct; for, before I had opened the hernial sac, there was a highly offensive and putrid smell. On opening the sac, I found the intestine in the state I have before described; I therefore divided the stricture, and then made an incision of about an inch and a half in extent, on the anterior part of the gangrenous intestine, through which the fæces readily escaped. I afterwards directed that a poultice should be applied. Fæculent matter continued to be discharged through the wound; but nine days subsequent to the operation she had a stool, per anum, after which the patient passed her stools by the natural

Case.

passage, occasionally at first, then more frequently, as the artificial anus and wound closed, and she completely recovered. This patient was confined five months after the operation, and delivered of a full grown but dead child, by Mr. Brown, a respectable surgeon at Rotherhithe. It is extraordinary, that being considerably advanced in her pregnancy at the time of the operation, she did not miscarry.

Termination without an operation.

When a patient with strangulated hernia will not submit to the operation necessary for his relief, or if the proper assistance cannot be procured, and gangrene takes place, the hernia sometimes suddenly returns into the cavity of the abdomen, and the patient survives only a few hours. Sometimes the skin and other coverings inflame and slough, when the fæces are discharged through the opening thus produced, and the symptoms of strangulation subside, after which an artificial anus is formed, rendering the remainder of the patient's life miserable.

Artificial anus.

Occasionally, however, it happens that the external wound and artificial anus are gradually closed, and the patient entirely recovers.

Case.

A case of this kind occurred under the care of my friend, Mr. John Cooper, surgeon, of Wotton Underedge, Gloucestershire. He was requested to attend a poor woman, aged sixty, who was the subject of strangulated crural hernia. When he first saw her, she had been labouring under symptoms of strangulation for a fortnight, and the hernia was evidently in a state of mortification. Thinking, therefore, that there would not be any chance of saving her life by an operation, he only directed that her strength should be supported, and the part poulticed. In a few days the mortified parts began to separate, and the fæces were discharged through the wound. This continued for three months, during which period several inches of one of the small intestines sloughed. After this, a small quantity of fæces began to pass by the natural channel, and in six months the woman had perfectly recovered.

Danger of artificial anus.

The formation of an artificial anus is dangerous, according to its situation in the intestinal canal. If the opening be near to the

stomach in the jejunum, the patient will die in consequence of the small surface for the absorption of chyle being inadequate to produce sufficient nourishment. If the opening be in the lower part of the ilium, or in the colon, then the patient may recover, as there is but little interruption to nutrition.

A man about fifty years of age was admitted into Guy's Hospital with a strangulated umbilical hernia, which sloughed, and occasioned an artificial anus. As he was recovering from the effects of the strangulation and sloughing, and was allowed to take food in any considerable quantity, it was observed that part of what solids he ate passed out at the artificial anus, within half an hour after he had swallowed them, and that fluids passed out in ten minutes after they had been taken into the stomach. Although he took sufficient food to support a healthy person, he wasted rapidly, and died in three weeks. On examining his body after death, and tracing the jejunum, the lower part of that intestine was found entering the hernial sac, and in it the opening was situated. The other viscera were healthy. Case.

When an artificial anus has been formed, care must be taken to guard against any inversion of the intestine at the artificial opening, as such an occurrence will most likely prevent the perfect recovery of the patient, by rendering the false opening permanent. From inversion of the intestine.

A patient of Mr. Cowell's, in St. Thomas's Hospital, underwent the operation for a strangulated hernia; the intestine was found to be gangrenous, and the consequence was the formation of an artificial anus. For three weeks after the operation, the fæces passed in part by the artificial opening, and in part by the natural aperture, but most by the latter; at this period the intestine became inverted, and protruded at the artificial opening; after which the fæces were entirely discharged by the false passage. The man lived eleven years after this, but always discharged his stools by the artificial anus. Case.

If a portion of the colon has been strangulated, and the patient be fat, the appendices epiploicæ are sometimes found much more Appendices epiploicæ removed.

diseased than the intestine, so much so that it becomes necessary to remove them, which I have had occasion to do.

Examination of omentum.

Having returned the intestine, the surgeon should carefully examine the omentum, and if it be not in a large quantity, or of an unhealthy appearance, it should be returned into the abdomen, with as gentle a pressure as possible. If a very large portion of omentum be protruded, a part should be removed, which may be done without any danger to the patient by means of the knife; and, if any arteries sufficiently large to afford a troublesome hæmorrhage, are divided, they must be secured by fine ligatures; the divided surface should then be returned to the mouth of the sac, so as to form a plug, and the ligatures should remain hanging from the external wound.

Use of the ligature abandoned.

The old mode of applying a ligature around the protruded portion of the omentum to occasion it to slough off, is now, I believe, entirely abandoned; and it appears extraordinary that it should ever have been adopted, as it is the object of the operation to remove the stricture, which would be thus immediately restored with increased severity.

Omentum mortified.

If the omentum be in a state of mortification, which may generally be known by its crispy feel, and the distension of its veins by coagulated blood; or even if any suspicion arise of its being in an unsound state, it should be removed by excision at the sound part. In doing this, the strangulated portion should be drawn down a little, so as to expose some of the sound part, which should be held by an assistant to prevent its sudden retraction into the abdomen, while the surgeon cuts off the diseased part; and when this has been completed, any bleeding vessels should be secured as before directed. Should the omentum, in an unsound state, approaching to gangrene, be returned into the cavity of the abdomen, the danger of the patient will be much increased.

Sloughing of Omentum. Case.

I have, however, known a patient recover, in whom sloughing of the omentum took place after it had been returned into the cavity of the abdomen. This occurred in a man who had undergone the operation for a strangulated hernia in Guy's Hospital.

The sac contained both intestine and omentum; and the latter, although much changed in appearance, was returned into the abdomen. Some days after the operation, the man appeared to be dying; the ligatures, holding the edges of the wound together, were removed, and poultices and fomentations employed, when, on the following day, a portion of gangrenous omentum was found protruding from the wound, and for several days more continued to present itself, until the whole of the portion which had been previously strangulated was exposed, and gradually sloughed off; after which the patient recovered.

Omentum adherent.

When the omentum alone adheres to the sac, it may be freely separated and returned, any vessels likely to afford a troublesome hæmorrhage being previously secured.

Omentum hard like scirrhus.

Should the protruded omentum be much hardened, or have a scirrhous feel, it should also be removed in the same manner as I have already described.

TREATMENT AFTER THE OPERATION.

Employment of sutures.

When the contents of the hernial sac have been returned into the cavity of the abdomen, the wound should be well cleansed, and its edges should be afterwards brought into contact by means of sutures, in order to promote adhesion; two or three sutures being necessary, according to the extent of the wound. Care should be taken in passing these sutures only to include the integument, otherwise, by penetrating the sac, much subsequent mischief may arise.

Of plaister.

The approximation of these parts should be assisted by the application of slips of soap plaister, and a compress should be placed over the wound, and retained there by means of a T bandage, to close the orifice of the sac, and prevent any further protrusion into it, and at the same time the scrotum should be well supported.

Position in bed.

The patient should then be carried to bed in a horizontal po-

sition, and placed with his shoulders a little elevated, and the thigh, on the same side as the wound, moderately flexed towards the abdomen.

Necessity of the recumbent position.

As it is perfectly necessary that the patient should keep the recumbent position during the cure, a folded sheet must be placed under him, into which he should discharge his stools, otherwise, should he rise to use the night-chair, much mischief may arise from the effort. Mr. Cline had operated upon a patient for strangulated hernia; and some hours after the operation the patient got out of bed to use the night-chair, and from the exertions he made in getting up and in passing his motion, the intestine, which had been reduced, again descended into the sac: Mr. Cline again reduced the intestine, and gave strict orders for the man to keep the recumbent position, and the patient ultimately did well.

Case.

Usually, if the patient be left to himself, he will have some natural stools in a few hours after the operation; but, if several hours elapse without an evacuation, either castor oil or sulphate of magnesia should be given, or a purgative enema, containing colocynth, or castor oil, should be thrown up, and the abdomen should be fomented with spirituous fomentation, which will assist the action of the bowels, and afford much comfort to the patient.

Medicines.

As the safety of the patient depends much upon procuring evacuations from the bowels, the exhibition of opium soon after the operation should, if possible, be avoided; but if the irritability of the stomach continue, or if the patient have a troublesome cough, it should be administered in conjunction with calomel.

Purgatives.

It is not only necessary to procure evacuations from the bowels soon after the operation, but it is extremely desirable to keep up a free action upon them for several days following; as I have frequently known patients die in a few days after the operation with constipation and peritoneal inflammation, although they had passed several stools within twenty-four hours after the strangulation had been relieved.

Sutures removed.

Should the patient go on well, the wound should be dressed on

the third day, and afterwards daily. The sutures may be removed on the fourth and fifth day; but the patient must be kept in bed until the wound is entirely closed.

Operation successful.

When the operation has been performed at an early period after the strangulation has taken place, the patient generally does well; but when much time has elapsed from the strangulation of the hernia before the performance of the operation, dangerous symptoms frequently arise.

Sometimes not.

Sometimes the intestine does not recover its function, when the vomiting and constipation continue, and the patient dies.

Peritoneal inflammation.

Sometimes peritoneal inflammation continues, in which case the abdomen is extremely tender and tense, although the bowels are open, and the life of the patient is soon destroyed. The best means of relieving this inflammation are by local and general bleeding, fomentations, purgatives, and extremely low diet.

Diarrhœa.

Occasionally the patient is attacked with a violent diarrhœa, which continues for many days, producing so great a state of debility as to prevent recovery. In such cases, the treatment I have found most efficacious, consists in exhibiting small doses of opium frequently, and the employment of injections of starch and opium, with a light but nutritious diet, as gruel, or milk, with isinglass, &c.

Hiccough.

In a few instances I have known a troublesome hiccough continue for several days after the operation, but entirely unconnected with gangrene, being the result of peritoneal inflammation.

Case.

The most remarkable example of this kind I ever met with, was in a gentleman at Maidstone, for whom I performed an operation upon a large strangulated intestinal hernia. The symptoms had been unusually severe, and inflammation had taken place in the peritoneum. The abdomen continued tender to pressure for several days after the operation, and the hiccough continued until the sixth day. The patient was bled and purged freely, and he eventually recovered. As this symptom depends upon inflammation of the peritoneum when gangrene has not taken place, the proper means of relieving it are the same as directed for the in-

flammation of this membrane, as local and general bleeding, purgatives, &c.

The operation does not prevent a future protrusion.

The performance of the operation for strangulated hernia does not prevent the future descent of the intestine or omentum, but perhaps renders the patient more liable to its recurrence, as the mouth of the sac is by the operation considerably enlarged. It is, therefore, perfectly necessary before the patient be allowed to get up, or use any exertion, that he should be fitted with a truss, which will effectually prevent any protrusion, by keeping the mouth of the sac closed, otherwise he may in a short time again become the subject of strangulated hernia.

Truss to be again applied.

When the truss is first applied, a dosil of lint should be placed under the pad, to protect the recently healed wound.

Removal of the sac recommended.

In consequence of a radical cure not being produced by the operation I have described, some persons have recommended the removal of the hernial sac by excision or ligature, or that it should be returned into the abdomen.

Case.

In a patient of Mr. Holt's, at Tottenham, I had an excellent opportunity of seeing the effects of removing the sac by excision. A woman who, for several years, had been subject to a femoral hernia, applied to Mr. Holt, on account of the swelling having become so painful and tender as to prevent her from following her ordinary occupations, although the bowels appeared to act very regularly. Mr. Holt requested me to visit the patient with him, and I made many ineffectual attempts to reduce the hernia, and in a few days afterwards I recommended Mr. Holt to operate, as the symptoms had not in the least subsided. On opening the hernial sac, a small portion of intestine was found at the mouth of the sac, inflamed, and adherent to it. Mr. Holt carefully separated the adhesions, and returned the intestine into the abdomen. The sac itself being but little attached to the surrounding parts, I requested Mr. Holt to allow me to remove it, which I did, close to the mouth of the sac. I then closed the orifice by sutures, and the external wound was treated in the usual way. On the sixth day, the ligatures came away, and the wound was closed on the tenth. I saw

this woman a month after the operation, when she had a hernia nearly as large as the one for which the operation had been performed, and at the same spot; she was subsequently obliged to wear a truss constantly, to prevent the protrusion of this hernia.

Removal of the sac not successful.

From this it appears that the removal of the sac will not prevent the re-formation of a hernia, nor do I think, upon reflection, that it scarcely could be expected to do so, as the aperture from the abdomen remains equally large, and the peritoneum alone offers resistance to the formation of another hernia, and this had been insufficient to prevent the protrusion of the first.

Objection to removal of the sac by a ligature.

The removal of the sac by ligature is equally objectionable, even if it could be done without risk, which it hardly could, more especially in oblique inguinal hernia, as the ligature ought, in such cases, to be applied close to the internal ring, which could not be done without a very tedious and hazardous dissection; besides, the spermatic cord is sometimes divided by the sac, which would increase the difficulty and danger of such an operation.

Danger of.

The great danger of this operation is in the inflammation, which is likely to be induced by the action of the ligature upon the peritoneum, and in this inflammation extending to the cavity of the abdomen.

OF LARGE HERNIÆ.

Different operation required.

In very large inguinal herniæ a very different mode of operating is required, to that which I have already described, for the following reasons:—

Difficulty of reducing.

When a large hernia has existed for some time, the cavity of the abdomen becomes diminished, from the habitual loss of a large portion of its natural contents, and such a resistance is offered when any attempt is made to return the contents of the hernial sac, that the intestine sometimes gives way, or is lacerated from the violence employed in attempting to reduce it, and even if it can be returned, the slightest exertion will occasion a further protrusion.

Danger from the taxis.

Also, in large hernia, a considerable extent of protruded intestine being submitted to much violence in the attempt to reduce it, often gives rise to inflammation, which may produce fatal consequences.

Extensive adhesions.

Sometimes extensive adhesions have been formed between the sac and protruded intestine, or the portion of peritoneum which has descended, and is forming part of the sac, may have brought with it a portion of the intestine, to which it is naturally closely connected, as the cœcum, and which thus becomes irreducible: in either case the reduction of the hernia is of course prevented.

Mode of operating.

Instead of performing the same operation, as in other cases, I should, under these circumstances, merely expose the upper part of the hernial sac, and divide the stricture without opening the peritoneum, unless the stricture happened to be seated in the mouth of the sac itself.

Case.

The first time that I had an opportunity of performing the operation in this manner, was upon a patient of Mr. Birch's, in St. Thomas's Hospital. The man was between fifty and sixty years of age, and had been subject to a hernia from his infancy, which, becoming strangulated, and not yielding to the usual measures, rendered an operation necessary. From the size of the hernia, which reached half way to the knees, and its duration, I conceived that such adhesions might have occurred as would render its reduction impossible, and that the ordinary mode of operating would be extremely hazardous, on account of exposing so large a surface of intestine; I therefore determined upon trying what could be effected by a division of the stricture, without opening the hernial sac.

Operation.

I commenced by making an incision, beginning about one inch and a half above the external abdominal ring, and terminating about the same distance below it; this exposed the tendon of the external oblique, and the fascia of the cord. I then carefully made an opening into the latter, large enough to admit a director, which I introduced, and upon it divided the fascia so as to expose the cremaster muscle as far as the external ring; after this I passed

the director between the cremaster and edge of the external ring, and introducing a probed bistoury, I cut through a part of the tendon of the external oblique, so as to enlarge the external ring. On passing my finger into the inguinal canal, to the edge of the transversalis muscle, I felt some further resistance, and again introducing the director, I carefully separated some fibres of this muscle. The contents of the hernial sac were then reduced, and the edges of the wound being approximated, the patient was put to bed.

The wound healed kindly in about three weeks, although the hernia was protruded upon the slightest exertion, which would have occasioned much irritation, had the sac been opened. The patient was subsequently obliged to wear a laced bag truss.

Division of the stricture.

Should the stricture be seated in the neck of the hernial sac itself, of course the division of the parts exterior to it will not relieve the strangulation; in this case the sac must be opened carefully at the upper part only, so as to allow of a division of the stricture.

Care in returning the viscera.

Having divided the stricture, the surgeon must avoid violence in attempting to return the protruded parts, for the reasons I have before mentioned. I have known the intestine ruptured in forcibly endeavouring to effect the reduction after the liberation of the stricture. The case occurred in St. Thomas's Hospital, and terminated fatally. The ruptured intestine is preserved in the collection at that hospital.

Some surgeons object to the division of the stricture without opening the hernial sac, urging that the intestine or omentum may be in a gangrenous state, and that this cannot be ascertained unless the sac be opened; but I should imagine that a very limited experience would enable the surgeon to form an accurate opinion in this respect.

OF HERNIÆ IN THE INGUINAL CANAL.

Appearance.

The oblique hernia is sometimes confined entirely to the in-

guinal canal, and does not emerge through the external ring. It is often difficult to detect in the living subject, as there is no distinct tumour perceptible, but merely a fulness above Poupart's ligament. When strangulated, the usual symptoms are present, and the part is very tender on pressure, or during coughing.

Coverings. This hernia is covered by the superficial fascia, the tendon of the external oblique muscle, by a thin fascia from the edge of the internal ring, and in part by the cremaster muscle, the spermatic cord and the epigastric artery lie posterior to it.

Mistaken. These herniæ, when strangulated, are often mistaken for cases of peritoneal inflammation, as the patient is not conscious of having a swelling; and thus he may fall a victim to the disease, without a suspicion of its true nature.

Case. A patient was admitted into St. Thomas's Hospital with a hernia of this description, strangulated, which was treated as peritoneal inflammation, for five days before the true nature of the complaint was discovered. There was a fulness above Poupart's ligament, which was painful on pressure or during coughing; and on pressing the part, a small tumour appeared at the external ring, which disappeared when the part above was not pressed.

The operation was performed, and a portion of the circumference of one of the small intestines was found strangulated, but not gangrenous. Although the strangulation had existed for so long a period, and the patient had suffered from hiccough, and extreme tenderness of his abdomen, yet he ultimately recovered.

Mode of operating. The mode of operating in these cases is as follows:—The hair having been removed from the part, and the patient being placed in a convenient position, an oblique incision is to be made, commencing at the upper part of the swelling, about midway between the anterior superior spinous process of the ilium and symphysis pubis, and terminating a little above the external abdominal ring. This incision should divide the integument and superficial fascia, and expose the tendon of the external oblique muscle, which is to be carefully cut through in the same direction, when the hernial sac will be seen covered by a very thin fascia, which is given off

from the upper aperture. Part of the cremaster muscle is also found covering the lower part of the sac. The sac is to be opened with the usual precautions, and the stricture, which will be found at the upper orifice, is to be carefully divided upwards, by first passing a small director under it, and then introducing the hernia knife upon the director.

Hernial sac returned.

The return of the hernial sac into the cavity of the abdomen has been recommended in this form of hernia; but it does not appear that any advantage is gained by it, independent, in many cases, of the difficulty of effecting it.

Case.

Mr. Weld, junior, surgeon, at Romford, having occasion to perform an operation upon a woman, on account of the strangulation of a hernia of this kind, after liberating the stricture, returned the sac into the abdomen. The woman recovered, but some time after became the subject of hernia at the same spot, as she would not wear a truss after the operation.

I am indebted to my friend Mr. Thomas Blizard, for the following curious and interesting case of hernia, descending behind the spermatic cord, which had been accompanied with hydrocele, in the tunica vaginalis of the same side.

Case.

The patient had been the subject of hernia on the right side, for six years, for which he had worn a truss; and from his own account a hydrocele had formed on each side, two years previous to his coming under the care of Mr. Blizard; but that on the right side had gradually disappeared, leaving the testis wasted and drawn up to the groin.

The hernia becoming strangulated, and not yielding to the usual means employed for reducing it, Mr. Blizard performed the operation about twenty-four hours after the commencement of the symptoms. Having laid bare what he thought was the hernial sac, he punctured it, and then freely opened it upon the director. It extended through the external ring, into the inguinal canal, which Mr. Blizard in part cut open, in order to make the necessary examination of what he conceived to be the hernial sac; this, how-

ever, proved to be the tunica vaginalis, which had formerly bee distended by the hydrocele, having the hernia seated behind it The posterior part of this tunic was then cut through, exposin the hernial sac, which was found to contain a portion of intestin nearly of a black colour, from strangulation. The stricture whic was seated at the mouth of the sac was divided in the usual man ner, and the intestine returned. The patient did well. Mr Henry Cline had occasion to operate upon a similar case.

OF DIRECT INGUINAL HERNIA.

Sometimes a hernia protrudes nearer to the pubes than that have just described, descending from the abdomen immediatel behind the external abdominal ring, and having the epigastric ar tery situated on its outer side.

First observed by Mr. Cline.

Mr. Cline first observed this species of hernia, in opening th body of a Chelsea pensioner, with Mr. Adair Hawkins, on the 6t of May, 1777. The hernia was on the right side, and the mouth of the hernial sac was situated an inch and a half on the inner sid of the epigastric artery. I have myself witnessed several cases o this description.

Course of.

I have carefully dissected this hernia, and found that it passe on the inner side of the epigastric artery, and protruded throug the external abdominal ring, under the fascia of the cord, pushin the spermatic cord to the outer and upper part of the tumor. traced a covering upon it, formed in part by the tendon of th transversalis muscle, and in part by the fascia transversalis; be neath which is situated the hernial sac. The coverings of thi hernia are, therefore, the integument, the fascia of the cord, a part of the cremaster crossing obliquely the outer part of th swelling, then the fascia and tendon of the transversalis.

Differs from the oblique hernia.

It differs from the oblique inguinal hernia in not taking th course of the inguinal canal, but in protruding directly through th external ring, and having the epigastric artery to its outer side

and in having but an imperfect covering from the cremaster, and a perfect one from the fascia transversalis and tendon of the transversalis united.

Distinguishing marks.

The distinguishing marks between the direct and oblique inguinal hernia, are the situation of the spermatic cord, and the direction of the tumour; in the first, the spermatic cord is on the outer and upper part of the swelling, and the swelling may be traced in a direction towards the umbilicus:—in the latter, the spermatic cord is situated behind the hernia, and the inclination of the tumour is towards the spine of the ilium.

Causes.

The direct inguinal hernia may be produced suddenly from a laceration of the tendon of the transversalis, in which case the covering from this tendon will be found wanting.

Case.

A gentleman applied to me, having a direct inguinal hernia, which had appeared immediately after he had been thrown from his horse, and had fallen with the lower part of the abdomen upon a post, by which accident I imagine the tendon of the transversalis might have been ruptured.

Seldom becomes large.

I have never seen this hernia acquire the size of the common inguinal hernia, and in most of the cases I have witnessed, the patients have had some disease of the urethra.

Case in which six herniæ existed.

In a patient of Mr. Weston's, of Shoreditch, who had for a long time laboured under difficulty in passing his urine, I found six herniæ of this description, of which I have given a plate. I also found several strictures in his urethra, and a stone lodged behind one of them.

TREATMENT OF DIRECT INGUINAL HERNIA.

Truss.

When reducible, the truss employed should be longer than that applied for common inguinal hernia, as the part at which the hernia quits the abdomen is an inch and a half nearer to the pubes. The pad of the truss should not rest on the pubes, but press principally a little above the abdominal ring, otherwise the general form of the truss may be the same.

When irreducible.

If the hernia be irreducible, the means recommended for the oblique irreducible hernia will be proper.

When strangulated, taxis.

When strangulated, the reduction must be attempted in a different direction to that required for the oblique. The tumour is to be grasped as in the oblique hernia, with one hand, while the fingers and thumb of the other hand are to be placed over the abdominal ring, to knead the neck of the swelling, and the pressure must be directed upwards and inwards, instead of upwards and outwards.

Case.

In this manner I quickly succeeded in reducing a direct hernia which had become strangulated, in a patient who was admitted into Guy's Hospital, for some other complaints. The hernia was small, it had the cord to its outer side, and could not be traced higher than the abdominal ring.

Hernia apparently reduced.

This hernia may apparently be reduced by the employment of the taxis, and strangulation still exist; a case of this kind occurred a short time ago at Guy's Hospital. A man applied at the surgery, having a direct hernia strangulated, and the taxis was had recourse to, by which the gentleman in attendance thought he had succeeded in reducing the hernia, as he had pushed it through the abdominal ring. The symptoms of strangulation, however, still continued, and in two or three days the man died. On examination of his body, the hernia was found placed immediately behind the external ring, with a stricture still existing at the mouth of the sac.

Caution in operating.

If the operation for this variety of hernia be performed in the manner usually advised in bubonocele, that is, by dilating the hernial sac and stricture upwards and outwards, the epigastric artery will certainly be divided. It has therefore been recommended to alter the direction of the incision, and to make it upwards and *inwards*, to avoid the epigastric artery; and, if the surgeon is certain as to the species of hernia, that is the safest plan. But if, in some instances, the operator is directed to make the incision in one way, and in others precisely the reverse, there will always be reason to fear some mistakes in practice, which would

be attended with the most serious consequences; such mistakes, it is true, would hardly occur to a surgeon constantly in the habit of dissection, but to the greater number the distinguishing marks of the two species will not be sufficiently discriminative. It is therefore desirable to point out such a mode of operating as would ensure the safety of the patient, of whatever kind the hernia may be. Such are the advantages possessed by the method of making the division directly upwards, opposite to the middle of the hernial sac, for in this direction the epigastric artery is certainly avoided.

The operation, therefore, is to be performed in the following manner: the surgeon first makes an incision through the integuments, along the middle of the tumour, from its upper to its lower part, following the longitudinal direction of the tumour; so that if it has any inclination inwards towards the umbilicus, the incision should incline the same way. The fascia being exposed, is divided over the surface of the tumour from the abdominal ring down to its lower extremity. The hernial sac which now comes in view, is then opened, from an inch below the ring down to the lower part of the sac, in the same cautious manner as has been formerly described. The surgeon then passes his finger into the sac, and feels for the stricture; if at the abdominal ring, he introduces the blunt sharp pointed bistoury between the sac and the ring, slitting the latter directly upwards, till the aperture is large enough to allow of the return of the parts; if the stricture is above the ring, he follows it with the knife still in the same direction, and anterior to it, opposite the middle of the mouth of the sac, till the dilatation is sufficient to allow his finger to slip into the cavity of the abdomen; after which the hernia is to be pushed up, or, if not in a fit state for that purpose, to be treated as mentioned in a former chapter. The parts anterior to the sac above the ring, and divided by the knife, are the tendons of the transverse and internal oblique muscles. If the stricture is within the sac, still the same direction is to be preserved, but the knife must then be passed into the sac itself.

In this way the epigastric artery will, with certainty, be avoided;

which it cannot be if the division of the stricture is made outwards, and in the common hernia it will be divided by dilating inwards.

Some, however, have doubted the possibility of the epigastric artery ever being divided, whatever may have been the direction of the incision; and in support of this opinion, they adduce the great number of operations which have been performed by various practitioners, without the occurrence of this accident. However, this artery may actually have been divided, and produced the patient's death, by pouring its contents into the cavity of the abdomen, without the surgeon being aware of the mischief which his knife has occasioned; and even when the accident has been known by him to have happened, the circumstance has been concealed from the public.

OF INGUINAL HERNIA IN THE FEMALE.

Structure of parts.

The structure of the inguinal canal in the female is very much the same as that which I have described in the male, only that the round ligament in the former takes the place of the spermatic cord existing in the latter.

Round ligament.

The round ligament, which commences at the fundus uteri, passes from the abdomen midway between the anterior superior spinous process of the ilium to the outer side of the epigastric artery, above Poupart's ligament, and below the transversalis and internal oblique muscles, as the spermatic cord in the male; it takes a course obliquely downwards, and inwards to the external abdominal ring, through which it passes, and is lost upon the pubes.

This round ligament, however, being much smaller than the spermatic cord of the male, passes through openings corresponding to its size, which are consequently much less than those for the spermatic cord, and on this account the formation of inguinal hernia in the female is of comparatively rare occurrence.

Course of the hernia

When this hernia does occur in the female, it takes the course

of the round ligament, is at first confined to the inguinal canal, where it is covered by the tendon of the external oblique, and subsequently it protrudes through the external ring, and forms a swelling at the upper part of the labium, which seldom acquires a large size; here it is covered by a superficial fascia given off from the tendon of the external oblique.

Causes.

It is produced by the same causes in the female as in the male, and presents the same symptoms. The sac usually contains either intestine or omentum, or both, but sometimes the appendages of the uterus are found in it.

Less liable to mistake than in the male.

As the round ligament in the female is not liable to the same affections as the spermatic cord of the male, the hernia in the former case is not likely to be confounded as it frequently is in the latter case with such diseases. I have, however, known this form of hernia in the female mistaken for a femoral hernia, which may readily be imagined when we recollect the proximity of the parts concerned.

How distinguished from femoral.

A careful examination will readily enable the surgeon to distinguish between the two, as in the inguinal the neck of the tumour is above Poupart's ligament, and in the femoral below; in the former, also, the spinous process of the pubes can be readily felt outside the swelling, which it cannot be in the latter.

Reducible.

When this hernia can be reduced, a truss, similar to that necessary for a male, is to be employed.

Irreducible.

When irreducible, the same treatment as recommended for the male will be proper. If intestinal and small, a truss with a hollow pad; if omental, a common pad; and when the hernia is very large, a T bandage, to give support and prevent increase.

Strangulated.

Should this hernia become strangulated, the taxis should be first employed in the same way as in the other sex; and should this not succeed, bleeding, the warm bath, ice, the tobacco enema, or other means to assist reduction, should be had recourse to.

The usual means having failed to relieve the strangulation, an operation becomes necessary, which should be performed in the following manner.

Operation. The hair having been removed from the surface of the tumour, and the patient being placed in the same position that I directed the male should be under similar circumstances, the surgeon should make an incision through the integument, commencing a little above the external abdominal ring, and terminating at the lower part of the swelling. This exposes the fascia covering the hernial sac, which should next be carefully divided to the extent of the first incision. The sac, being thus laid bare, should first be cautiously punctured as before mentioned, and then should be further opened upon the director.

The portion of the hernial sac below the external abdominal ring may perhaps contain only a quantity of the dark serum usually found; in which case the operator must introduce his finger into that part of the sac which is in the inguinal canal, and there he will feel the portion of intestine or omentum which is strangulated. He should then slit up the canal and sac towards the anterior superior spinous process of the ilium, so as to expose the strangulated parts; and, ascertaining the seat of stricture, he should pass a small director under it, and carrying the hernia knife upon the director, the stricture should be divided upwards, or upwards and outwards, after which the protruded parts are to be returned, if they be not in a state of gangrene.

The last case of inguinal hernia in the female, in which I had an opportunity of witnessing the operation, was under the care of Mr. Forster, in Guy's Hospital.

Case. Upon opening the sac below the external ring, a quantity of fluid escaped, but there was not any appearance of intestine or omentum. However, upon passing the finger into the sac, through the external ring, a portion of intestine could be distinctly felt, which Mr. Forster subsequently exposed, by slitting up the inguinal canal. The stricture, which was seated at the internal ring, was divided upon a director in the usual manner, and the patient did extremely well.

After-treatment. The after-treatment does not differ from that I have directed for the other sex.

When the inguinal hernia in the female has not descended through the external ring, it may become strangulated, and occasion fatal consequences, as in the male, without its existence having been recognised during the life of the patient. In the inguinal canal.

A patient was admitted into St. Thomas's Hospital, under the care of Sir Gilbert Blane, with symptoms of strangulated hernia; but upon being closely questioned by Sir Gilbert, she denied the existence of any tumour at the groin, navel, or elsewhere, and the case was consequently treated as one of inflammation. The woman died; and Sir Gilbert, supposing that some concealed hernia might have been the cause of her death, inspected the body, and found a small strangulated inguinal hernia on the right side, which did not protrude an inch from the internal ring. Case.

When necessary, the operation in this case is similar to that required for the same disease in the male. Operation.

I have never seen direct inguinal hernia in the female.

OF CONGENITAL HERNIA.

In this hernia the protruded parts have not any proper peritoneal sac, as the common inguinal hernia, but are contained in the tunica vaginalis of the testicle. All herniæ seated in this cavity are not, however, congenital, as such protrusion may occur at the adult period for the first time. No proper sac.

This hernia is originating from the descent of the testicle in the fœtus. Usually about the seventh month, the testicles, which are up to that period seated upon the loins, begin to descend into the scrotum. At this time, a strong ligament is found connected with the inferior part of the testis and epididimis, and passing to the scrotum in the same direction as the spermatic cord is afterwards placed; it is called the gubernaculum, and appears to guide the testicle into the situation provided for it. Origin.

The testicle and its vessels are covered by peritoneum, except just where the latter enter at the posterior part of the former.

In its descent, the testicle takes with it a portion of peritoneum, Descent of the testicle.

which afterwards becomes the tunica vaginalis; and it is usually found in the scrotum at the ninth month; but there is considerable variety as to the period when the descent is complete, sometimes being earlier or later than the ninth month, sometimes one testicle comes down first, and the other does not descend until some time afterwards. In some cases, the testicles never quit the abdomen, and in others they only descend to the groin.

When the testicle has reached the scrotum, the opening through which it quitted the abdomen generally closes, but at what period is not precisely ascertained. If, however, it should remain open at the time of birth, the efforts of the child in breathing or crying cause the protrusion of a small portion of intestine into the cavity, and thus the congenital hernia is formed.

Called the windy rupture.

From its appearance and feel, more particularly when the child cries, the nurses call it the windy rupture, in opposition to the term watery rupture, which they apply to an hydrocele, when it occurs in the infant, and this is not very unfrequent.

Sometimes occurs at the adult period.

I have found the tunica vaginalis sufficiently open at the adult period to admit the introduction of a female catheter; and I have known hernia, similar to the true congenital form, occur in persons between twenty and thirty years of age. In these cases I imagine the opening at first to have been so small as not to admit the descent of a hernia under ordinary circumstances, but that when the patients have been under the necessity of doing very laborious work, or during a state of great relaxation, the protrusion has taken place.

Course.

The congenital hernia must necessarily take the course of the spermatic cord, passing in the same direction as an oblique inguinal hernia, from which it is to be distinguished by the following marks. In common oblique inguinal hernia, the testicle is perfectly distinct from the hernial sac; whereas, in the congenital disease, the testicle is confounded with the sac. In the latter case, also, the appearance of the part very much resembles that of a hydrocele; more especially if, as sometimes happens, a quantity of fluid descends into the sac with the intestine or omentum, which,

upon a close inspection, gives a transparent appearance to the swelling. To distinguish these joint diseases, the contents of the hernia should be returned into the cavity of the abdomen whilst the patient is in a recumbent posture; after this, a moderate pressure is to be made against the abdominal ring, with the finger, so as to prevent the descent of the intestine or omentum; if the patient then assume the erect position, the water will escape into the tunica vaginalis, but the intestine or omentum will be felt pressing against the finger above.

Sometimes the testicle does not descend to the bottom of the scrotum, and then, if a congenital hernia form, the tunica vaginalis becomes elongated, and reaches considerably below the situation of the testicle.

Division of the cord.

In the congenital form of hernia, also, the cord is occasionally divided, the artery and vein being on one side, and the vas deferens taking its course on the other side.

Reducible.

When the congenital hernia is reducible, it requires the use of a truss, as the common inguinal hernia, provided that the testicle has completely descended into the scrotum, or does not rest at the groin. For the first three months, perhaps a pad and bandage may be sufficient to prevent the descent of the hernia; but after this period a truss with a spring may be employed with safety, or even at a younger period if necessary.

Testicle in the groin.

If the testicle be seated in the groin, a truss cannot be worn without risk of injuring the gland, and it is better to allow of such a protrusion as will assist the complete descent of the testicle, before any truss or other means of suppressing the hernia be resorted to.

Case.

A young man who now holds a situation of importance, and who is the father of several children, was brought to me formerly by his father, on account of his having a congenital hernia; but because the descent of the testicle on the same side was incomplete, I directed that the protrusion should not be retarded. The testicle afterwards descended into the scrotum, a truss was then applied for the hernia, and the disease was ultimately subdued.

Closure of the tunic.

After the truss has been worn for some time, the tunica vaginalis becomes closed at the upper part, and near the testicle, but sometimes remains open between, allowing a space for the deposit of fluid which occasionally takes place, forming hydrocele of the cord, and for the cure of which I have had to perform an operation on several occasions.

Irreducible.

With regard to the treatment of this hernia in the irreducible state, the same as directed for common inguinal hernia, is here applicable; and when strangulated, the same means as recommended in the latter case, should be employed for the relief of the patient.

Operation.

When an operation is required, it should differ from that described as necessary for common oblique inguinal hernia, in the following particular. Having laid bare the tunica vaginalis, it should not be opened low down on account of exposing the testicle, but a sufficient quantity of the tunic should be left whole to cover this gland.

Large quantity of fluid.

On opening the tunica vaginalis, a much larger quantity of fluid generally escapes than is found in the sac of a common inguinal hernia.

Seat of stricture.

The seat of stricture will be generally found under the edge of the transversalis muscle, or at the internal ring, when it should be divided in the same manner as in other cases of hernia; after which, the protruded parts, if not adherent, should be returned. If extensively adherent, the stricture should be divided in the same way, but the surgeon should not attempt to separate the adhesions, unless very few and slight, in order to allow of the return of the parts; but they should be left; and after the wound has healed, a bag truss will be required, as for other irreducible scrotal herniæ.

In operating for this form of hernia, the testicle is sometimes found in the inguinal canal in contact with the intestine; in which case the intestine only should be returned into the abdomen, the testicle being left in the canal. The stricture in this case is at the orifice of the tunica vaginalis.

PLATE VI.

Fig. 1.

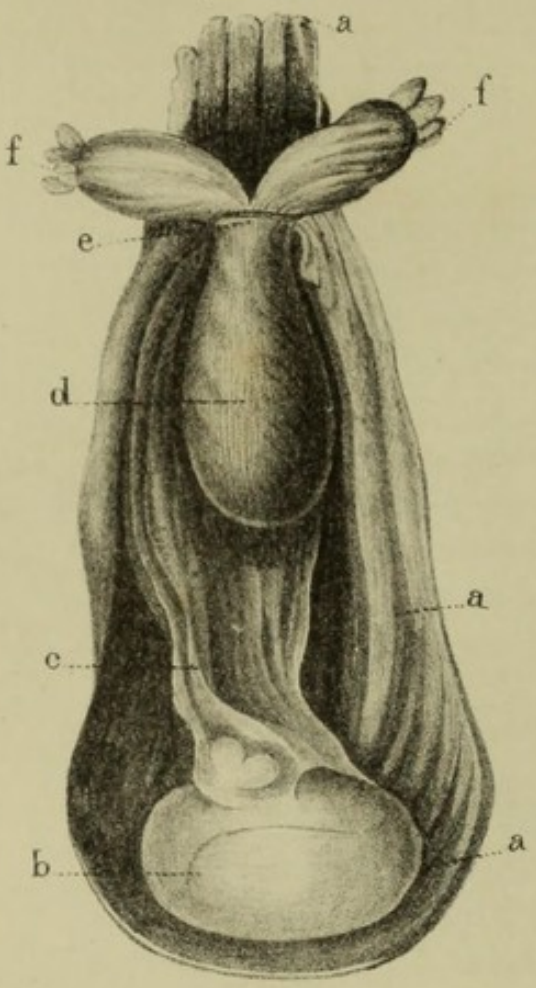


Fig. 2.

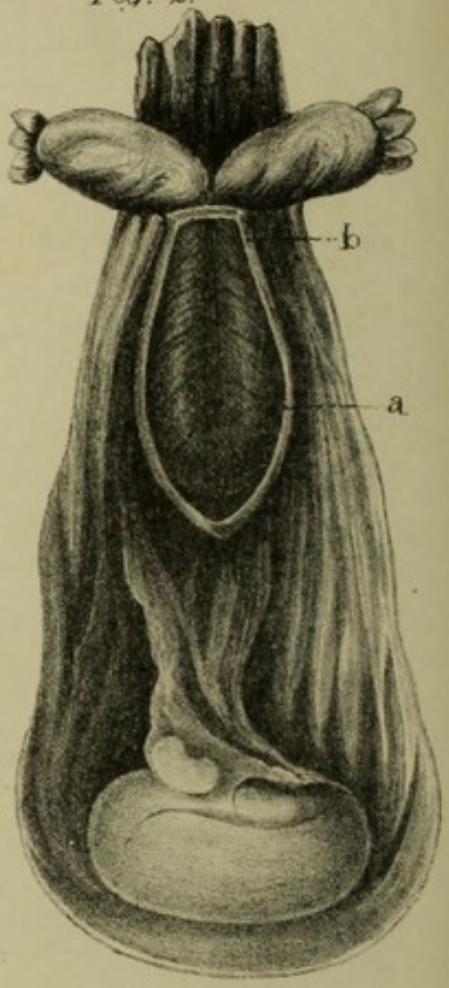


Fig. 3.

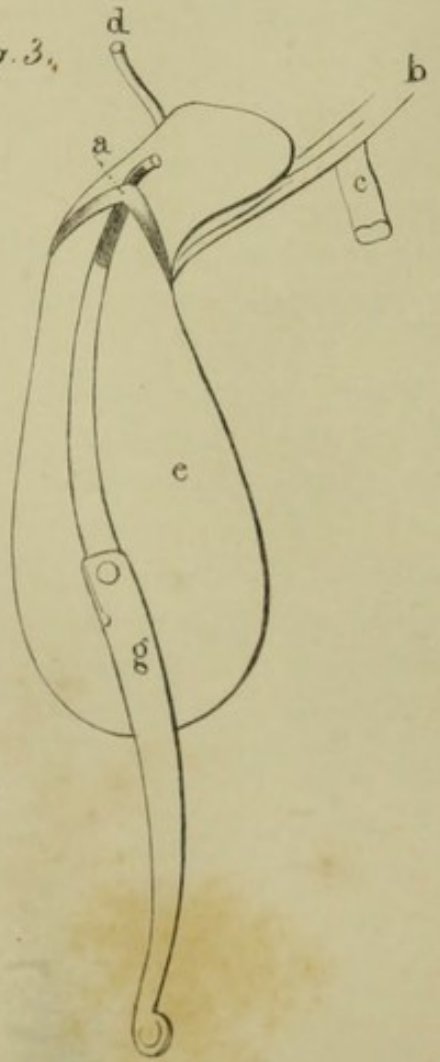


Fig. 4.

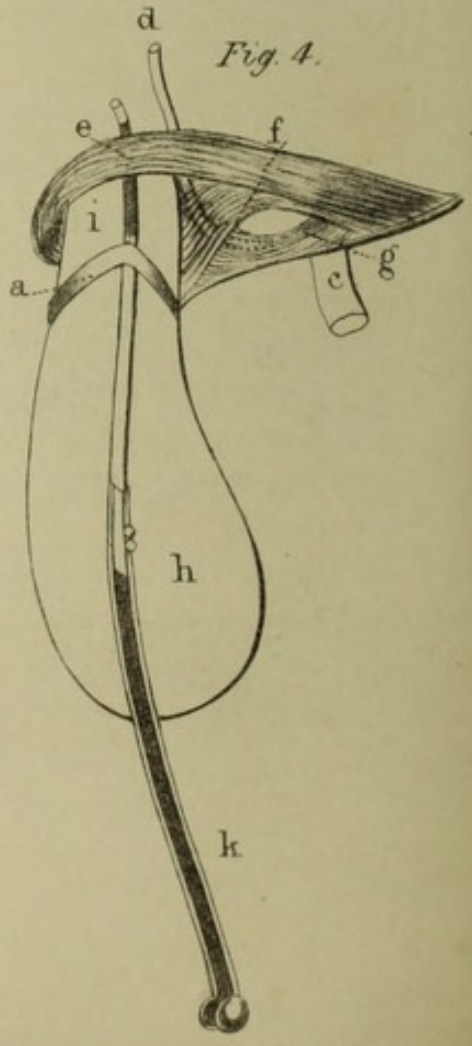


PLATE VI.

Different views of preparations of inguinal herniæ, intended to shew the mode of operating on each variety.

Fig. 1. *a a a*, Tunica vaginalis.
b, Testis.
c, Spermatic cord.
d, Hernial sac within the tunica vaginalis.
e, Mouth of the sac, which has been produced by an adhesion of the tunica vaginalis, opposite the abdominal ring.
f f, Intestine.

Fig. 2. *a*, Strangulated intestine, the sac cut open.
b, The adhesions of the tunica vaginalis to the mouth of the sac.

Fig. 3. Common inguinal hernia.
a, Abdominal ring.
b, Poupart's ligament.
c, Femoral artery.
d, Epigastric artery.
e, Hernial sac below the ring.
f, Hernial sac above the ring.
g, The sharp part of the knife introduced between the ring and the sac, with its side towards the sac; its edge is to be turned forward to divide the ring.

Fig. 4. Hernia on the inner side of the epigastric artery.
a, Abdominal ring.
b, Poupart's ligament.
c, Femoral artery.
d, Epigastric artery.
e, Internal oblique and transverse muscles passing over the sac.
f, Tendon of the transversalis muscle passing under it.
g, Fascia from Poupart's ligament, the cord being removed to shew the opening by which it passes.

h, Hernial sac above the ring.

k, Knife introduced indicating the manner of dilating the stricture, that is forwards and upwards, opposite to the middle of the mouth of the hernial sac, in all the varieties of inguinal hernia, excepting when the spermatic cord is on the anterior part of the mouth of the sac, then the division should be made outwards.

OF ENCYSTED HERNIA OF THE TUNICA VAGINALIS.

This is a particular species of hernia, which occurs in the following manner. The tunica vaginalis becomes closed, by adhesion, opposite the abdominal ring, but remains open above and below it; and when a protrusion of intestine occurs, this adherent portion of the tunic becomes elongated, forming a distinct hernial sac within the proper tunica vaginalis. How formed.

I had an opportunity of witnessing the following case, under the care of Mr. Forster, in Guy's Hospital. A man was admitted into the house with symptoms of strangulated hernia, which the usual means failed to relieve, and the operation was proposed and urged; but the patient would not submit, choosing rather to die. On examining his body after death, a sac was found within the tunica vaginalis, descending from the abdominal ring towards the testicle. This sac contained a portion of one of the small intestines which had become gangrenous. The stricture was at the mouth of the sac. Case.

In operating upon a case of this kind, the tunica vaginalis should be opened freely, to expose the sac, otherwise some difficulty may arise. Operation.

Mr. Hey, in his surgical observations, has related a case similar to that of Mr. Forster.

LECTURE XLV.

ON CRURAL HERNIA.

When a femoral hernia commences, the patient's attention is first directed to the part on account of experiencing pain on suddenly straightening the limb, as in rising from a sitting posture. Commencement of the hernia.

This is occasioned by the extension of the fascia lata, and its pressing on the protruded parts.

Appearance of the hernia.

On examining the seat of pain, a fulness is discovered at the upper and inner part of the femoral sheath, which disappears on pressure, or when the patient is recumbent. This fulness soon increases, so as to form a tumour about the size of a small walnut, which is situated immediately below Poupart's ligament, to the inner side of the femoral vessels, and to the outside of the spine of the pubes. As the swelling enlarges, it projects more forwards and upwards, turning over Poupart's ligament, as it meets with the least resistance in this direction.

Like an enlarged gland.

When the tumour is small, from its situation and circumscribed feel, it has much the character of an enlarged inguinal gland.

Direction of the hernia.

The direction of this hernia is at first a little downwards in the femoral sheath, then obliquely inwards and forwards, and lastly upwards; sometimes, however, instead of turning up over Poupart's ligament, it takes a course downwards, in the direction of the saphena major vein; but this very rarely happens.

Dissection of the hernia.

On dissecting a femoral hernia, the following appearances present themselves. On cutting through the integument, the fascia superficialis is exposed; this, in its natural state, is thin and delicate; but frequently, when hernia exists, the fascia becomes dense and tough from pressure. Under this fascia a portion of the sheath of the femoral vessels is found, which closely envelopes the hernial sac itself; it is that portion which is perforated for the entrance of absorbent vessels.

Fascia propria.

This covering I first became acquainted with in examining a patient in St. Thomas's Hospital, in the year 1800, and have since invariably found it when operating for this form of hernia. It may be termed the fascia propria of the hernia.

Beneath this covering, and between it and the sac itself, there is generally some adipose matter situated, on separating which the sac is laid bare. This layer of adipose matter I have known to be mistaken for omentum.

PLATE VII

Fig. 1.

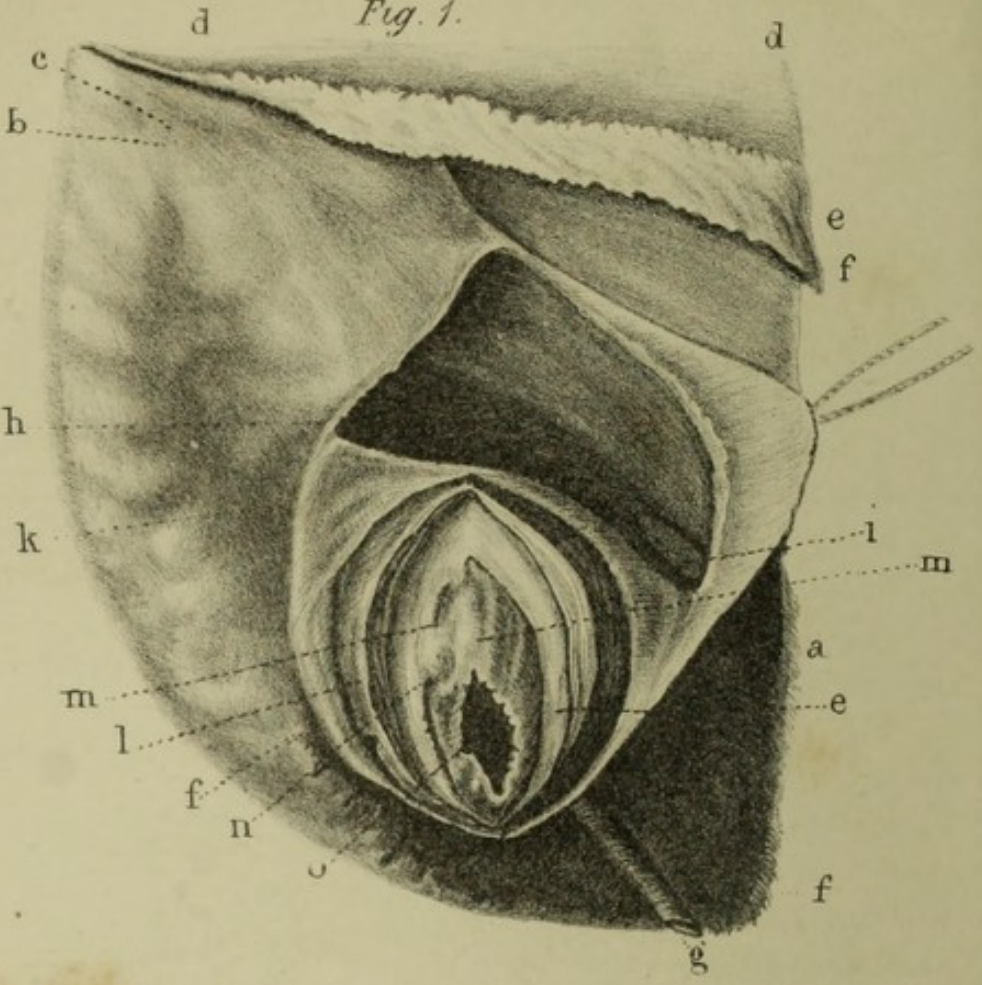


Fig. 2.

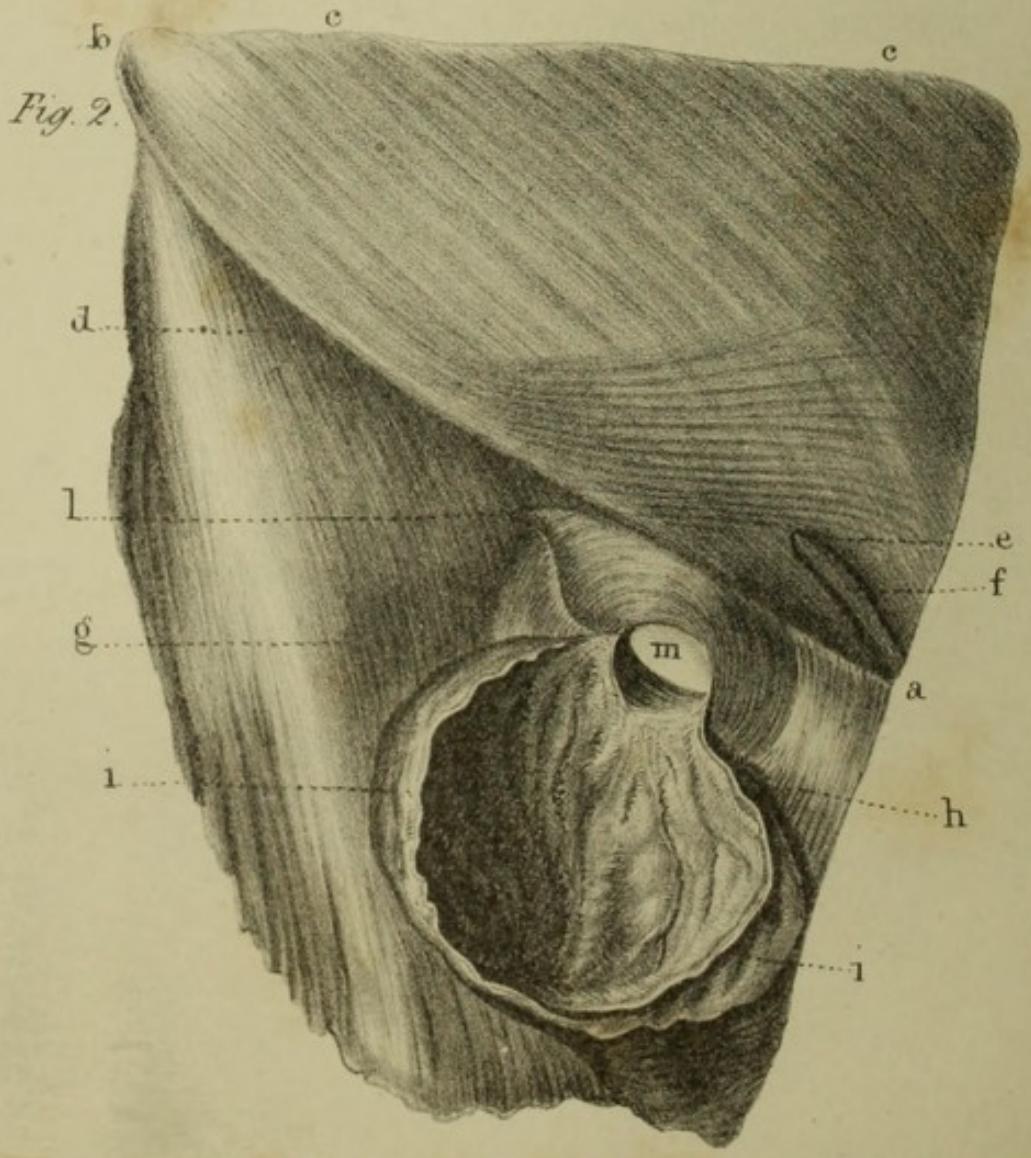


PLATE VII.

Different views of crural hernia in the female.

Fig. 1. First dissection of crural hernia.

a, Symphysis pubis.

b, Spinous process of the ilium.

c, Situation of the crural arch, or Poupart's ligament.

d d, Tendon of the external oblique muscle.

e, Superficial fascia raised from the external oblique muscle.

f f f, Superficial fascia.

g, Saphena major vein, the superficial fascia being cut away to shew it.

h, A part of the superficial fascia attached to the crural arch.

i, Abdominal ring and round ligament passing through it.

k, Superficial fascia raised from the hernia.

l l, Fascia propria raised from the hernial sac.

m m, Hernial sac.

n, Omentum within the sac.

o, Intestine within the sac.

Fig. 2. Shews the origin and appearance of the fascia propria.

a, Seat of symphysis pubis.

b, Spinous process of the ilium.

c c, Abdominal muscles.

d, Crural arch.

e, Abdominal ring.

f, Ligamentum rotundum uteri.

g, Fascia ata.

h, Portion of the fascia lata over the pectineus muscle.

i i, Fascia propria, or protruded crural sheath, which covered the hernial sac.

k, Attachment of the fascia propria to the sheath of the femoral vessels.

l, A portion of the sheath covering the crural vessels, exposed by removing the semilunar edge of the fascia lata.

m, The opening in the sheath, through which the hernia had descended, above which is seen a dotted line, which marks the seat of the anterior stricture, and which is the part generally required to be divided.

The form of the sac in crural hernia differs from that of the inguinal; the shape of the latter is pyriform, but the fundus of the crural bears a very large proportion to its orifice, and the form of the sac, when inflated and dried, is generally that of the following outline.

The orifice of the sac is surrounded by a fascia or cellular membrane, much condensed by an adhesive process which forms with the fascia below a complete bag, out of which the hernia may be drawn and the bag left behind perfect. Between the orifice of the hernial sac and the tuberosity of the pubes is situated the insertion of the external oblique muscle into the linea ileo pectinea, and ligament of the pubes. Behind it, is the os pubis, covered by its ligament and fascia iliaca; anterior to it, is the beginning of the posterior edge of the crural arch; and below this, the lunated edge of the fascia lata, and part of the crural sheath; and on its outer side is a thin process of fascia, which passes between it and the iliac vein. Indeed, it is according to the size of the hernia that there is more or less remaining of the original fascia, which extends from the insertion of the external oblique to the iliac vein. If the hernia is small, a process of this fascia remains round the orifice of the sac; but if it is large, the orifice occupies the whole space between the insertion of the external oblique and the crural vein, excepting that a thin portion of fascia still remains between the vein and the sac. This vein runs on the outer side of the hernial sac, about half an inch from the centre of its orifice, and half an inch beyond the vein; and exterior to it is the centre of the external iliac artery; the epigastric artery arises from the external iliac, about three quarters of an inch from the centre of the sac, and as it passes forwards and upwards, it approaches this point about a quarter of an inch nearer. The general distances of the different parts are as follows.

MALE.

From the symphysis pubis to the centre of the orifice of the sac, two inches.

From the centre of the orifice of the sac to the external iliac artery, one inch.

From the centre of the orifice of the sac to the centre of the external iliac vein, half an inch.

From the centre of the orifice of the sac to the origin of the epigastric artery, three-fourths of an inch.

From the centre of the orifice of the sac to the inner edge of the internal abdominal ring, one inch.

From the tuberosity of the pubes to the centre of the orifice of the crural hernia, one inch.

FEMALE.

Each measurement is from one-eighth to one fourth of an inch more, where the female pubis is large and well formed, than in the male.

The spermatic cord of the male, and the round ligament of the uterus in the female, pass about half an inch anterior to the mouth of the hernial sac, being first situated to the outer side, and afterwards crossing its fore part.

When the opening through which the hernial sac has passed is examined anteriorly, it will be found that the sac, after descending a little way into the crural sheath, turns inward and protrudes the inner part of this sheath where the absorbent vessels pass. The hernial sac is here placed between two columns of fascia of the crural ring sheath; the one proceeds from the anterior part of the insertion of the external oblique muscle into the pubes, is reflected behind the crural vein, and passes over the neck of the sac: the other arises from the point of insertion of the external oblique into the linea ileo-pectinea and ligament of the pubes, is continued behind the neck of the sac, and is at last undistinguishably blended both with the fascia that covers the crural vein, and with that part of the fascia which passes over the pectineus muscle.

The same general symptoms characterize crural as inguinal hernia; it appears in the erect, and disappears in the recumbent

posture; it dilates when the patient coughs, is elastic and uniform to the touch when it contains intestine, and gives a gurgling noise when it returns into the abdomen. When it contains omentum, the surface is less equal, it feels doughy, and gives no particular sound when it returns into the abdominal cavity.

Mistaken for other diseases.

The femoral hernia is much less likely to be confounded with other diseases than the inguinal, on account of the much more frequent formation of various tumours in the situation of the latter; but still there are some diseases which I have known to be mistaken for femoral hernia, and in the discrimination of which much care is requisite.

Enlarged gland.

In several instances, an enlarged gland in the groin has been mistaken for a femoral hernia; and, on the contrary, the hernia has been treated as an enlarged and suppurating gland; but such mistakes must arise from inattention to the previous history of the case.

Case.

Some years ago, a man was admitted into Guy's Hospital with a strangulated hernia, over which a poultice had been applied for three days before his admission, under the supposition that it was a bubo. The operation was performed, and the intestine found gangrenous.

Case.

Mr. Bethune, surgeon, at Westerham, in Kent, assured me, that he saw a patient who had been the subject of a strangulated femoral hernia, which had been poulticed for some days, and at length opened, when air and feculent matter escaped, and the patient died ten days after.

Hernia and enlarged gland.

When a femoral hernia and enlarged gland exist at the same time, an attentive and minute examination is sometimes requisite to ascertain the existence of the former.

Case.

I once saw a lady with Mr. Owen, surgeon to the Universal Dispensary, who had suffered from symptoms of strangulated hernia for nine days, and had been treated for inflammation of the intestines, as she had not mentioned the existence of a swelling in her groin. Mr. Owen discovered this swelling, and in consequence requested me to visit the patient, at the same time inform-

ing me, that the tumour had not the feel of a hernia, but that he supposed it must be one from the symptoms. Upon examining the part, I found an enlarged gland, about the size of a walnut, very hard, and movable; but beneath this gland, and separate from it, was an elastic tumour, which I succeeded in reducing by the employment of the taxis; and this relieved the patient from all the symptoms of strangulation.

Psoas abscess.

Some of the symptoms attending psoas abscess resemble those of a femoral hernia, and might lead to mistake. Psoas abscess makes its appearance in the groin, in the same situation as a femoral hernia; it dilates when the patient coughs, and is less apparent when the person is in a recumbent posture than when he is erect. It may, however, be readily distinguished from hernia by the pain in the loins which precedes the appearance of the swelling, by the general constitutional derangement attending it, by its more rapid increase, and by the absence of intestinal derangement.

Inguinal hernia.

The error of most consequence respecting femoral hernia, is, that of mistaking it for inguinal hernia. Danger arises under such circumstances, from the operation of the taxis, the direction to make pressure in the femoral being quite different from that proper in the inguinal; but the most serious mischief is likely to arise, if an operation be necessary, in the division of the stricture.

Case.

I was once sent for to operate on a patient for a strangulated inguinal hernia, which, on examination, I found to be femoral, and succeeded in reducing it, by making the pressure in the proper direction; and I have known operations performed as for inguinal hernia, when the disease has been femoral. These mistakes arise from the femoral protrusion turning up over the crural arch or Poupart's ligament; and much attention is often requisite in making an examination, before the surgeon can confidently decide on the true nature of the disease. The best marks of distinction which I have observed, are, that the neck of the femoral hernia is below and to the outer side of the spine of the pubes, while that

of the inguinal hernia is above the spine; also, by drawing down a femoral hernia, Poupart's ligament may be traced above it, which it cannot be if the disease be inguinal.

Varicose vein.

I have seen a case of enlargement of the femoral vein, which had somewhat the appearance of a femoral hernia, but it was readily detected, by pressing on the iliac vein above, while the patient was recumbent, when the tumour immediately appeared.

This hernia most frequent on the right side.

Femoral hernia is most frequent upon the right side, probably on account of most persons employing that side in the greatest degree.

Mothers liable to it.

Women who have borne many children are more liable to this disease than others, which arises from the extension of the abdominal parietes during gestation, causing a more relaxed state of the parts; also, old persons are more frequently troubled with this disease than the young.

Most frequently intestinal.

Most frequently the protruded part in femoral hernia is small intestine, very rarely only omentum, but occasionally both intestine and omentum. I have seen the cœcum in a femoral hernia on the right side, and the ovaria have also been found in the hernial sac.

Causes.

The femoral hernia is produced by the same causes as occasion the formation of inguinal hernia, except that I do not recollect a single instance in which this disease has been originated by a blow.

EXPLANATION OF PLATE X.

Fig. 1. First dissection of crural hernia.

a. Symphysis pubis.

b. Spinous process of the ilium.

c. Situation of the crural arch, or Poupart's ligament.

d d. Tendon of the external oblique muscle.

e. Superficial fascia raised from the external oblique muscle.

fff. Superficial fascia.

g. Saphena major vein, the superficial fascia being cut away to shew it.

h. A part of the superficial fascia attached to the crural arch.

i. Abdominal ring and round ligament passing through it.

k. Superficial fascia raised from the hernia.

l l. Fascia propria raised from the hernial sac.

m m. Hernial sac.

n. Omentum within the sac.

o. Intestine within the sac.

Fig. 2. Shews the origin and appearance of the fascia propria.

a. Seat of symphysis pubis.

b. Spinous process of the ilium.

c c. Abdominal muscles.

d. Crural arch.

e. Abdominal ring.

f. Ligamentum rotundum uteri.

g. Fascia lata.

h. Portion of the fascia lata over the pectineus muscle.

i i. Fascia propria, or protruded crural sheath, which covered the hernial sac.

k. Attachment of the fascia propria to the sheath of the femoral vessels.

l. A portion of the sheath covering the crural vessels, exposed by removing the semilunar edge of the fascia lata.

m. The opening in the sheath, through which the hernia had descended, above which is seen a dotted line, which marks the seat of the anterior stricture, and which is the part generally required to be divided.

Fig. 3. A small crural hernia dissected.

a. Seat of symphysis pubis.

b. Spinous process of the ilium.

c. Tendon of the external oblique muscle.

d. Anterior edge of the crural arch.
e. Abdominal ring.
f. Superficial fascia turned from the external oblique muscle.
g. Superficial fascia upon the fascia lata.
h. Crural vein.
i. Absorbent gland thrust down by the hernia.
k. Superficial fascia opened where it covered the hernia.
l. Fascia propria of the hernial sac.
m. Hernial sac unopened.

Fig. 4. A small hernia in the male, to shew the origin of the fascia propria.

a. Seat of symphysis pubis.
b. A portion of the crural arch.
c. Insertion of the external oblique into the pubes.
d. Portion of the fascia transversalis descending to unite itself to the crural vein.
e. Portion of the crural vein.
f f. Edge of the fascia lata, cut from Poupart's ligament, and drawn downwards to expose the parts behind.
g. Fascia lata wrinkled by its falling down.
h. Semilunar edge of the fascia lata.
i. Saphena major vein passing into the crural sheath.
k. The portion of the crural sheath which covered the crural hernia, and forming the fascia propria, the hernial sac having been entirely removed.
l l. The aperture by which the crural hernia had descended from the abdomen.
m. A depression within the crural sheath, in which a process of the hernial sac was contained.

EXPLANATION OF PLATE XI.

This plate exhibits two different views of crural hernia in the male.—Fig. 1 is preserved in the collection at Guy's Hospital. Fig. 2 is in my own possession.

Fig. 1. *a.* Symphysis pubis.
b. Spinous process of the ilium.
c c. Abdominal muscles.
d. The crural arch, or Poupart's ligament.
e. Semilunar edge of the fascia lata.
f. Tendon of external oblique cut open.
g. Internal oblique and transversalis.
h. External portion of the fascia transversalis.
i. Internal portion of the same fascia.
k. Internal abdominal ring.
l. External abdominal ring.
m m m. Spermatic cord passing through both apertures to the testis.
n. Testis.
o. Epigastric artery.
p. Cremaster muscle.
q. Crural hernia.
r. The sac of the crural hernia.
s. The fascia propria, which covers the hernial sac.
Fig. 2. Anterior view of another crural hernia.
a. Symphysis pubis.
b. Spinous process of the ilium.
c. Abdominal muscles.
d. Crural arch, or Poupart's ligament.
e. Abdominal ring.
f. Spermatic cord.
g. Testis.
h. Crural hernia.
i i. Superficial fascia cut open and turned back.
k k. Fascia propria of the sac laid open.
l l. Hernial sac laid open.
m. Omentum seen within the sac.

TREATMENT OF THE REDUCIBLE FEMORAL HERNIA.

Danger of strangulation.

From the small size of the opening through which femoral hernia passes, the patient is in great danger from strangulation, unless proper means be adopted to prevent the descent of the viscera.

Truss.

The employment of a truss is the only method by which the safety of a patient can be secured; but the truss required for femoral hernia must be of somewhat different construction to that which is required in inguinal hernia.

The pad, instead of being continued nearly in a straight direction with respect to the spring, as when required for inguinal hernia, should project downwards, nearly at right angles, to the spring, that it may effectually press upon the opening through which the hernia protrudes under Poupart's ligament, and also upon the upper part of the thigh.

To be constantly worn.

The truss should be constantly worn, as for inguinal hernia, to prevent the protrusion of the hernia, and also with the view of obliterating the mouth of the sac, and curing the disease.

Does not cure.

It is very rare, however, that a cure is effected in femoral hernia by means of the truss, but still it is right that it should be constantly kept on. I have known many instances in which the constant application of the truss has not produced the smallest apparent alteration in this hernia; the reason is, because Poupart's ligament, and the fascia lata, support the pressure of the truss, and the constant variation in the tension of these parts on every movement of the body, prevents the steady pressure necessary to produce a gradual closure of the opening.

In some cases, when the opening of the femoral sheath is large, it will be necessary to have a larger pad and a stronger spring to the truss, and the pad may be more effectually kept in place, by means of a strap passed from it round the upper part of the thigh.

Double truss.

If a hernia exist on both sides, a double truss will be required, made upon the same principles as the single one.

Salmon and Ody's truss.

The truss made by Salmon and Ody I have generally found best adapted to these cases.

EXPLANATION OF PLATE XII.

Fig. 1. Anterior view of a crural and two inguinal herniæ.

a. Symphysis pubis.

b. Spinous process of the ilium.

c c. Crural arch sending off the fascia lata of the thigh.

d d. Semilunar edge of the fascia lata.

e e. Saphena major vein on each side.

f f. Abdominal rings.

g. Sac of the inguinal hernia on the left side.

h. Its fascial covering.

i. Inguinal hernia on the right, its cavity obliterated by adhesion.

k. Sac of crural hernia.

m. Its orifice, which had been dilated inwards in the operation for this hernia.

Fig. 2. *a.* Inguinal truss.

b. Crural truss.

Fig. 3. *d.* Truss for the large crural hernia.

e. Upper abdominal ring.

f. The place at which the crural hernia descends.

g. Lower abdominal opening or ring.

OF THE IRREDUCIBLE FEMORAL HERNIA.

Causes.

Femoral hernia may become irreducible from adhesions of the protruded parts to the interior of the hernial sac; from a growth

Plate VIII.

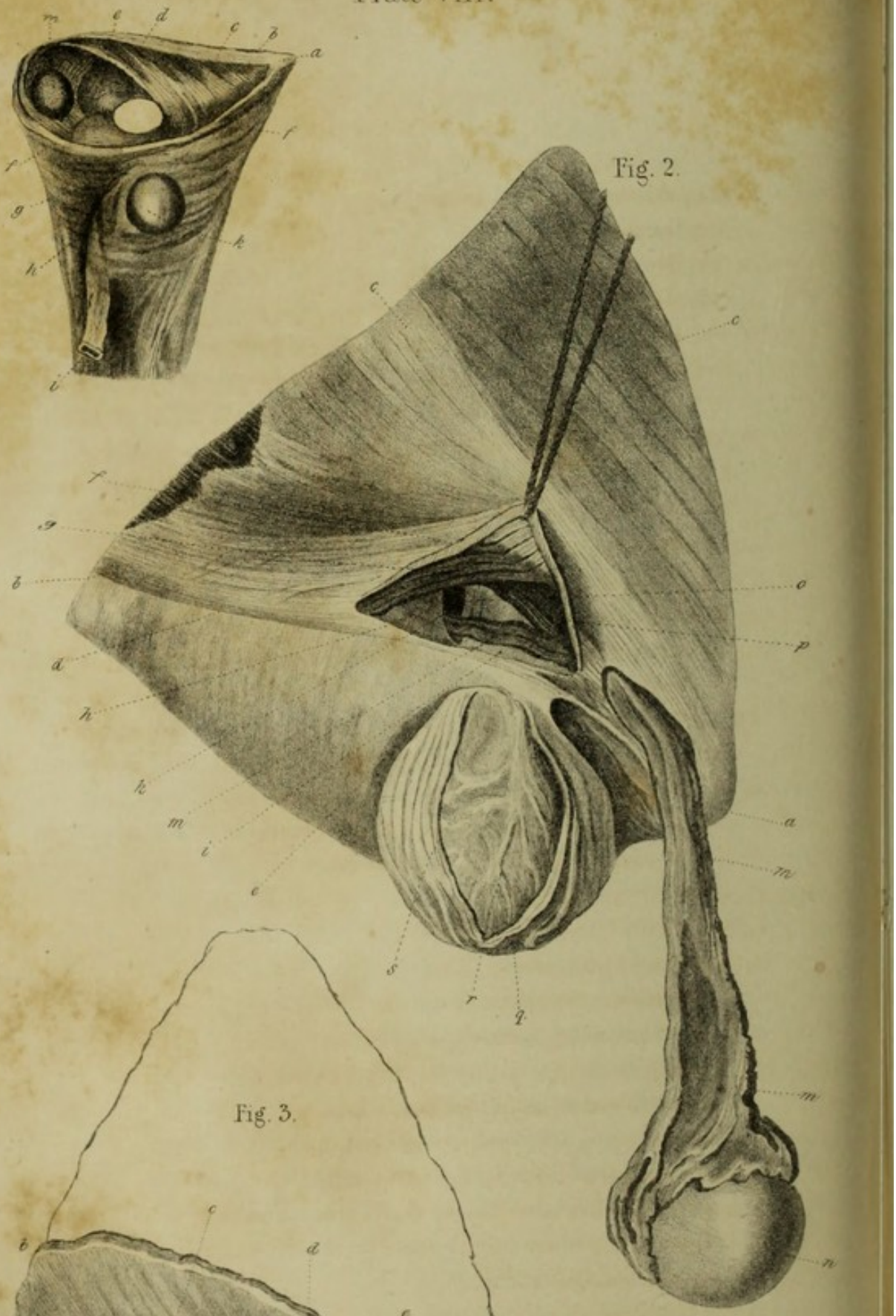


PLATE VIII.

Fig. 1. A small hernia in the male, to shew the origin of the fascia propria.

a, Seat of symphysis pubis.

b, A portion of the crural arch.

c, Insertion of the external oblique into the pubes.

d, Portion of the fascia transversalis descending to unite itself to the crural vein.

e, Portion of the crural vein.

f f, Edge of the fascia lata, cut from Poupart's ligament, and drawn downwards to expose the parts behind.

g, Fascia lata wrinkled by its falling down.

h, Semilunar edge of the fascia lata.

i, Saphena major vein passing into the crural sheath.

k, The portion of the crural sheath which covered the crural hernia, and forming the fascia propria, the hernial sac having been entirely removed.

l l, The aperture by which the crural hernia had descended from the abdomen.

m, A depression within the crural sheath, in which a process of the hernial sac was contained.

Fig. 2. Crural hernia in the male.

a, Symphysis pubis.

b, Spinous process of the ilium.

c c, Abdominal muscles.

d, The crural arch, or Poupart's ligament.

e, Semilunar edge of the fascia lata.

f, Tendon of external oblique cut open.

g, Internal oblique and transversalis.

h, External portion of the fascia transversalis.

i, Internal portion of the same fascia.

k, Internal abdominal ring.

l, External abdominal ring.

m m m, Spermatic cord passing through both apertures to the testis.

n, Testis.
o, Epigastric artery.
p, Cremaster muscle.
q, Crural hernia.
r, The sac of the crural hernia.
s, The fascia propria, which covers the hernial sac.

Fig. 3. A small crural hernia dissected.
a, Symphysis pubis.
b, Spinous process of the ilium.
c, Tendon of the external oblique.
d, Anterior edge of the crural arch.
e, Abdominal ring.
f, Superficial fascia turned from the external oblique muscle.
g, Superficial fascia upon the fascia lata.
h, Crural vein.
i, Absorbent gland thrust down by the hernia.
k, Superficial fascia opened where it covered the hernia.
l, Fascia propria of the hernial sac.
m, Hernial sac unopened.

of the protruded parts within the sac, so that they cannot repass the opening into the abdomen, or by a contraction at the neck of the sac itself, producing the same consequences.

Treatment. In either case, a truss should be applied with a hollow pad, which is to receive the tumour, and prevent its increase.

Case. A gentleman consulted me, in consequence of his having an irreducible femoral hernia, which, upon examination, I thought only to contain omentum; I directed him to wear a truss, with a depression in the pad, just large enough to receive the tumour. Two or three years afterwards, I saw this gentleman again, when I was gratified in learning, that his hernia had nearly disappeared. This was in consequence of absorption of the omentum having been produced by the pressure of the pad.

Truss cannot always be worn. If the hernia be entirely intestinal, this form of truss, with a hollow pad, cannot always be borne, as I have known it to create very severe suffering.

OF STRANGULATED FEMORAL HERNIA.

Symptoms. The symptoms of strangulation being the same as those I have already detailed in the lecture on inguinal hernia, I shall not again repeat them, but merely observe, that in femoral hernia, they are usually more urgent on account of the smallness of the opening, through which the protrusion occurs, causing greater pressure.

Severe. The patients generally complain of more pain from strangulated femoral than inguinal hernia in the same state, and they die sooner from the former than the latter disease.

Medical treatment. The medical treatment required for strangulated femoral hernia, does not differ materially from that necessary for the inguinal disease.

Taxis. In the first place, the taxis should be employed, but in a different mode to that I have described as proper for the reduction of inguinal hernia. The patient should be placed on a bed, with the shoulders elevated, and the thighs bent at right angles with the body, leaving only sufficient space between them to admit the arm

of the operator. The tumour is first to be pressed downwards, until it be below the level of Poupart's ligament, when it is to be kneaded upwards towards the abdomen.

Difficulty.

The difficulty usually experienced in attempting to reduce this form of hernia, arises from the pressure being made at first in an improper direction, viz. upwards, so that the hernia is forced over Poupart's ligament, instead of beneath it, and in this way the hernia never can be reduced.

As in the reduction of inguinal hernia, the pressure should be gentle and continued, avoiding violence, which may be productive of the most serious consequences.

General treatment.

Should the taxis fail, the same general treatment as that directed for inguinal hernia, should be pursued, as bleeding, the warm bath, opium, the application of cold, and the injection of the tobacco glyster. These remedies, however, have much less beneficial influence in femoral, than in the other forms of hernia; which I imagine is owing to the nature of the parts through which the protrusion occurs, and the smallness of the aperture through which it descends.

Symptoms urgent.

As the symptoms are usually very urgent in femoral hernia, and as the disease more rapidly destroys life, there is the greater necessity for the early performance of an operation, when the usual means to effect reduction have been tried and have failed. I have known a patient die in seventeen hours after the symptoms of strangulation had commenced; and on the contrary, I have performed an operation with success, after the symptoms had existed seven days; but in general, the patients labouring under this disease do not survive the strangulation more than four days, if the stricture remain; whereas, in inguinal hernia, under similar circumstances, they often live a week or more.

OF THE OPERATION FOR FEMORAL HERNIA.

Preparation.

The hair is to be removed from the surface of the tumour, and the bladder should be emptied. The patient should then be placed

upon a table of convenient height, in a horizontal position, but his shoulders should be a little raised, and the thigh bent towards the abdomen, in order to relax the abdominal muscles, &c.

Operation.

The first incision should commence a little above the superior part of the tumour, towards the umbilicus, and be extended downwards, somewhat to the inner side of the prominent part of the swelling, as far as its middle; a second incision should then be made from the inner to the outer side of the tumour, at right angles with the first incision, and joining it at the lower part, so that the two together form a figure resembling an inverted ⅃.

The angular flaps should then be dissected up, to allow of sufficient space for the other steps of the operation.

Superficial fascia.

The superficial fascia which is thus exposed, should next be divided to the same extent as the integument, by which the covering formed of the sheath of the femoral vessels will come into view*; this should be carefully cut into, so as to admit of the introduction of a director under it, upon which it should be further opened, so as to freely expose the hernial sac.

Layer of fat.

If the patient is fat, a layer of adipose matter may be found between this covering, formed of the sheath of the femoral vessels, and the sac itself.

Sheath of the vessels.

I have known this covering, which I call the fascia propria, to be mistaken for the hernial sac, so that the surgeon who operated, supposed he had opened the peritoneal covering when he cut into the sheath, and after considerable difficulty, he succeeded in pushing up the protruded parts, but on the following day the patient died; and when examining his body, it was discovered, that the hernial sac had not been opened, but had been thrust up into the abdomen with its contents, which still remained in a strangulated state.

Hernial sac.

The surgeon having exposed the hernial sac, should pinch up a small portion of its anterior and lower part, between his finger and

* There is usually a considerable vein between the superficial fascia, and the fascia propria, as well as absorbent glands.

thumb, carefully excluding any portion of the contents of the sac, and then placing the blade of his knife horizontally, he should cautiously make a small cut into the elevated part, making an aperture of sufficient size to allow of the passage of a director, upon which he should further divide the anterior part of the sac upwards and downwards.

Fluid.

A quantity of fluid usually escapes, when the sac is first opened, which varies greatly in quantity, and somewhat in colour, according to the period that the strangulation has existed. It is not uncommon, however, for the fluid to be entirely wanting, even when there are no adhesions.

If inflammation runs high, the peritoneal surface of the intestine is covered by adhesive matter.

Division of the stricture.

The next and most important step in the operation, consists in dividing the stricture, the situation of which should first be distinctly ascertained by passing the point of the little finger into the hernial sac, on the fore and inner part of its contents.

Seat of.

If the hernia be large, the seat of stricture may be at or under the opening in the fascia lata, through which the covering formed by the sheath of the femoral vessels is protruded; but generally, the stricture will be found immediately beneath Poupart's ligament, in the mouth of the sac itself, where the hernia quits the abdomen.

In either case, a director should be very carefully introduced into the sac, anterior to its contents, and gradually insinuated under the stricture, and upon its grove the hernia knife (before described) should be passed, with its cutting edge turned upwards, and a little inwards, towards the umbilicus, in which direction the stricture should be divided.

Two strictures.

In some cases, when the hernia is large, strictures may be found both at the crescentic margin of the fascia lata, and under the crural arch of Poupart's ligament, and each will require division; that at the fascia lata must of course be first liberated.

How treated.

When a stricture, therefore, exists at the crescentic margin, the surgeon, after dividing it, should make a careful examination, to

ascertain if the passage to the abdomen be free, before he attempts to return the protruded parts, for should a second stricture exist, he may rupture the protruded intestine in the violence he must employ in endeavouring to return it.

Direction of division.

In dividing the inner stricture, it has been recommended to cut in the direction of Gimbernat's ligament, inwards towards the pubes; but as the stricture is not occasioned by this ligament, there cannot be any necessity for dividing it; I have known Gimbernat's ligament divided, from an idea that it formed the stricture, but the stricture still remained at the orifice of the fascia propria, or in the mouth of the sac itself, and the patient died *.

Great caution necessary.

Great caution is requisite in dividing the stricture, if the protrusion be entirely intestinal, and the operator should not introduce the knife, until the intestine has been carefully placed out of danger by an assistant.

Case.

Sometime ago, a case occurred in one of the Borough hospitals, in which the intestine was wounded, when the operator was dividing the stricture, which he did inwards, towards Gimbernat's ligament; feculent matter was extravasated into the cavity of the abdomen, and the patient died. On examining the parts after death, two openings were found in the intestine, close to the mouth of the sac.

Adhesions.

The treatment I have directed as proper in inguinal hernia, when the protruded parts adhere to the sac, or when the intestine or omentum are gangrenous, is also proper under similar circumstances in femoral hernia.

After-treatment.

After the operation, the same mode of closing the wound, and

* It is curious, that Gimbernat's ligament should ever have been supposed to be the seat of stricture, as it exists only upon the inner side of the mouth of the hernial sac, and therefore could not influence the outer portion. If strangulated femoral hernia be examined in the dead body, and Gimbernat's ligament be cut through, the hernia is not liberated by such a division, for the orifice of the fascia propria, or the neck of the sac itself, still girt the viscera as much as ever.

indeed the after-treatment generally, should be the same as in the inguinal disease.

But little variety.

Very little variety is met with in femoral hernia, the most important one is that in which the obturator artery arises from the epigastric, and surrounds the neck of the sac.

Dr. Barclay's preparation.

Dr. Barclay, a celebrated teacher of anatomy at Edinburgh, was kind enough to send me a specimen of this variety, which was taken from a patient, whose previous history could not be ascertained.

Mr. Wardrop has also met with this variety.

Common course of the obturator.

Although the obturator artery frequently arises from the epigastric, it is very rarely found passing before the sac in femoral hernia, but usually takes a course to the outer side, and beneath the sac, as I have often witnessed when dissecting the parts of femoral herniæ. My mode of avoiding injury to the epigastric or obturator arteries, is to make a very slight division of the stricture with the knife; and then, by pressure of the finger or of a director, to enlarge the opening.

Fluid beneath the fascia propria.

In one instance I have met with a large quantity of fluid situated between the fascia propria and the hernial sac. The following is a short account of the case:—

Case.

Miss ———, æt. 20, had been the subject of a femoral hernia on the right side for three or four years, which had acquired about the size of a pullet's egg. In June, 1825, the hernia became strangulated, and increased to a very large size. As she did not mention the existence of the hernia to her medical attendants, it was not discovered until the third day from the commencement of the symptoms, the continuance and severity of which led to an examination. Mr. Wakefield, of Hatton Garden, who had attended her, immediately requested me to visit her; when, after trying, without effect, the ordinary means to reduce the hernia, I operated. On opening the fascia propria, I was astonished at the escape of nearly a pint of transparent fluid, resembling that usually drawn off in hydrocele. The hernial sac, which then became

Plate IX.

Fig. 3.

Fig. 1

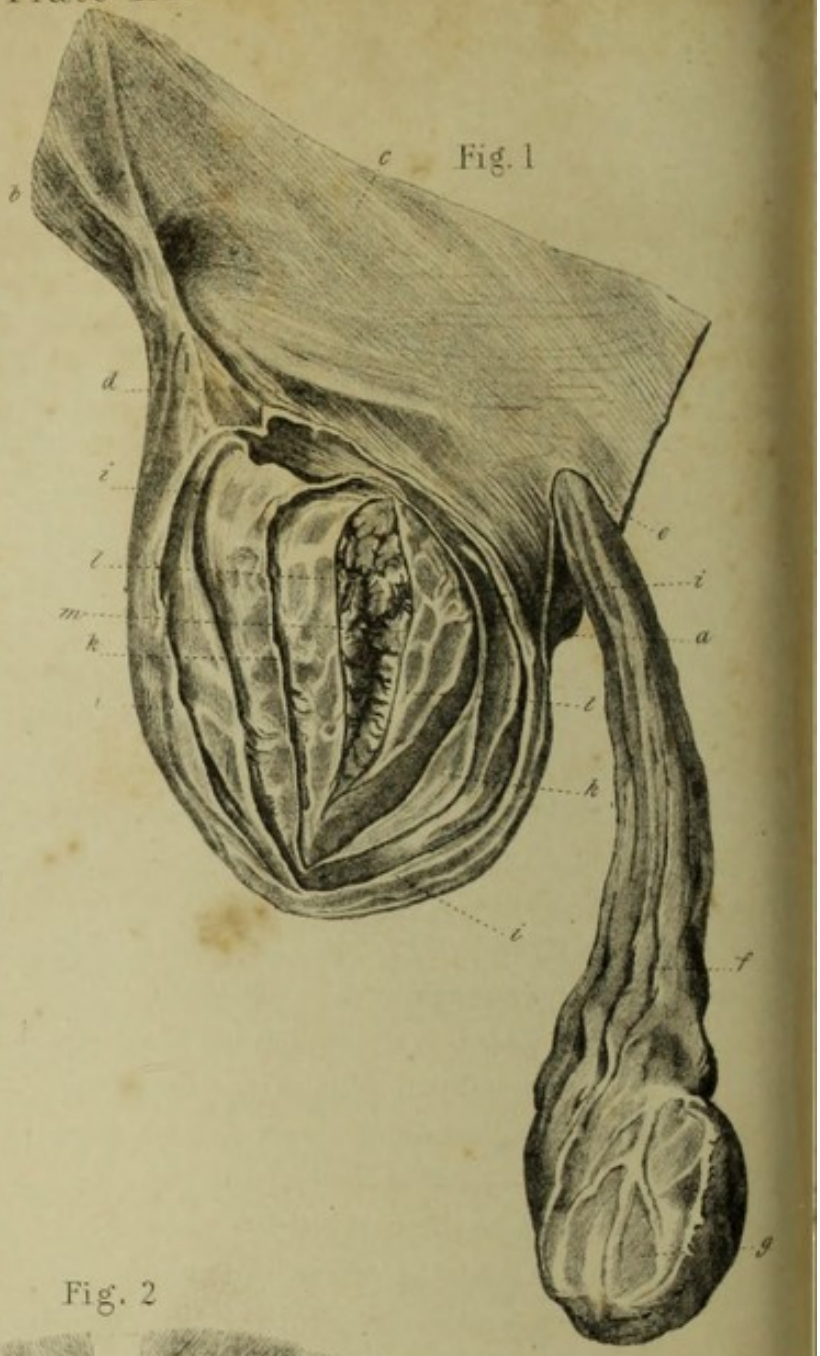


Fig. 4.

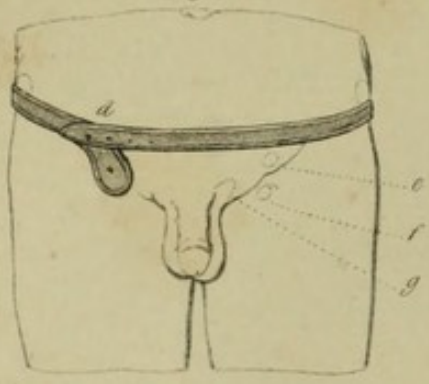


Fig. 2

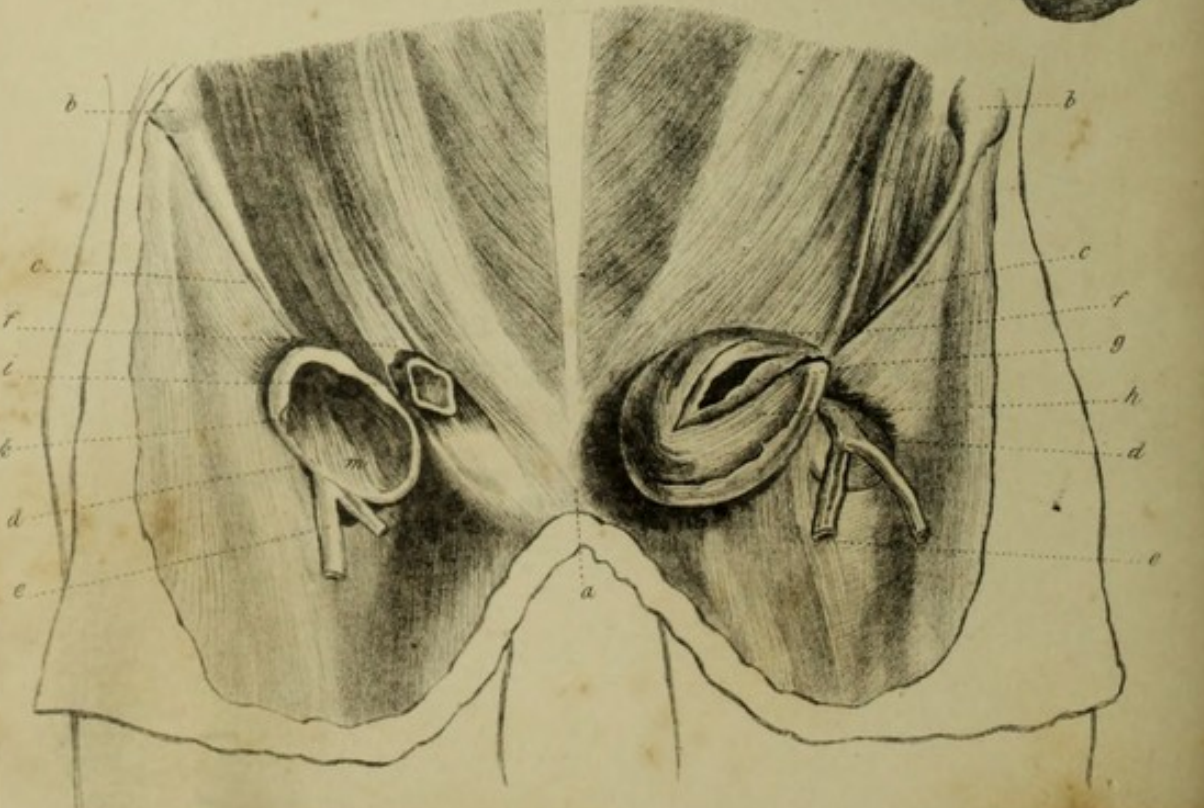


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PLATE IX.

Fig. 1. Anterior view of another crural hernia.

a, Symphysis pubis.
b, Spinous process of the ilium.
c, Abdominal muscles.
d, Crural arch, or Poupart's ligament.
e, Abdominal ring.
f, Spermatic cord.
g, Testis.
h, Crural hernia.
i i, Superficial fascia cut open and turned back.
k k, Fascia propria of the sac laid open.
l l, Hernial sac laid open.
m, Omentum seen within the sac.

Fig. 2. Anterior view of a crural and two inguinal herniæ.

a, Symphysis pubis.
b, Spinous process of the ilium.
c c, Crural arch sending off the fascia lata of the thigh.
d d, Semilunar edge of the fascia lata.
e e, Saphena major vein on each side.
f f, Abdominal rings.
g, Sac of the inguinal hernia on the left side.
h, Its fascial covering.
i, Inguinal hernia on the right, its cavity obliterated by adhesion.
k, Sac of crural hernia.
m, Its orifice, which had been dilated inwards in the operation for this hernia.

Fig. 2. *a*, Inguinal truss.
b, Crural truss.

Fig. 3. *d*, Truss for the large crural hernia.
e, Upper abdominal ring.

f, The place at which the crural hernia descends.

g, Lower abdominal opening or ring.

Fig. 3. Inguinal and crural truss.

a, Inguinal pad.

b, Crural pad.

Fig. 4. Truss for large crural hernia.

d, A large pad.

e, Upper abdominal opening.

f, The part where crural hernia descends.

g, The lower abdominal opening or external ring.

exposed, was small; and, on opening it, a little of the usual dark-coloured fluid was discharged. A small portion of omentum, with a fold of small intestine, were protruded. After dividing the stricture, and returning the viscera into the cavity of the abdomen, I removed a large part of this loose bag exterior to the sac. The patient recovered rapidly.

EXPLANATION OF PLATE XIII.

Preparations of crural hernia after the operation.

Fig. 1. A view of a preparation in which the intestine was divided by cutting inwards.

a. Seat of symphysis pubis.
b. Crural arch.
c. Abdominal muscles.
d. Fascia lata.
e. Femoral artery.
f. Femoral vein.
g. Hole in one fold of the intestine.
h. Hole in the other fold.
i. Hernial sac.

Fig. 2. Preparations of the hernial sac which had been returned into the abdomen unopened.

a. Seat of symphysis pubis.
b. Seat of the spine of the ilium.
c c. Abdominal muscles.
d. Muscles of the thigh.
e. Muscles of the outer part of the thigh.
f. Crural arch.
g. Femoral artery.
h. Femoral vein.
i. Large hole at the crural arch, by which the hernia was pushed back.

k. Fascia propria of the sac, which was also pushed within the abdomen.

l. Hernial sac.

m m. Peritoneum.

n. Strangulated intestine.

o. Intestine above the strangulated part.

p. Stricture at the mouth of the sac remaining undivided.

q. Mesentery.

LECTURE XLVI.

ON UMBILICAL HERNIA.

Synonyme.

THIS form of hernia, which is also termed exomphalos, is next in frequency to the inguinal.

Natural opening.

The protrusion takes place through the opening in the linea alba, which is formed in the fœtal state for the passage of the vessels of the umbilical cord.

How closed usually.

After the funis has been tied, this opening usually becomes closed by dense cellular tissue, and the remains of the umbilical veins and arteries, but not by a tendinous structure. The integument over it is adherent, and generally drawn in, forming the navel.

Dissection of the parts.

Behind the navel, when these parts are dissected, the peritoneum is found, which adheres more firmly at this part than any other of the linea alba ; it is connected above to the remains of the umbilical vein, and below to the ligament of the bladder and remains of the umbilical arteries. There is not any perforation in the peritoneum behind the navel, as the vessels do not penetrate it, but pass between it and the abdominal parietes.

Commencement of the disease.

Umbilical hernia commences in a small protrusion about the size of a nut, which can be easily reduced, but which again appears immediately the patient coughs or exerts himself. If neglected, it soon increases in bulk ; and, as it augments, it gravi-

tates; so that the larger part of the swelling is below the orifice of the sac, and in some instances it acquires so great a size as to reach to the upper part of the thighs.

Creates much suffering.

This disease, if intestinal, and not supported, is attended with much danger, and creates a considerable degree of suffering. The patient frequently feels so much weakness and sensation of sinking, as to be incapable of making exertion. The bowels are very irregular in their actions, and the patient is much troubled with flatulence and nausea.

Symptoms when intestinal.

Besides the frequent occurrence of these symptoms, the intestinal protrusion may be distinguished by its elasticity, its uniform feel, and by the passage of the air, &c., through the canal, producing a gurgling noise.

When omental.

When the protrusion is entirely omental, the patient experiences but little uneasiness or irregularity of the bowels. The feel of the swelling is uneven and doughy, and is but little tender under considerable pressure.

When both.

Sometimes, if both intestine and omentum are contained in the hernial sac, they can be distinguished from each other by the above-mentioned marks. The omentum is in these cases usually above, and the intestine below. But, most frequently, the quantity of omentum protruded is much larger than that of the intestine, and the latter is covered by the former, so that it cannot be at first distinguished.

Common in infants.

The umbilical hernia is very common in infants soon after birth. Intestine is then generally protruded, and the shape of the swelling somewhat resembles the distended finger of a glove in shape; the hernia is easily reduced, unless the opening in the linea alba is very small.

Children, subject to this disease, suffer from griping and a very irregular state of bowels, sometimes being constipated, at others being violently purged.

Appearance in the adult.

When this hernia occurs in the adult, if the patient be thin, the shape of the tumour is pyriform and defined; but in fat persons, the hernia is sometimes scarcely perceptible on a superficial in-

spection, as it extends upwards and downwards, is flattened anteriorly, and has its circumference blended with the adipose matter, so as not to present any defined edge. The tumour may be flattened in thin persons, but when so, its extent is always evident.

Sac in part deficient.

Although, generally, the hernia has a peritoneal covering, or proper sac, yet, in a few instances, when the disease has been of long standing, and has acquired a very large size, I have seen the sac in part wanting.

Two sacs.

I have also known two sacs to exist at the same time; one protruded by the side of the other, and only separated at their origin by a thin septum.

Case.

Mr. Cline operated twice upon a woman in St. Thomas's Hospital, for strangulated umbilical hernia, in whom two herniæ existed, having their commencement about half an inch apart, but the sacs lying in contact.

Most frequent in women.

Women are much more liable to this disease than men, and the most frequent cause of it is pregnancy, the bowels being pushed up by the gravid uterus as it rises from the pelvis.

Causes.

Another cause is the deposition of adipose matter within the omentum and mesentery, whereby their size is so much increased that the abdomen is hardly capable of containing them. Women who become corpulent after having had many children, are often subject to this disease, on account of the lax state of the abdominal parietes not affording sufficient resistance to prevent such protrusions.

The distension of the abdominal parietes, and protrusion of the navel, which is sometimes met with in ascites, is said to be a cause of umbilical hernia; but I am inclined to think that it is more frequently the consequence than the cause of this disease.

Children, however, are most frequently the subjects of this complaint, and in them it appears very soon after birth, as the opening for the passage of the umbilical cord is at that time very large, and will readily allow of the escape of the intestine. This complaint is more frequent in some families than in others, and I am disposed to impute it to the size of the funis, as I know an in-

stance of three children in one family who have this disease, and in whom at birth the funis was larger than usual.

Children are sometimes born with a deficiency of the abdominal muscles at the umbilical aperture, which gives rise to a large protrusion, a little on one side of which is the funis, and the covering is so thin, that the intestines may be seen through it. The edges of the skin surrounding the tumour are of a red colour, and somewhat thickened and retracted.

A small tumour sometimes projects from the navel of children, which surgeons have mistaken for hernia. It hangs in the hollow of the navel, is of a florid red colour, and is attached by a small neck.

The first case of this kind which I saw was brought to me from the neighbourhood of Sittingbourne, in Kent. The child was seven years of age, and during the first four years of its life it had a discharge from the navel, and the funis, which had sloughed further from the navel than usual, had never healed. A small red and fungous tumour then appeared, which bled frequently, and at other times discharged a bloody serum, and was painful when irritated by exercise. On examining this substance, I found it arose from the circumstance of the funis being so long as to project beyond the skin of the navel, which prevented cicatrization. I made a ligature around it, which gave the child scarcely any pain, and on the following day I removed it with scissors. I have seen another case of a similar kind.

TREATMENT OF REDUCIBLE UMBILICAL HERNIA.

In infants subject to this disease, the plan I usually adopt is, after having reduced the hernia, to apply half of an ivory ball sufficient to cover the opening, and to confine it in that situation by means of adhesive plaister. A linen belt should be applied, and secured round the body, but as soon as the child begins to walk, two straps must be fixed to the lower part of the belt, which should

In infants.

pass under the pelvis, between the thighs, to prevent the belt from slipping.

In adults. For the adult, or even for children, when the hernia is of small size, a spring truss may be employed, made on the same principle as that directed for inguinal or femoral protrusions. The pad of the truss should cover the opening through which the viscera escape; and the spring should pass from the pad to the back of the patient, a little beyond the spine; and a strap should be continued from the spring to the pad, to complete the circle.

In very fat persons. When the patient is very corpulent, so that the navel is deep, the portion of ivory may be advantageously placed under the pad of the truss, the more effectually to close the opening of the sac; and this is much better than having a conical pad, which is liable to shift its position when the patient is in motion; but the half globe of ivory does not follow the motions of the pad.

When very large. Very large herniæ, accompanied with a lax state of the abdominal parietes, require a different form of truss, as it is necessary to make a more extended pressure. The pad of the truss, therefore, instead of being only of sufficient size to cover little more than the orifice of the sac, must be of considerable extent, so as to press upon a large space round the hernial opening, and thus support the parietes as well as the hernia, which will render the patient comfortable, although there is not any prospect of thus effecting a cure.

EXPLANATION OF PLATE XIV.

Umbilical hernia, and the trusses necessary for its treatment.

Fig. 1. The common appearance of umbilical hernia.

a a a. Integuments.

b b. Abdominal muscles.

c c c. Peritoneum.

d. Mouth of the hernial sac.

e e. Hernial sac.

f f. Termination of the linea alba around the mouth of the sac.

g. Fascia lining the integuments and covering the sac.

In this preparation some omentum adhered within the sac, which was not included in the drawing.

Fig. 2. An improved truss by Mr. Morrison, of Leeds.

a. The pad.

b. The spring added to the pad.

c. An elastic band to assist the pressure of the pad.

The lower *b* points to the belt, which is added to keep this truss in its place in corpulent persons.

Fig. 3. Anterior view of the ventral hernia.

a a a. Integuments.

b b. Tendon of the external oblique, and rectus muscle behind it.

c. Hernia.

d. Fascia turned from the sac.

e. Hernial sac.

OF THE IRREDUCIBLE UMBILICAL HERNIA.

Causes.

Umbilical hernia becomes irreducible from the same causes as the inguinal does; viz. adhesions of the intestines or omentum to the inner surface of the sac, or a growth of omentum, rendering it too bulky to repass the opening by which it escaped.

Becomes very large.

Under these circumstances, the hernia sometimes acquires an enormous size, more particularly in women whose abdominal parietes have been weakened by frequent pregnancy; and I have in such persons seen the pudendum entirely covered by the hernial swelling. The umbilicus in these cases is brought nearer to the pubes than natural, by the constant weight and drag of the hernia.

Danger of.

With such a large hernia the patient is exposed to constant danger from blows or falls; besides the weight of the tumour, and an ulcerated state of integument, which often occurs, renders the patient incapable of following any employment requiring bodily exertion.

Treatment.

When the hernia is irreducible, and not of very large size, a truss should be worn with a hollow pad, as recommended for irreducible inguinal herniæ. The hollow should be just sufficient to contain the swelling, and the edges should be rounded off so as to prevent any injury from pressure to the surrounding parts. The substance of the cup should be pewter, which should be covered with soft leather. The spring should be of the same kind as that of the common truss.

When very large.

In very large herniæ of this description, a truss cannot be worn; and all that can be done to relieve the patient is to support the swelling by bandages, passed over the shoulder so as to prevent the constant dragging of the tumour.

OF STRANGULATED UMBILICAL HERNIÆ.

Symptoms.

The symptoms indicating strangulation in this form of hernia, are the same as those I have described as existing when inguinal or femoral herniæ are in the same state; but in the umbilical disease they are generally less urgent.

Causes.

Strangulation is frequently produced in these cases by the patient taking food not easy of digestion, or such as occasions flatulency; persons having this complaint should therefore eat sparingly, and be careful to avoid all food difficult of digestion, or likely to create flatulence.

Seat of stricture.

The seat of stricture is usually at the tendinous opening through which the hernia protrudes, but sometimes the neck of the sac itself is thickened, and prevents the reduction of the viscera.

Treatment. Taxis.

When strangulation exists, the surgeon should first endeavour to relieve the patient by employing the taxis in the following manner. The patient being placed on the back, the shoulders should be

elevated by pillows, also the pelvis a little raised, and the thighs bent at right angles with the body. The surgeon should then grasp the swelling with his hand, and direct the pressure a little upwards as well as inwards, because the opening to the abdomen is not usually in the centre of the swelling, unless the hernia is small, or projecting, when the pressure should be made directly inwards. If the neck of the sac can be distinctly felt, the surgeon should knead it with the finger and thumb of one hand, while he presses the hernia with the other.

In very large herniæ.

In very large, flat, and spreading hernia, when the tumor cannot be grasped by the hands, the surgeon should make pressure by means of some broad surface, as the bottom of a wooden platter, which he should place on the surface of the swelling, and keep up a steady pressure upon it for twenty minutes or half an hour.

General treatment.

Should the employment of the taxis fail in relieving the patient, the other means recommended for the femoral and inguinal herniæ, under similar circumstances, should be tried; but the remedy which I have found most successful in this disease, and on which I place the greatest reliance, is the tobacco glyster, as it appears to produce much more beneficial effects in this form of hernia, than in the others I have described. It should be used of the same strength, and with the same precautions I have before mentioned. In many instances I have known this remedy successful, after repeated trials of other means had failed to relieve the patient.

Bleeding, and the application of cold, I have known to produce the desired effect after the taxis had failed; but the surgeon must be careful how he takes away blood, as women of delicate constitution, and lax fibre, are often the subjects of this disease, in whom the loss of blood, in large quantity, might prove destructive.

Should the strangulation continue in spite of these trials to relieve it, the surgeon should proceed to liberate the hernia by an operation, the performance of which is extremely simple, but requires a little caution.

Operation.

The patient being placed upon a table of convenient height, in an easy position, with the abdominal muscles relaxed, the surgeon

should commence the operation by making an incision across the swelling, and then a second cut at right angles with the first, in the direction of the linea alba; the transverse incision should be below, and should be joined at its centre by the lower part of the perpendicular cut, so that the two represent an inverted ⊥.

The two angles should be dissected up to expose the superficial fascia, which the surgeon must next divide, but very carefully, as the hernial sac itself is sometimes wanting in part; and in such a case the protruded viscera would be immediately exposed. This covering should therefore be opened, as if it were the sac, by nipping up a small portion between the finger and thumb, in the manner I have already described.

Hernial sac.

If the peritoneal covering be complete beneath the superficial fascia, it should be cut into, and divided further, upon a director, in the same way as when operating for other herniæ. The escape of a small quantity of fluid usually indicates that the sac has been opened.

Division of the stricture.

The protruded viscera being exposed, the operator should carefully pass his finger over their upper part to the opening of the umbilicus, and then introducing the hernia knife upon his finger, and insinuating it under the stricture, he should cut upward towards the ensiform cartilage to such an extent as will make the opening sufficiently large to allow of an easy reduction of the protruded parts.

Return of viscera.

Having divided the stricture, the intestine, if in a fit state, should be first cautiously returned; and the omentum, if in large quantity, or if in a doubtful state, may be cut away, but if in a small quantity, and sound, it may be returned into the abdomen.

After-treatment.

The edges of the external wound should be brought together by sutures, and the approximation completed by strips of adhesive plaister; a compress of linen should be placed over this, and confined by means of a broad bandage passed round the body.

It is of much importance, after this operation, to procure a closure of the wound by adhesion, as the direct communication with the abdomen increases the risk of peritoneal inflammation.

Operation for large herniæ.

For very large umbilical herniæ, when strangulated, I should recommend a different mode of operating, which should be performed in the following manner. A small opening should be made over the neck of the swelling, through the integument and superficial fascia, so as to expose the hernial sac at that part; then the operator should pass his finger between the sac and edge of the umbilical opening, so as to guide the hernial knife, by which the umbilical opening should be dilated upwards without dividing the sac.

Case.

I performed this operation upon a Mrs. Aaron, who had long been afflicted with a large irreducible umbilical hernia, which became strangulated. When I had divided the tendon, I was able, by very slight pressure, to return a portion of the protruded intestine, and she rapidly recovered.

Adhesions.

In some cases the intestine adheres so firmly to the mouth of the sac, that great care is requisite to avoid wounding it. The separation of these adhesions in part must be effected with as little violence as possible, by means of the finger, to allow of the safe division of the stricture.

Strangulation from opening in the sac.

In some instances, where there has been an opening formed by absorption, or laceration of the hernial sac, the intestine, or omentum escape from the sac through the aperture, and become strangulated by the pressure from its edge. In these cases there is considerable danger, unless the operation be very carefully performed, as the viscera are exposed immediately the superficial fascia is divided.

Should the adhesions be extensive and firm, the surgeon must be content with liberating the stricture, and not attempt to return the protruded viscera.

Part of the colon protruded.

The intestine generally protruded in umbilical hernia, is a portion of the colon; the appendices epiploicæ of which become more quickly altered than the intestine itself; and if much changed, they should be cut off rather than any risk incurred by leaving them to slough after the operation.

Danger of the operation.

The danger in this operation is of wounding the intestine, as there is not any vessel of importance that can be injured.

OF VENTRAL HERNIA.

Like the umbilical.

This hernia only differs from the umbilical in its seat, which is usually at the linea alba, or linea semilunaris; but any visceral protrusion at the anterior, or lateral parts of the abdomen, except those already described, may be called ventral herniæ.

Symptoms.

The symptoms of this form of hernia are usually the same as those of the umbilical, excepting when the hernia is formed between the umbilicus and ensiform cartilage in the linea alba, and contains a portion of the stomach, when peculiar symptoms will arise.

Case.

I once saw a gentleman with a hernia in this situation, who suffered constantly from indigestion, flatulency, and a distressing sensation of sinking at the scrobiculus cordis. His hernia was, however, reducible, and the application of a truss relieved all his unpleasant symptoms.

Causes.

The following causes may give rise to this hernia:—

1. A natural deficiency of tendinous structure, which I have known to a very considerable extent, in the linea alba or linea semilunaris.

2. The apertures for the passage of blood-vessels being unusually large.

3. Injuries by which the continuity of the parietes is destroyed.

Coverings.

The coverings of ventral hernia are generally the same as those of the umbilical disease; viz., the integument, superficial fascia and peritoneal sac; but, in some instances, I have found another covering connected with the edge of the opening in the tendon through which the hernia escapes.

When this hernia occurs in consequence of wound, the covering must, of course, vary.

PLATE X.

Two views of crural hernia after the operation.

Fig. 1. Preparations of the hernial sac which had been returned into the abdomen unopened.

a, Seat of symphysis pubis.

b, Seat of the spine of the ilium.

c c, Abdominal muscles.

d, Muscles of the thigh.

e, Muscles of the outer part of the thigh.

f, Crural arch.

g, Femoral artery.

h, Femoral vein.

i, Large hole at the crural arch, by which the hernia was pushed back.

k, Fascia propria of the sac, which was also pushed within the abdomen.

l, Hernial sac.

m m, Peritoneum.

n, Strangulated intestine.

o, Intestine above the strangulated part.

p, Stricture at the mouth of the sac remaining undivided.

q, Mesentery.

Fig. 2, A view of a preparation in which the intestine was divided by cutting inwards.

a, Seat of Symphysis pubis.

b, Crural arch.

c, Abdominal muscles.

d, Fascia lata.

e, Femoral artery.

f, Femoral vein.

g, Hole in one fold of the intestine.

h, Hole in the other fold.

i, Hernial sac.

Fig. 3. Anterior view of ventral hernia.

a a a, The integuments.

b b, Tendon of the external oblique muscle and rectus behind it.

c, The hernia.

d, Fascia turned from the sac.

e, The hernial sac.

Fig. 4. The common appearance of umbilical hernia.

a a a, Integuments.

b b, Abdominal muscles.

c c c, Peritoneum.

d, Mouth of the hernial sac.

e, Hernial sac.

f f, Termination of the linea alba around the mouth of the sac.

g, Fascia lining the integuments and covering the sac.

In this preparation some omentum adhered within the sac, which was not included in the drawing.

Fig. 5. An improved truss by Mr. Morrison, of Leeds, for pregnant or corpulent females.

a, The pad.

b, The spring added to the pad.

c, An elastic band to assist the pressure of the pad.

The lower *b* points to the belt, which is added to keep this truss in its place in corpulent persons.

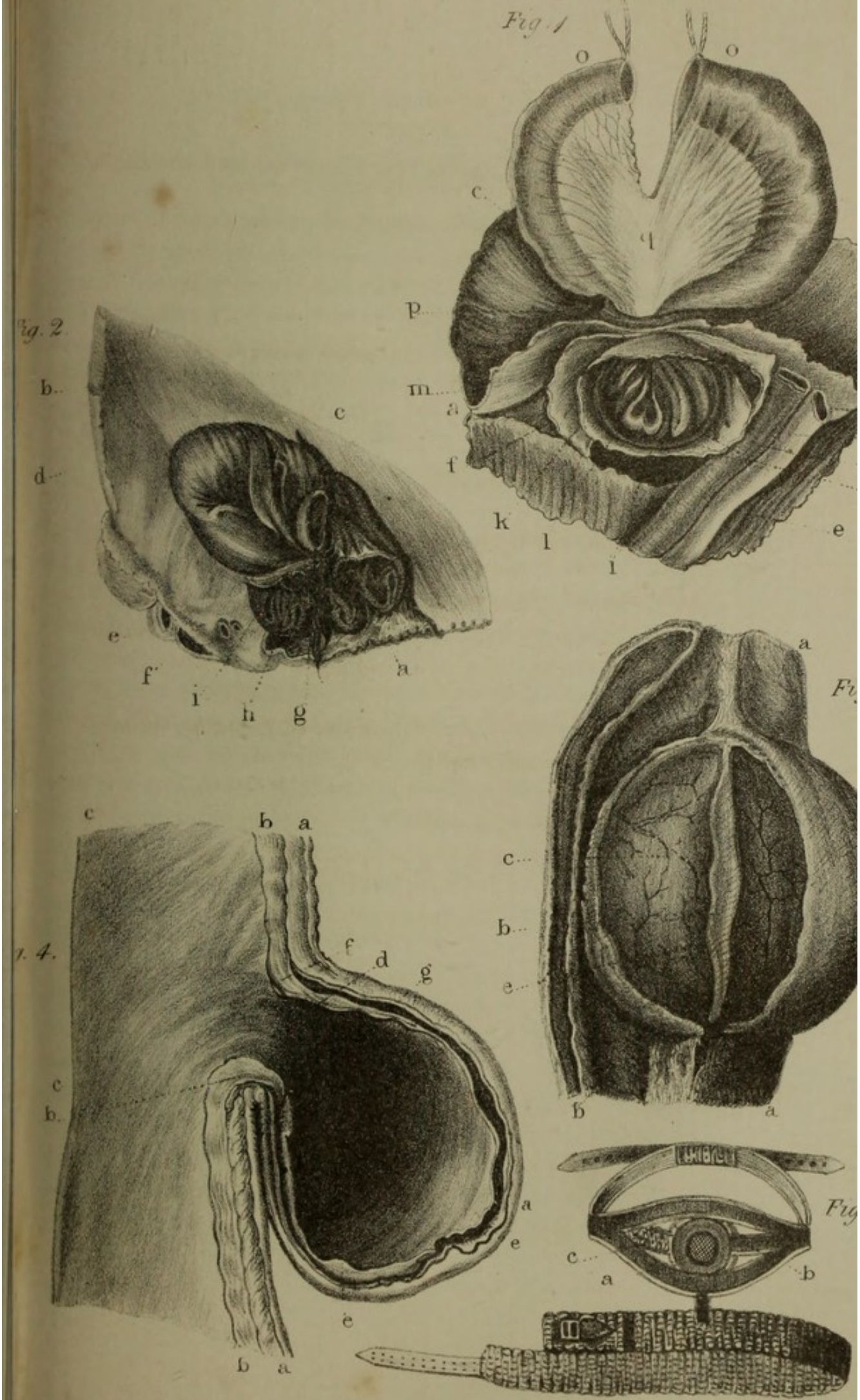
Fig. 1
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OF THE REDUCIBLE VENTRAL HERNIA.

Truss.

When seated in the linea alba, a truss, similar to that employed for umbilical hernia, should be worn; but, when low down in the linea semilunaris, the truss applied should resemble that recommended for inguinal hernia, only that the pad must be turned somewhat upwards.

When irreducible, the same form of truss, with a hollow pad, will be required.

OF STRANGULATED VENTRAL HERNIA.

Symptoms.

The symptoms indicating strangulation of this hernia are, in every respect, similar to those already described, as occurring when umbilical hernia is in the same state; and the means which should be tried, with a view of relieving the patient, should be of a like nature.

Treatment.

As in the umbilical disease, the tobacco enema has here a more powerful effect than in the inguinal or femoral herniæ.

Taxis.

In employing the taxis, the pressure should be made a little upwards as well as inwards, for the swelling, like the umbilical, has the greater part situated below the opening from the abdomen.

Operation.

If an operation becomes necessary for the relief of the patient, it should be performed in the same mode as that described for umbilical hernia; but when the disease is seated low down in the linea semilunaris, the surgeon must bear in mind the course of the epigastric artery, and divide the stricture so as to avoid it.

For large herniæ.

In very large ventral herniæ, the operation I have mentioned before, of merely exposing the neck of the sac, and dividing the stricture, without opening the sac itself, may be adapted with advantage.

After-treatment.

In the after-treatment of these cases, nothing of importance is necessary beyond what I have already recommended for the other forms of herniæ.

OF THE THYROIDEAL HERNIA, OR HERNIA FORAMINIS OVALIS.

The first example of this disease which I saw, was accidentally discovered in a male subject, in whom an inguinal hernia also existed on the same side. The parts are preserved in the collection at St. Thomas's Hospital.

Course. The hernia was protruded through the opening in the ligament of the foramen ovale, by which the obturator artery and nerve pass to the thigh; the pubes was immediately before the neck of the sac, and the ligament of the foramen embraced the other portion about three-fourths. The obturator vessels were situated behind, and somewhat to the inner side of the neck of the sac. The sac itself, not larger than a nutmeg, was placed under the heads of the pectineus and adductor brevis muscles.

Two herniæ in the same person. I lately had an opportunity of seeing two specimens of this hernia in the same subject, one existing on each side, which were not discovered during life.

Several cases of this form of hernia are related in the first volume of the Memoirs of the Royal Academy of Surgeons at Paris.

Operation difficult. The depth at which this hernia is situated, would render an operation, in case of strangulation, extremely difficult; but, should such a step be necessary, I should recommend the division of the stricture inwards on account of the obturator artery, &c.

Treatment. If reducible, a truss, similar to that used for crural hernia, but with a thicker pad, would prevent its further descent.

OF THE PUDENDAL HERNIA.

Its seat. This hernia appears in the external labium pudendi, about its middle.

Course. It commences at the side of the vagina, and passes into the labium between the vagina and ischium; it has usually a pyramidal figure, and presents the characters of other herniæ, as elasticity,

dilatation on coughing; also appearing in the erect position, and disappearing when the patient is recumbent.

The situation of the swelling, and its want of connection with the abdominal ring, sufficiently distinguish it from inguinal hernia, which also appears in the labium, but at the upper part.

Treatment. The increase of this disease may be prevented by the patient's constantly wearing a bandage to support the part; but a partial protrusion cannot readily be checked, as from its situation, a pessary, unless of very large size, would not be of any service.

When strangulated. When strangulated, the usual remedies before mentioned should be tried; and, if an operation becomes necessary, the sac should be carefully opened, and the stricture divided inwards towards the vagina, the bladder being previously emptied.

OF THE VAGINAL HERNIA.

Its seat. This hernia protrudes between the uterus and rectum, where the peritoneum is reflected from one viscus to the other, at the posterior part of the vagina; sometimes, however, it appears at one side instead of the posterior part. It is only covered by the lining membrane of the vagina.

Treatment. The use of a pessary will prevent the protrusion of this disease.

OF THE PERINEAL HERNIA.

Its seat. In the male, this hernia protrudes between the bladder and rectum; and, in the female, between the rectum and vagina.

Case. I have only seen one instance of this disease, which was in the body of a male brought into the dissecting room.

Dissection. The reflected portion of peritoneum between the bladder and rectum, was protruded as far as the perineum, but no external tumour was perceptible; Mr. Cutliffe, surgeon, at Barnstaple, has the parts preserved.

Anterior to the sac were seated part of the bladder, the prostrate gland and terminations of the vesiculæ seminales; behind was the

rectum, and the mouth of the sac was about two inches and a half from the anus.

The following curious case is taken from Mr. Bromfield's Chirurgical Observations:—

Case. "A lad, between six and seven years of age, was put under my care to be cut for the stone. The staff, in the attempt to introduce it into the bladder, met with resistance from a stone, which seemed to be lodged in the membranous part of the urethra, or a little lower down in the neck of the bladder. I made my incision, as usual, through the integument and muscles, to get at the grove of the staff; and then pressed the blade of my knife into the sulcus, at the extremity of the staff, being able to divide only the membranous part of the urethra; and a very small portion, if any, of the prostate gland; by the examination of the parts, with my fingers, I then found that this hard body was a process continued from the body of the stone contained in the bladder; I therefore took the double gorgeret, without the cutting blade affixed, intending only to push back the stone, and dilate the neck of the bladder, which I did by getting the beak of the gorgeret into the sulcus of the staff, and pressing it against the point of the stone, following its course with the instrument as the stone retired: but the direction that the gorgeret took alarmed me, as it passed under the ossa pubis with great obliquity. I then concluded that the instrument had taken a wrong route, as I could not, in this case, have the advantage of the grove of the staff farther than the extremity of the membranous part of the urethra; but, on withdrawing the upper part of the gorget, I introduced the fore-finger of my right hand into the bladder, by the under part of the instrument, which remained in the bladder, and was now no more than the common gorgeret; by which I was soon convinced that it was in the bladder, the situation of which was raised much higher in the pelvis than usual. I then introduced my forceps, and, while I was searching for the stone, a thin diaphanous vesicle, like an hydatid, appeared rather below my forceps, which, in the child's screaming, soon burst, discharged a clear water, as if forced from

a syringe; the next scream brought down a large quantity of small intestines. I need not say, that this was sufficient to embarrass a much better operator than myself; however, I proceeded in the operation with the greatest tranquillity, being convinced, that this very extraordinary event was not owing to any error in the operation: but the difficulty was to keep the intestine out of the cheeks of the forceps, when I should again attempt to lay hold of the stone; the extraction of which would be very difficult to effect, from the unusual situation of the bladder in this subject. The lower part of the gorgeret remaining in the bladder, the forceps were again easily introduced, which being done with the fingers of my right hand, I pressed back the intestines, while I laid hold of the stone; but during the extraction the intestines were again pushed out by the child's screaming; nevertheless, as I had the stone secure in my forceps, I proceeded to extract it, which I did very easily. Before I introduced the common gorget for the introduction of the forceps the next time, I got up the intestines again, and desired my assistant to keep them up till I got hold of a second stone, which, from its shape, appeared to be that which had got into the neck of the bladder. As soon as I was convinced by the examination, with my finger, that the bladder was freed totally from any pieces of stone, I again returned the intestines into the pelvis, and brought the child's thighs close together; a piece of dry lint was applied on the wound, and a pledget of digestive over it; he was then sent to bed, with no hope of his surviving till the next day; but, contrary to expectation, the child had a very good night, and was perfectly well in little more than a fortnight, without one alarming symptom during the process of cure; neither did the intestines once descend through the ruptured peritoneum after they had been returned when the operation was finished."

The following are Mr. Bromfield's ideas of the nature of this case:—

"After the incision of the integument and muscles was made, as usual, there soon appeared in the wound something like an hydatid, which proved afterwards to be that part of the peritoneum

which is extended from the left side of the bladder and intestinum rectum to its attachment on the inside of the left os innominatum; preventing the intestines from falling down too low into the pelvis; therefore, in this case, this expansion of the peritoneum must have been forced out of its usual situation.

" Suffering daily more and more extension, it will at length permit the intestines to fall down to the very bottom of the pelvis, between the bladder and the rectum; therefore, when in the case above related, the resistance of the integument and muscles was taken off by the operation, the peritoneum was forced out, and at first was filled only with lymph, which gave it the appearance of an hydatid; but its thinness not being able to resist any longer the force of the abdominal muscles, pressing the viscera downwards, it burst, and the intestines soon followed through the aperture. If this is allowed, we can easily account for the oblique course that the gorgeret took when first introduced, as the intestines had raised up the fundus of the bladder against the back part of the ossa pubis, so that my forceps could not be conveyed into the bladder, but almost in a perpendicular direction; and I was obliged to press with my hand on the lower part of the abdomen, just above the pubes, to bring the bladder and its contents sufficiently low for the laying hold of the last stone with my forceps."

Scarpa met with a case in which this hernia formed a tumour in the perineum.

This form of hernia, and the vaginal, may become dangerous during gestation, and some cases illustrating this are related in Dr. Smellie's cases on midwifery.

VESICAL HERNIA.

This variety of hernia is of very rare occurrence, for I have only seen two instances of it in the living subject. The symptoms characterising this species of hernia are the following. The size of the tumour varies, and is not much affected by the position of the body: but is most affected by the quantity of urine contained

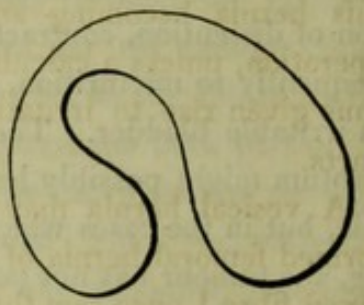
in the bladder. This variation of size, however, is not always observable, as the bladder does not always discharge the whole of its contents when the patient makes water; that part of the viscus within the pelvis completely emptying itself, while the portion within the scrotum remains distended as before the attempt to void urine. Persons, therefore, labouring under this complaint, are sometimes under the necessity of raising the scrotum and pressing upon it, in order to force its contents into the pelvic portion of the bladder, by which means the whole volume of urine is discharged by the urethra. This imperfect evacuation of the bladder, to which these persons are liable, gives rise to another troublesome symptom, a very frequent desire to void the urine; for the part of the bladder within the scrotum, when imperfectly emptied, labours under a continued or frequently renewed sensation of distention, contracts upon its contents, impels the patient frequently to micturition, and thus gives rise to the symptoms of an irritable bladder. The fluctuating feel of the tumour in the scrotum might possibly lead to the suspicion of a common hydrocele, but in the cases which I have had an opportunity of examining, the tumour has not possessed transparency; this circumstance, together with the above symptoms, will sufficiently enable a surgeon to distinguish it from the latter disease.

Two opportunities have presented themselves, which enabled me to examine the anatomy and appearances of this variety of hernia. For the first I am indebted to Mr. Maiden, of Stratford; and for the second to Mr. Hallam, at Walworth.

A large inguinal hernia was perceived on the right side, which had descended into the scrotum, so as to occupy its lower part. On removing the integuments, the fascia of the cord and the cremaster were seen spread over the part of the tumour, and both somewhat increased in density; these being removed, a hernial sac came into view; the cavity of this hernial sac was laid open by incision; both omentum and intestine presented themselves; the bag in which they were contained was complete, and the bladder

was still concealed. I then threw air in by the urethra, in order to inflate the bladder; and immediately the bladder began to swell, not only in the pelvis, but also in the scrotum behind the hernial sac, until it became as large nearly as an ostrich's egg. The bladder was situated behind the peritoneal sac, to the posterior part of which the anterior surface of the viscus closely adhered; posteriorly, it was connected by cellular membrane to the scrotum, and to the tunica vaginalis of the cord. On tracing it upwards, it was found to ascend through the external abdominal ring into the inguinal canal, where it maintained the same relative situation to the cremaster and spermatic vessels as in the scrotum; it thence descended through the internal abdominal ring into the pelvis. It is almost needless to observe, that both rings, especially the inner ring, were much dilated.

Its form, viewed anteriorly, resembled this outline.



This disease has its origin in a relaxed state of the bladder, and the protrusion is also probably favoured by neglect in regularly evacuating the bladder when required. The bladder thus becomes distended laterally, and spreads so as to occupy the lower part of the abdomen, and then reaches the inner abdominal aperture of the inguinal canal, through which it becomes forced by the weight and pressure of the superincumbent abdominal viscera, and the action of the abdominal muscles, diaphragm, and pyramidales. The following is the explanation of the peculiar peritoneal connexion which attends the vesical hernia. As the anterior and lateral parts of the bladder are in some degree devoid of peritoneal covering, the bladder at first enters the inguinal canal without bringing that membrane with it; but as soon as the fundus begins to descend, the peritoneum accompanies it; and with the sac thus formed, intestine and omentum afterwards produce the triple descent, of bladder behind the peritoneum, of intestine and omentum

into the peritoneum, which the fundus of the bladder causes to descend.

The treatment consists in the application of a truss, similar to that which is worn in the common inguinal hernia, and in paying unremitting attention to the frequent and complete discharge of urine. When the hernia is small, and the bladder only has descended, the cure is easier than in a common hernia, being assisted by the contraction of the muscular coat of the bladder. But if it has drawn down the peritoneum, intestine, and omentum with it, it will then be as difficult to cure as common inguinal hernia. The vesical hernia only admits of cure by a gradual absorption, or an extreme elongation of the adhesions which unite the bladder to the scrotum. I can hardly conceive the possibility of this hernia becoming strangulated, so as to really require an operation, unless a calculus has formed in the protruded part, and thus given rise to irritation, inflammation, and thickening of the parts.

A vesical hernia may also be a consequence of a previously formed femoral hernia of the common kind; for in a female of relaxed fibre I once saw the bladder drawn quite close to the orifice of a femoral hernial sac. But the comparatively small size of the aperture in femoral hernia, and the unyielding nature of the parts which form it, explain the reason of its not being met with in practice.

OF THE ISCHIATIC HERNIA.

This is an extremely rare form of hernia; indeed, I have only seen one specimen of it, for which I am indebted to my friend Dr. Jones, whose name is well known by his excellent work on hæmorrhage. Very rare.

Dr. Jones having told me that he had inspected the body of a patient who had died in consequence of the strangulation of a Case.

portion of intestine in the ischiatic notch, I became very anxious to obtain the parts; and, after considerable difficulty, we obtained permission to open the body a second time, when I removed the hernia and surrounding parts.

Dr. Jones had been requested to visit the patient, a young man about twenty-seven years of age, in consequence of his suffering from symptoms which resembled those produced by strangulated hernia. The patient stated that he had experienced a similar attack before, which had been relieved by opium, followed by a dose of castor oil. Dr. Jones, therefore, gave him some opium, and directed that he should take some pills composed of calomel and scammony, as soon as the stomach appeared tranquil.

On the day following, Dr. Jones found that the patient had experienced relief for a short period after taking the opium, but that the pills had been thrown up, and no evacuation had taken place from the bowels. The patient was also much troubled by eructations and flatulence, for which he took some spir. ammoniæ comp. and spirit. lavendulæ, with good effect.

Dr. Jones, feeling confident that the symptoms were produced in consequence of the strangulation of some portion of the intestines, now examined the man carefully, but could not detect any protrusion; nor did the patient complain of any local pain which could induce Dr. Jones to inspect the ischiatic notch.

As no stools had been procured, some purgative glysters were thrown up, but without producing the desired effect. Other purgatives were subsequently given, and glysters were again thrown up, but without affording relief; also leeches and blisters were employed, but they produced only temporary benefit. On the sixth day from the commencement of these symptoms, they suddenly subsided, excepting that no evacuation from the bowels took place; and the patient felt himself so well, that he was desirous of going to business; but Dr. Jones advised him to remain quiet for some days. Early on the morning of the seventh day the patient got up, and went down from his bed-room, which was on the fourth

story, to the ground floor, but he soon returned, complaining of being very unwell; after which he gradually sunk, and expired on the same evening.

On examining the body after death, a portion of the ilium was discovered passing by the right side of the rectum to the ischiatic notch, through which a fold of the intestine was protruded into a small hernial sac, to the inner surface of which the intestine was adherent. The strangulated part of the gut, and about three inches of it on each side of the stricture, was very much discoloured. The intestines between the stomach and protruded portion were distended with air, and had a few livid spots upon them. The intestines from the stricture to the rectum were very much contracted, particularly the arch of the colon. Dissection.

On carefully dissecting the parts after I had removed them from the body, I found a small orifice in the pelvis, anterior to, but a little above the sciatic nerve, and on the fore part of the pyriformis muscle. This opening led to the hernial sac, which was situated under the gluteus maximus muscle, and in which the intestine had been strangulated.

The orifice of this hernial sac was placed anterior to the internal iliac artery and vein, below the obturator artery, and above the obturator vein; its neck was seated before the sciatic nerve, and its fundus was covered by the gluteus maximus muscle. Below the fundus was the sciatic nerve, and behind it the gluteal artery; above, it was placed near the bone.

Should the existence of such a hernia be ascertained, it might, if reducible, be prevented from protruding by the application of a spring truss; but should it become strangulated, and an operation be deemed advisable, I should recommend the division of the stricture to be made directly forwards. Treatment.

OF THE PHRENIC HERNIA.

Protrusions of the abdominal viscera through the diaphragm, Its seat.

may take place either at the natural apertures framed for the passage of the œsophagus, vena cava, aorta, &c., or through unnatural openings, the consequence of malformation or injury.

Symptoms. When this hernia exists, the patient suffers much from interrupted respiration and cough, besides experiencing the symptoms of hernia already enumerated.

Hernial sac. This hernia has, or has not a proper sac, according to the circumstances of its formation; when protruded through one of the natural apertures, it has a proper sac; when occurring from malformation, it sometimes has a peritoneal covering, and sometimes this covering is wanting; when the consequence of laceration or injury, the hernial sac is always deficient.

Case. I have never seen an hernia protruding through any of the natural openings of the diaphragm; but several cases are related by Morgagni, in which this form of hernia existed. He mentions the case of a young man who was attacked with symptoms of acute cardialgia and constant vomiting, under which he expired. On examining his body after death, the omentum, with part of the colon, the duodenum, some portion of the jejunum and ilium were found in the cavity of the thorax, having passed through the same opening by which the œsophagus descends; the lungs and the heart were compressed into a very small space.

From malformation. The occurrence of phrenic hernia from malformation is not very uncommon. There are two preparations in the Museum at St. Thomas's Hospital exhibiting this disease. In one instance the opening is of sufficient size to admit nearly the whole of the small intestines through it; in the other specimen the large portion of the stomach was protruded through a much smaller aperture. In both cases the unnatural openings are in the left muscular portion of the diaphragm.

Some cases of this form of the disease are also related in the first volume of Medical Observations and Inquiries, by Dr. G. Macauley.

Danger. When the unnatural aperture is small, the patient suffers fre-

quently from the usual symptoms of hernia, and is in danger of being destroyed by a strangulation of the protruded parts as in other herniæ.

In the year 1798, I published the history of an interesting case of this description, which I shall take the liberty of relating here.

Sarah Homan, æt. twenty-eight, had, from her childhood, been afflicted with oppression in breathing. As she advanced in years, the least hurry in exercise, or exertion of strength, produced pain in her left side, a frequent cough, and very laborious respiration. Case.

These symptoms were unaccompanied with any other marks of disease; and, as her appetite was good, she grew fat, and, to common observation, appeared healthy. The family with whom she lived suspected her of indolence, and her complaints being considered as a pretext for the non-performance of her duty, she was forced to undertake employments of the most laborious kind.

This treatment she supported with patience, though often ready to sink under its consequences. After any great exertion, she was frequently attacked with pain in the upper part of the abdomen, with vomiting, and a sensation, as she expressed it, of something dragging to the right side; which sensation she always referred to the region of the stomach.

The cessation of these symptoms used to be sudden, as their accession. After suffering severely for a short time, all the pain and sickness ceased, and allowed her to resume her usual employments.

As her age increased, she became more liable to a repetition of these attacks; and, as they were also of longer continuance than in the early part of life, she was at length rendered incapable of labouring for her support.

Some days previous to her death, she was seized with the usual symptoms of strangulated hernia; viz. frequent vomitings, costiveness, and pain: the pain was confined to the upper part of the abdomen, which was tense and sore when pressed.

As these symptoms were unaccompanied with any local swelling which indicated the existence of hernia, they were supposed to be produced by an inflammation of the intestines; but there were other symptoms that could not be attributed to this cause, which occasioned much obscurity with respect to the true nature of the complaint, and seemed to indicate a disease in the thorax. She was unable to lie on her right side, had a constant pain in the left, a cough, difficulty of breathing, attended with the same dragging sensation of which she had formerly complained.

The signs of inflammation of the intestines, with the addition of a troublesome cough, continued without abatement for three days, when she expressed herself better in these respects; but the morbid symptom in the thorax remained as violent as at first: and in the fourth day from their commencement she expired.

Dissection.

On examining the body after death, when the abdomen was opened, there appeared a very unusual disposition of the viscera. The stomach, and left lobe of the liver, were thrust from their natural situation towards the right side. On tracing the convolutions of the small intestines, they were found to retain their usual situation; but lines of inflammation extended along such of their surfaces as lay in contact. This appearance the adhesive inflammation assumes in its early stage; and it is highly probable, that, if the approach of death had been less rapid, these surfaces of the intestines would have been glued together by the effusion of coagulated lymph.

When the large intestines were examined, the great arch of the colon, instead of being stretched from one kidney to the other, was discovered to have escaped into the left cavity of the chest, through an aperture in the diaphragm. The cœcum and beginning of the colon were much distended with air, and appeared therefore larger than natural; but the colon, on the left side, as it descended toward the rectum, was smaller than it is commonly found.

A small part only of the omentum could be discovered in the cavity of the abdomen, a considerable portion of it having been

protruded into the chest, through the same opening by which the arch of the colon had passed. The displacement of the stomach, and left lobe of the liver, had arisen from the altered position of the colon and omentum; which, in their preternatural course towards the diaphragm, occupied the situation of each of these parts.

When the chest was examined, the left lung did not appear of more than one third its natural size; it was placed at the upper part of the thorax, and was united to the pleura costalis by recent adhesions. The protruded omentum and colon were found at the lower part of the left cavity of the chest, between the lung and the diaphragm, floating in a pint of bloody-coloured serum. The colon, in colour, was darker than usual; in texture, softer, and distended with feculent matter mixed with a brownish mucus. The portion of the intestine contained within the chest measured eleven inches. The omentum was also slightly altered in colour, being rather darker than natural; but, in other respects, this viscus was not changed; it adhered firmly to the edge of the aperture, and more than half of its substance was contained within the chest.

The opening through which these viscera had protruded, was placed in the muscular part of the diaphragm, three inches from the œsophagus; it was of a circular figure, and two inches in diameter; its edge was smooth, but thicker than the other parts of the muscle.

The peritoneum terminated abruptly at the edge of this aperture, so that the protruding parts were not contained in a sac, as in cases of common hernia, but floated loosely, and without a covering, in the cavity of the chest, of which they occupied so large a space, as to occasion considerable pressure on the left lung, and to produce the diminution I have before remarked.

The right side of the chest, also the right lung and the heart, were free from disease.

Could the precise nature of this disease be ascertained during

the life of the patient, but little could be done for her relief; no more, than, perhaps, her own feelings would dictate, the refraining from all kinds of bodily exertion.

From laceration. The third cause of this form of hernia is a wound, or laceration of the diaphragm, and the former inflicted with the small sword, has been the most frequent. The opening is at first prevented from closing, by the pressure of the abdominal viscera, which frequently protrude through it, in small quantity at first; but at length, should the patient survive, very large portions escape.

The only instance in which I have known this disease produced by accident, has been from laceration of the diaphragm, in consequence of the fracture of several of the ribs.

Case. William Rattley, aged thirty, was admitted into Guy's Hospital. About one o'clock on February 5, 1804, having fallen from the height of about thirty-six feet, by which six of the lower ribs on the right side were fractured. When admitted, he breathed with great difficulty, and complained of excessive pain; the crepitus from the fractured ribs could be distinctly felt, and there was slight emphysema. Soon after his admission, he vomited violently, had frequent hiccough, and expired about eight o'clock on the following morning.

Dissection. The following appearances presented themselves on inspecting the body after death. A small wound at the inferior and posterior part of the right lung, with some slight but recent adhesions between the two portions of pleura. On pressing down the diaphragm, a portion of intestine was discovered in the cavity of the chest on the right side, of a livid colour. On examining the cavity of the abdomen, this fold of intestine proved to be a part of the ilium, which passed upwards behind the liver, through the lacerated opening in the diaphragm, into the chest. The aperture in the diaphragm was situated about two inches from the cordiform tendon on the right side, in the muscular structure; it was filled by the intestine, which was confined by a firm stricture. The laceration had been occasioned by the fractured end of the

tenth rib. The other viscera of the abdomen were otherwise but little altered; but near a quart of bloody serum was extravasated into the cavities of the chest and abdomen.

OF THE MESENTERIC HERNIA.

Cause. This hernia occurs in consequence of a natural deficiency of one of the layers composing the mesentery, or from an accidental aperture being made.

Formation. The intestines force themselves into such an opening, and, quitting the proper cavity of the peritoneum, form a hernia, which may become of very large size, as the cellular union of the two layers is not sufficiently firm to offer much resistance to the pressure of the protruding viscera.

Case. Mr. Pugh, of Gracechurch Street, afforded me an opportunity of examining a hernia of this kind. The subject in which it was found, had been brought for dissection to St. Thomas's Hospital; and the man had been a patient under Mr. Forster, in Guy's Hospital, just previous to his death.

Appearances. On opening the abdomen, and raising the omentum and colon, the small intestines were not to be seen, but a large swelling was discovered, situated over the lumbar vertebræ, and reaching to the basis of the sacrum; which, on further examination, proved to be a sac of peritoneum, containing the small intestines, and surrounding them completely, excepting at the posterior part, where the aperture by which the intestines had escaped, was situated.

From what I could collect of the previous history of the patient, he did not appear to have been much inconvenienced by this unnatural position of the viscera.

OF THE MESOCOLIC HERNIA.

The formation of this hernia is similar to that last described; and the first example I had an opportunity of examining, was, as the former, in a subject brought to the Hospital for dissection.

Appearances.

The abdomen having been opened, and the omentum and large intestines turned up, a tumour was discovered on the left side of the cavity, extending from over the left kidney, to the edge of the pelvic cavity, the lower portion being situated in the fold of the sigmoid flexure of the colon. The large intestines took their usual course, only that the cœcum was nearer to the centre than in common. On the left side, the colon was raised by the tumour. The duodenum, a small part of the jejunum, and termination of the ilium, were the only parts of the small intestines to be seen, on first opening the abdomen, all the rest being situated in the sac, having protruded by an aperture on its right side, which was large enough to admit two folds of intestine in a distended state.

The sac was formed by the peritoneal layers of the mesocolon.

Dr. Jones's case.

Dr. Jones, of Barbadoes, sent me a drawing, exhibiting the larger part of the moveable viscera, between the layers of the peritoneum, as found when examining the body of a patient he had attended.

OF STRANGULATION OF THE INTESTINE WITHIN THE ABDOMEN.

This I have known to occur in several different ways.

Causes.

First.—From the intestine protruding through an aperture in the omentum, mesentery, or mesocolon.

Second.—From the same circumstance occurring when small openings are left in the adhesions formed in consequence of inflammation.

Third.—From a membranous band formed at the mouth of a hernial sac, becoming elongated, and entangling the intestine when it has been returned from the hernial sac.

Fourth.—From the appendix vermiformis entangling the intestine.

Case.

Mr. R. Croakes, surgeon, of Barnsley, in Yorkshire, sent me the account of a case in which a portion of intestine had been protruded through an opening in the omentum, and had become strangulated. The patient was eighty years of age, and had been

previously very healthy and active. The case terminated fatally, two days after the commencement of the symptoms; and on examination after death, the intestine was found in a gangrenous state.

A case in which a portion of small intestine had protruded through an opening in the mesentery, and become strangulated, occurred under the care of Mr. Palmer, of Hereford. The symptoms were severe, but the patient survived until the ninth day from their commencement. Case.

Dr. Monro has related a case of this nature in his work on crural hernia.

Mr. Hodson, of Lewes, attended a young man who died in consequence of the strangulation of a fold of small intestine, which had protruded through an aperture left in an adhesion of the omentum to the peritoneum. Case.

I have a very excellent specimen, showing the strangulation of intestine by elongated membranous bands. It was taken from the body of a patient of Mr. Weston's, of Shoreditch. The patient was eighty-five years of age, and resided in Hoxton Workhouse. He was seized with symptoms of strangulated hernia, in consequence of which Mr. Weston was sent for, who, on examining the man, found a hernia on the right side, which he soon reduced by the taxis. The symptoms, however, continued, and the patient died. On examining his body after death, I found that the intestine had been returned into the cavity of the abdomen, but that two folds of it were entangled and strangulated by a long membranous band. Case.

In the Museum at Guy's Hospital is a beautiful preparation, showing a considerable portion of the small intestine, surrounded and strangulated by the appendix vermiformis; but I am not acquainted with the history of the patient from whom it was taken. Specimen in Guy's Museum.

As the precise nature of any of the above cases could not be ascertained during the lives of the patients, no benefit could be derived from surgical aid.

LECTURE XLVII.

ON WOUNDS.

Of four kinds.

Solutions of continuity on the surface of the body are of four kinds, according to the manner in which they are produced; viz. Incised, Lacerated, Contused, and Punctured.

Incised, when produced by a cutting instrument; lacerated, when the parts are forcibly rent asunder; contused, when occasioned by some heavy body, or one passing with great velocity; and, punctured, if made by a pointed substance.

This division of wounds is attended with advantage in the description of their treatment, as it must in some degree vary from the mode of their production.

OF THE INCISED WOUND.

Character.

The lips of the divided parts are more or less separated according to the extent of the injury; and the division of the muscles, which, by their contraction, lead to a gaping state of the wound, as in the cheek, the lips, or in transverse incisions in the limbs.

The wound is covered with blood, which is florid or purple, as an artery or vein has been injured. If an artery, the blood flows by jets rapidly, and is of a florid colour; if a vein, the bleeding is slow, gradually filling the wound, and the blood is of a purple colour. Fainting is produced if an artery be cut, but rarely, if the bleeding be venous. Fainting also results if the wound extends to parts of vital importance, even although the hæmorrhage be very slight.

Treatment.

When you are called to a case of incised wound, you are to make pressure upon its surface with a sponge to arrest the hæmorrhage, and if the divided vessels be small, you will soon find it subside under a steady and continued pressure. But if an artery of any magnitude has been injured, it should be drawn from the surrounding parts by a pair of forceps, or raised by a tena-

culum, and then tied with a very fine ligature; one end of which should afterwards be cut off, that no more space than is absolutely necessary may be occupied by the thread or silk.

So soon as the bleeding ceases, the coagulated blood is to be completely sponged away from the surface and edges of the wound, the edges are to be brought together, and a strip of lint or linen moistened with the blood, is to be placed on the part in the direction of the wound, when the blood, by coagulating, glues the edges together in the most efficient and natural manner; adhesive plaister is to be applied over the lint, with spaces between to allow of the escape of blood or serum.

How closed.

In a few hours, inflammation arises, and fibrin becomes effused upon the surfaces and edges of the wound, by which they become cemented.

Organized.

In a few days, vessels shoot into the fibrin, effused by the inflammation; and it becomes organized with arteries and veins, and after a time, with absorbents and nerves; thus the structure of the part is restored.

Wound of muscle.

If the wound be in a muscular part, more especially in transverse wounds of muscles, it is required that the position of the limb be carefully attended to, that the wounded muscle may be relaxed as much as possible, and its separated portions approximated. Thus, if the biceps muscle were divided in the arm, the limb must be bent at right angles; and if the triceps be injured, extension will be necessary.

Sutures required.

But if the wound has happened in a muscular part, which is not supported, as in the cheek, a suture is required to preserve approximation; the thread employed should be as fine as possible, and only as many as are absolutely necessary, to produce the desired effect, should be inserted.

If a wound be angular, and of considerable extent, a suture at the angle is desirable, or the edges will seldom be returned in their proper situation.

Not injurious.

It is quite a mistake to suppose that sutures are injurious, and that they should be never used; for a wound often heals better

with a suture and a cooling lotion, than with adhesive plaister. Indeed, adhesive plaister should not be applied to the edges of wounds. Often have I seen it produce erysipelas, and sometimes the erysipelas followed by the death of the patient. After the removal of a large tumour from the breast, I often employ a suture to keep the parts in exact contact, and to prevent the edges from becoming inverted.

Reproduction of parts.

When the wound is healed, the parts wounded are generally reproduced. The cutis, and cuticle, easily; the rete mucosum, more slowly. The cellular membrane is for some time indurated, and requires the use and motion of the parts, to be completely evolved.

A number of branches of arteries and veins are formed instead of the original trunks. Nerves are reproduced. Tendons are also again formed. Bones are united by bone.

Muscle not reproduced.

But some parts are not reproduced. There is a specimen in the collection at St. Thomas's Hospital, in which a wound of a muscle is seen united by a tendinous structure. There is also a specimen of a cartilage of a rib united by bone, but in young persons cartilage is reproduced.

Parts nearly separated untie readily.

Parts which are nearly separated readily unite, as the finger or the nose when it has been cut, or torn, and a suture is required to aid its union.

Parts entirely separated will unite.

Parts entirely separated in other animals sometimes unite. Mr. Hunter removed the spur of a cock, and placed it in the comb by incision, where it not only adhered, but grew. He also removed the testis of a cock, and placed it in the belly of a hen, where it adhered. A tooth extracted from the human subject, and placed in the comb of a cock, adheres there.

The only instance in which I have seen a part removed entirely, and afterwards adhere, was in the following case:—

I amputated a thumb for a patient in Guy's Hospital; and, finding that I had not preserved a sufficient quantity of skin to cover the stump, I cut out a piece from the thumb which I had removed, and applied it upon the stump, confining it by strips of

adhesive plaister. On taking off the dressings a few days after the operation, I found, that the portion which had been completely separated, and afterwards placed upon the stump, was firmly united and organized.

The most extraordinary instance of the union of a separated part has been related by Dr. Balfour, in the Edinburgh Medical and Surgical Journal, for October 1814, from which the following account is taken :

Case.

" On the 10th of June last, two men came to my shop about eleven o'clock in the forenoon ; one of whom, George Pedie, a house carpenter, had a handkerchief wrapped round his left hand, from which the blood was slowly dropping. Upon uncovering the hand, I found one-half of the index finger wanting. I asked him what had become of the amputated part. He told me that he had never looked after it, but believed that it would be found where the accident happened. I immediately dispatched his companion to look for it, and to bring it to me directly he found it. During his absence I examined the wound, which began near the upper end of the second phalanx on the thumb side, and terminated about the third phalanx on the other side. The wound, which had been inflicted with a hatchet, was quite clean.

" In about five minutes, the piece of the finger was brought: it was quite cold, and white in appearance, like a bit of a candle. I immediately exposed both surfaces to a stream of cold water, to wash the blood off the one, and any dirt that might adhere from the other. I then applied, with as much accuracy as possible, the wounded surfaces to each other, expressing a confident opinion, that reunion would take place.

" I endeavoured to inspire the patient with the same hopes, but he did not appear convinced of the possibility of such an occurrence. I informed him, that unless pain, or fœtor, or both should occur, I would not remove the dressings for a week at least. I directed him to keep his arm in a sling, and not to attempt any kind of work ; to which he promised obedience. He called on me the next day, when he was quite easy, but the wound had bled

a little. Although he promised to call on me daily, I did not see him again till the fourth of July. I had concluded, that he had applied to some other practitioner; but, on the second of July, a gentleman called on me, and gave me the following account of the patient:—

"Two days after the accident, the patient, under the influence of the ridicule of his acquaintance for giving credit to my assurances, applied to another practitioner; who, on learning the history of the case, represented the impropriety of any one but myself intermeddling with it. But, prepossessed with the belief that he carried about a portion of dead matter tied to the stump of his finger, the man insisted upon having the bandages removed, which was accordingly done. Thus were nearly rendered abortive my attempts to produce reunion of the parts, and the profession deprived of a fact, which, as demonstrating the powers of nature to repair injuries, is inferior to none in the annals of the healing art. Fortunately, however, nature had been too busy for even this early interference to defeat her purpose,—adhesion had taken place.

"In consequence of the information I got from this gentleman, I found out the patient on the fourth, when reunion of the parts was complete. The finger was in fact the handsomest the man had, and had recovered both heat and sensation. In the progress of the cure, the skin was changed, and soon after the accident the nail fell off.

"From the account of persons present when the injury was inflicted, I am satisfied that twenty minutes must have elapsed before the parts were replaced; for the patient did not come to me immediately upon receiving the injury, but waited a considerable time in the building where the accident happened.

"The amputated part, as measured by the patient himself, was one inch and a half long, on the thumb side, and one inch on the opposite side."

Adhesion prevents danger.

When adhesion of the incised wounds can be completely effected, the danger ceases. An incised wound into the abdomen, exposing

its different viscera, is not followed by danger if the wound is made to unite. Wounds of the chest, even complicated with injury to the lungs, cease to be dangerous under the adhesive process. Wounds of the brain will unite by adhesion, and the patient recover.

Union by adhesion is prevented by the following circumstances in incised wounds:— Adhesion prevented.

1. By the introduction of many, and of large sutures. It is therefore necessary to employ the finest threads, and to cut off one of their ends, that they may occupy as little space as possible; and in from four to six days, they should be removed; thus they are prevented from producing suppuration and ulceration. By sutures.

2. By the inflammation being suffered to run too high from want of bleeding generally, or locally, by leeches; or, from not employing cooling evaporating lotions. Spirits of wine and water, or acetate of lead and water, should be applied upon the wound, and around it. Purging is also often required. By too much inflammation.

The adhesive inflammation is but a slow degree of action, and if it be not kept in bounds, suppuration will occur.

If poisons be introduced into wounds, it will be wrong to attempt to produce adhesion; thus the bite of a rabid animal should be excised, as well as cauterized afterwards, to prevent the terribly dangerous consequences of such an injury. By poisons.

The use of caustic applications, whether by potash, nitric acid, the actual cautery, &c., will necessarily prevent adhesions. By caustics.

When many absorbent vessels are divided, the lymph poured out by them prevents adhesion, as I have seen in a transverse wound in the groin. When an absorbent is divided.

When the secretory glands are wounded, their secretion prevents union. Or a secerning gland.

I was called to a gentleman who fell upon his face on an earthern plate, which he broke; his face was dreadfully wounded; I brought the parts together, and in ten days they appeared to be united, when I allowed him to eat; but the result was a profuse Case.

discharge of saliva from the wound, which was a very long time in healing, on account of the parotid duct having been cut across.

By the surgeon's imprudence.

Union by adhesion is often frustrated by the surgeon's impatience; he is anxious to see if union be effected or not, and most absurdly and mischievously raises the dressings, disturbing, and often breaking, the adhesions, and thus rendering the process of granulation necessary, when it might have been avoided.

By state of constitution.

The adhesive inflammation is often prevented by the state of the constitution; if the patient be much out of health, or if he be extremely irritable, the inflammation will proceed beyond the bounds of adhesion, and suppuration will take place. In such persons, evaporating lotions to the wound, and opium internally, are the means of arresting the mischief which will otherwise ensue.

Adhesion not always desirable.

It is not always an object to endeavour to produce adhesion; when there is much loss of substance, and the parts must be forcibly drawn together, much additional pain and irritation are occasioned by the attempt at adhesive union, and this is more especially the case in children, when the skin cannot well bear the application of the adhesive plaister. Therefore, when I remove

Nævi materni.

those marks which are called nævi materni*, I do not attempt to bring the edges of the wound together; but only, after the bleeding has ceased, apply lint for twenty-four hours, and then a poultice to the part by which much pain and irritation are avoided. The breast I often dress in the same manner, after the removal of tumours connected with much disease of the integument.

OF LACERATED WOUNDS.

Character.

These wounds bleed much less than the incised, for a reason which will be described when we speak of wounds of arteries;

* Nævus Maternus.—A mother's mark, which is congenital, and is said to be produced by the longing of the mother for particular things, or her aversion to them. Hence these marks resemble mulberries, strawberries, &c., &c.

but here it is sufficient to say, that the largest arteries of limbs may be torn through without any dangerous bleeding occurring.

Differ from incised.

Lacerated wounds also differ from incised, in their often containing extraneous bodies. Those of the scalp are frequently filled with dirt, from the head ploughing the ground, and the utmost care is required to cleanse them with warm water, and to remove with a sponge all extraneous matter, as I have seen such a wound adhere, and afterwards suppurate in various places, for the discharge of the foreign bodies which the adhesive matter had at first confined.

More disposed to inflame.

Lacerated wounds are more disposed to inflame, than the incised, and they require much more attention to the use of evaporating lotions, and of leeches to suppress it.

Affect the nervous system.

The nervous system frequently suffers severely from lacerated wounds. Spasms of the limbs, and tetanus, I have often seen follow these lacerations on the hand.

Case.

I was sent for to see a young gentleman at Marlow, who had fallen into a hedge and torn his hand with a thorn bush; he died from tetanus. In the hospitals, from lacerated wounds of the fingers, made by machines for combing wool, I have several times known tetanus produced; the tendons and fascia in these cases had been much exposed and injured.

Produce erysipelas.

Erysipelas is not an unusual effect of lacerated wounds, more especially if they are inflicted on the scalp, and they therefore require great attention, although they at first appear of trifling importance.

Treatment.

The treatment of these wounds is the same as that which has been described for incised wounds; but more care is required in the use of cooling lotions, and the application of leeches, in quiet, and in the exhibition of opium under the first appearance of spasmodic symptoms.

Patients with lacerated wounds, should not be much reduced by depletion, as it disposes to tetanic symptoms.

LECTURE XLVIII.

OF CONTUSED WOUNDS.

Character. These injuries differ from the incised and lacerated wounds, in being accompanied with disorganization: blood is extravasated, the cellular tissue is broken down, muscles are bruised, and many parts disorganized.

Process of reparation. The process of restoration is therefore quite different to that which takes place after incised or lacerated wounds.

Sloughing. Inflammation to a considerable extent must be produced; the dead parts must be separated by a process of ulceration, and granulations will arise to fill up the cavities occasioned by these separations. The surgeon, therefore, who treats these wounds as he would the incised or lacerated, has still to learn the fundamental principles of his profession.

Contused wounds bleed but little, from the organization of the parts being destroyed, and from the extravasation making pressure upon the vessels which are divided.

Treatment. The treatment of the contused wound in principle consists in facilitating the separation of the contused parts, instead of approximation, as in the incised and lacerated wounds. To effect this object, and to expedite the process, fomentations and poultices are to be used, which lessen inflammation when too violent, and hasten the suppurative and ulcerative processes. If the inflammation be still considerable, leeches should be applied; but bleeding ought not to be had recourse to from the arm, for all the powers of the constitution are required to assist in the process of separation and of granulation.

Medicines. The bowels should be kept regular; but opium should be combined with the medicines given, to effect that object. If the constitution become much debilitated, the sulphate of quinine may be given; or ammonia, combined with opium.

Applications. When the sloughing, or separating process is completed, the

fomentations and poultices are to be abandoned, and the parts may be approximated by adhesive plaister, or simple dressing be applied to the wound, treating it as a simple ulcer.

OF PUNCTURED WOUNDS.

Danger of.

These wounds are produced by pointed bodies, as needles, scissors, hooks, points of broken bones, &c.; and the effects which follow them are often highly dangerous, by occasioning inflammation of the absorbents; or when tendinous structures or nerves are injured.

OF THEIR EFFECTS UPON THE ABSORBENTS.

A slight wound through the skin into the cellular tissue, will be sometimes followed by severe pain in the part, a blush around it, and by the absorbent vessels forming red lines, from the wound to the absorbent glands in which they terminate.

Consequences.

Of this effect I have seen very many examples, and I have been a sufferer from it myself. Abscesses sometimes form upon the absorbents, in their course to the axilla, or to the groin; and sometimes in the glands in which they terminate; and in very irritable persons death sometimes ensues; and the following example of it I had an opportunity of inspecting.

Case.

A West Indian, studying at Guy's Hospital, wounded his finger, the absorbents of his arm became inflamed, and he laboured under excessive irritative fever; the veins seemed to suffer also from inflammation communicated to them, for his limbs became almost incapable of motion, from the violent pain produced by bending any of the joints, and the superficial veins of his limbs were very tender when pressed. He died in six days after the attack, and I inspected his arm. The absorbents of the limb were highly inflamed; and in the axilla matter was effused, not in a separate abscess, but in a sheet of suppuration in the cellular tissue, between and around the absorbent vessels. I was not permitted to inspect the body further.

Case. After an inflammation of this kind in myself, produced by wounding my finger when opening the body of a man executed on the same morning, my throat became sore as the inflammation in the absorbents of my arm subsided, and one of my knees became stiff from rheumatism; when this was subdued by a blister, the other knee became similarly affected.

Poison absorbed. It would seem that under certain circumstances a poison is produced sufficiently strong to excite inflammation, even when there is no wound.

Case. Mr. Cook, surgeon, at Marsh-gate, Westminster Bridge, sent to me whilst he was labouring under the highest irritative fever, in consequence of having opened the body of a person who had died of puerperal fever. When I examined him, I found the extremities of his fingers of both hands inflamed, as if they had been dipped in scalding water, and the absorbents of his arms red, hard, and knotted, to the axilla; yet he had not any wound or abrasion of any kind upon his hands; and it would therefore seem, that the fluid produced in the abdomen of this woman, in which his fingers had been frequently immersed, was of a highly stimulating nature.

Form of wound and state of constitution. The effect of punctured wounds depends, however, very much upon the form of the wound, and the state of the constitution. When punctures have been made, by a clean needle, the tongue of a knee-buckle, a fragment of bone, &c., nothing can be introduced of a poisonous nature, and the effect must depend upon the form of the wound, and the structure injured. But the effect also depends upon the state of the constitution, as is evinced in our young students suffering in the spring, after confinement in London, in the air of our dissecting room, and in the wards of our hospitals, and by their escaping these violent symptoms in the autumn, when they have just quitted the country.

I believe, therefore, that these effects arise from the form of the wound, and the state of the constitution; also occasionally, but rarely, from the introduction of an irritating fluid, the result of

peculiar inflammation, or the production of the first stage of putrefaction.

I have known the bites of cats, dogs, and rats followed by high inflammation, and constitutional irritation, many days after the injury has been inflicted; and these cases unite the symptoms of punctured and contused wounds; the first effects upon the constitution arise from the punctures of their pointed teeth; but when the symptoms produced from this cause subside, from fifteen to twenty days after, I have known the injured parts inflame and slough; the constitution, as well as the part, undergoes great changes, and the patient becomes excessively reduced. Bites of dogs and cats.

The treatment of punctured wounds consists in adopting the following plan:— Treatment.

First.—A lancet should be used to extend the puncture to an incision.

Second.—The surrounding parts should be pressed to remove, by the blood which issues, any extraneous matter which may have been introduced. If the finger is wounded, a piece of string or tape should be bound tightly round the injured finger, from its junction with the hand, as far as the wound, so as to force out blood from the opening.

Third.—The nitric acid, nitrate of silver, or caustic of potash, should be applied to the wound.

Fourth.—A lotion composed of the subacetate of lead; spirits of wine and water should be applied over the part, to prevent too much action when inflammation begins.

Fifth.—Leeches should be applied, and fomentations with poultices employed, if the pain and inflammation become considerable.

Sixth.—Give calomel and opium at night, and a brisk purgative in the morning.

Seventh.—Let the limb be supported on an inclined plane, so that the blood shall gravitate towards the body; all stimulating food and drink should be avoided; a measure so absurd that a caution against it appears unnecessary; but an anatomist killed

himself by taking wine to oppose the putrefactive influence of the matter he supposed to be absorbed.

Inflammation returns.

The inflammation from punctures of the hand in dissecting, will continue a long time, and be resumed when it seems to be at an end; attention to the general health, and to the part, must be therefore regarded closely, for a considerable period after the injury.

OF PUNCTURED WOUNDS OF TENDINOUS STRUCTURE.

Danger of.

If fascia be punctured, alarming symptoms will sometimes arise, in part from the form of the wound, from the feeble power of the structure, and partly from the confinement of matter beneath the fascia.

Form of the wound.

The form of the wound produces these symptoms, because the parts are rather forcibly separated than actually divided, and consequently the adhesive process does not readily succeed. The structure of tendons and fasciæ, from their little vascular organization, and difficult restoration, leads to much constitutional effort; and the form of fascia tends to confine the pus when it is secreted.

Case.

A gentleman sat upon a rail, from which a nail projected, and it entered the middle and back part of his thigh; great irritative fever followed, with redness and swelling of the thigh; and, as fomentations and poultices, and calomel with opium, did not relieve him, I made an incision in the situation of the puncture, and found that the nail had penetrated the fascia lata: I divided it freely, when some pus, which had formed under it, was discharged. He quickly recovered.

Early incisions.

When a puncture is made into a theca, suppuration is apt to ensue, when an early incision, by allowing the discharge of the matter, prevents the greatest mischiefs.

If matter forms under the aponeurosis of the palm of the hand, an early incision is the only mode of relief, if the puncture which

occasioned the suppuration is too small to admit of the escape of the pus.

The treatment, therefore, of these wounds, consists in endeavouring to prevent suppuration by leeches, and evaporating lotions, in the first instance; but, if matter does form, to open the abscess early, both with a view of making the punctured an incised wound, and to give a free outlet for the escape of the pus. Treatment.

ON THE EFFECTS OF PUNCTURED WOUNDS ON THE NERVOUS SYSTEM.

The spasmodic and tetanic symptoms which follow punctured wounds, are the effects of injury to tendinous, rather than nervous parts. Most of the cases of tetanus which I have seen occur from punctured wounds, have been when the hand or foot has been the seat of injury; the aponeurosis of the palm, or sole, or the tendons being hurt. I will not deny that an injury to a nerve will produce the same effect; but I cannot help doubting its being the usual cause. Tetanic symptoms.

I divided the posterior tibial nerve in a Mrs. Sabine, the wife of a surgeon at Dunchurch, for a painful tumour on it; and little constitutional irritation was produced by the operation. Case.

I removed a tumour from the median nerve of a gentleman, and cut away two-thirds of the thickness of the nerve, leaving one-third; tingling of the fingers, with some partial numbness, followed, but no constitutional irritation; and he did very well. Case.

I cut out five-eighths of an inch of the radial nerve, for aura epileptica; and no unpleasant symptom followed, but the patient got well. Case.

Mr. Key removed a portion of the cubital nerve, for aura epileptica; and, although it did not cure the woman, it produced no unfavourable symptoms.

These instances, to which many more might be added, as well as the usual seat of the wound, which produces tetanus, lead me to

believe that it is rather the result of injury to tendinous than to nervous structures.

Extensive injuries, by their sympathetic influence, and by their severe shock to the nervous system, produce the destruction of life, even without vascular reaction or inflammation.

The symptoms which arise are sometimes only general spasm, sometimes trismus, and sometimes tetanus.

Case. I once saw a boy die, in a few hours, of the most violent spasms of most of the muscles of his body, from the pointed extremity of a broken thigh-bone having penetrated the under side of the rectus femoris.

Case. I saw a person die from spasm, produced by a punctured wound in the triangular ligament of the pubes, from a sharp piece of wood; and I have seen a great number of such cases from injury to the hand and foot.

Degree of spasm varies. Sometimes, instead of this general spasm, the influence of the wound is particularly felt in the muscles of the jaw, producing trismus, with the subsequent affection of the muscles of volition, and afterwards those of respiration, constituting tetanus. Sometimes the muscles of the posterior part of the trunk are more particularly affected, when the term opisthotonos is applied to the disease; and sometimes, on the contrary, the muscles of the anterior part are chiefly attacked, when the disease is named emprosthotonos. In the first case, the body is curved forcibly backwards; and, in the second instance, forwards. The muscles of the extremities become also extremely rigid and contracted, so that the joints cannot be moved; and, in the greater number of cases, life is destroyed in a few days.

Tetanus, acute and chronic. However, it may be observed, that there are two kinds of tetanus; one of an acute form, which generally terminates the patient's existence; and the other, of a chronic nature, which, after a time, is often recovered from.

Treatment. The treatment which I have seen pursued in acute tetanus, has been,—

Warm bath.

The warm bath, which gives a temporary tranquillity, and slightly reduces the spasms; but is not followed by any permanent good effects.

Bleeding.

Bleeding, which hastens the patient's death; it reduces the powers of the body; and, although the spasms are less violent, they destroy sooner.

Opium.

Opium, I have generally seen given; but, in acute tetanus, never with any other advantage than a slight mitigation of the symptoms for a short period. I once saw Mr. Stocker give, at nine o'clock in the evening, half an ounce of tincture of opium, and at eleven o'clock an ounce more, without any permanent beneficial influence. To me, it appears to be absurd to resort to a treatment which has been repeatedly found to be inefficacious.

Tobacco.

Tobacco injections I have seen used, but with no permanent advantage.

Digitalis.

Digitalis I have known employed, but uselessly.

Cold.

Ice I have seen extensively applied; but all these means, in acute instances, fail.

Cases.

Mr. Ward, of Gloucester, has lately published two cases, which were relieved by the hydrocyanic acid.

Treatment of chronic tetanus.

Chronic tetanus I have known relieved by calomel and opium, by the cold and shower baths, by large doses of the tincture of muriate of iron; but I have also known persons recover who had scarcely taken any medicine; thus throwing a doubt upon the efficacy of those which had, in other cases, been supposed to be beneficial.

Trismus rarely fatal.

In every instance, in which I have witnessed the existence of trismus, the patient has recovered. Calomel and opium are the best medicines; and a blister to the head the most efficacious local remedy.

LECTURE XLIX.

OF WOUNDS OF ARTERIES.

Division.

These wounds we shall divide, as wounds in general, into the Incised, Lacerated, Contused, and Punctured.

When an artery is cut into, or divided, the immediate effect of such injury is to occasion an impetuous hæmorrhage of florid blood, which, if the artery be large, whizzes through the wound. It flows in pulsation in obedience to the action of the heart.

If the wounded orifice, nearest to the heart, be compressed, the blood from the opening, most remote from the heart, flows in an uninterrupted stream, and is of a dark venous colour, owing to its having passed through capillary vessels.

Fainting produced.

The brain soon ceases to be supplied with blood, and fainting is produced: sensation and volition become suspended; and the action of the heart is in a great degree suppressed; the flow of blood from the wound becomes much diminished, and sometimes entirely ceases.

Recovery from fainting.

In a few minutes the patient opens his eyes, and the power of the nervous system is restored.

Modes of arresting the bleeding.

The mode by which bleeding is arrested may be either constitutional or local. Fainting is the constitutional mode, by suspending the voluntary and involuntary functions, more especially in the diminution of the action of the heart, so that the blood scarcely reaches the wound, but it undulates in the heart, and large vessels under the fluttering of the heart.

Local means.

The local means consist in, first, the coagulation of the blood, which is effected in the cellular tissue around the artery, and also in the extremity of the wounded vessel, forming a plug; so that there is a continuation of coagulum from the outer surface to the orifice, and this sufficiently opposes the issue of blood under the enfeebled action of the heart.

But this process is also aided by the contraction of the artery, not particularly at the divided part, but also to a considerable extent from the orifice. Contraction of the vessels.

If the carotid artery, on one side, be cut across, and examined after the death of the animal, the artery is found much smaller on the wounded side than on the other which has not been injured. This state of the vessel lessens the influence of the blood upon the wound.

A retraction of the artery also follows when the division of the vessel is complete; and, by withdrawing itself into the cellular membrane, the blood becomes effused around it, so as to compress its orifice. Thus, then, it appears that coagulation with contraction and retraction of the vessel, all concur to put a check to the bleeding. Retraction of the vessel.

These, then, are the immediate means; but it is required that a further process should take place, to render their effects permanent. Inflammation follows; and the clot of blood becomes glued to the inner surface of the vessel, whilst effusion into the surrounding parts creates pressure upon the artery so as to diminish its calibre; this inflammation also usually produces a union of the edges of the wound, or otherwise granulations arise, fill it, and thus it becomes closed. Process of inflammation.

The treatment, when an artery of not a very large size, is divided in an extremity, is to apply a tourniquet to compress the trunk from which it is supplied; this, with gentle pressure on the wound for a short time, will generally command the hæmorrhage, when the edges of the wound may be approximated, and union promoted, leaving on the tourniquet, so as to continue a moderate pressure on the trunk. Pressure.

But if the vessel be large, it is necessary to make an incision in the direction it takes, so as to expose the wounded portions, when a ligature must be placed above and below on each portion of the vessel. The ligatures should be small, and one of the ends removed after their application. Dr. Vetch first recommended the removal of one of the threads. Application of a ligature.

When an artery is not completely divided, its retraction is prevented, and a coagulum, with difficulty, forms in it, and, when formed, is easily forced off by the action of the heart. Hence, in a week or ten days after the injury, bleeding will sometimes occur; and repeated hæmorrhage will destroy the patient if a ligature be not applied. I have known the temporal artery bleed eleven days after its partial division, and when the wound in the integument was almost closed.

The treatment of this injury consists in completely dividing the vessel, when its retraction enables a coagulum to form in, and around it; but, if the artery be large, a ligature must be applied.

LACERATED ARTERIES.

These bleed comparatively little.

Case. A sailor, on board a Margate Packet, was bringing up his vessel in the river, and having his leg in a coil of the cable, the anchor was unexpectedly let go, when the cable caught his thigh, and tore off his leg six inches above the knee, excepting that a small portion of skin still connected the parts externally; the bone was broken; the artery, vein, sciatic nerve, and muscles, were all completely separated. A handkerchief was bound around the wound, and he was brought to Guy's Hospital. The artery had ceased to bleed, but he had lost a considerable quantity of blood. I amputated his limb, and he proceeded favourably for ten days, when he was seized with tetanus, and died.

Case. I have also seen the foot torn off above the ancle, and the bleeding stop without the aid of tourniquet or ligature.

Cheselden's case. The case related by Cheselden, of the arm being torn off at the shoulder without much hæmorrhage, is known to every surgeon.

Causes which prevent bleeding. There are two causes which operate to prevent bleeding:—

1. The cellular tissue is sometimes drawn over the mouth of the vessel, and makes a ligature upon it, which stops the blood.

2. Another state of the artery produces the same result, and it

which the mouth of the vessel remains open, the coats of the artery are excessively elongated, and its sides fall together so as to render its canals impermeable.

The best treatment is to apply ligatures upon lacerated arteries, if they be large; otherwise, when the powers of circulation are restored, there is a danger of hæmorrhage. Treatment.

OF PUNCTURED ARTERIES.

They produce different symptoms from the other wounds of arteries in this respect, that the external opening being small, the blood does not readily escape; and therefore coagulates in the cellular tissue, and forms a swelling there, which gradually increases in size as the blood issues from the wound in the artery; the impetus of the blood causes a pulsation; and the cellular membrane, around the extravasated blood, being condensed, forms a sac, which impedes the evolution of the swelling. The external wound heals, and thus an aneurism is formed. Consequences.

It may be said that it differs from an aneurismal swelling in the mode of its production; and this is true, but it still has the other characters of the disease, and requires the same treatment.

I have several times known it happen from bleeding in the arm; in one case the radial artery was wounded, but in all the other cases, the brachial artery. Puncture in bleeding.

The first case was in a patient at Guy's Hospital; a dresser of Mr. Lucas, senior, bled the man, and he came to me excessively alarmed, telling me what had happened, and that he had great difficulty in stopping the hæmorrhage, but had at last succeeded, by applying a very tight bandage. A short time afterwards the man came to Guy's, and showed his arm to Mr. Lucas, who, seeing the aneurism, and hearing the cause, told the man that he must submit to an operation, which the patient refused. In walking home, he met an old acquaintance, to whom he told the circumstances; this friend, who occasionally bled and drew teeth, said he would cure Case.

him, and inviting him into his shop, he put a lancet into the swelling, and finding blood impetuously escape, he as quickly escaped from his shop. The patient finding himself bleeding, fortunately put his hand upon the wound, and called for assistance. A bandage was bound tightly round his arm, and he went to St. Thomas's Hospital, where Mr. Cline operated upon him, when the radial artery, in consequence of a high division, was found to be the wounded vessel.

Case. One of the apprentices at Guy's Hospital had the misfortune to wound the brachial artery in bleeding; he immediately perceived the nature of the mischief, but before he could arrest the bleeding, thirty-seven ounces of blood were lost. He bound up the arm extremely tight, and when the bandage was removed a few days after, an aneurismal swelling appeared at the fore part of the elbow, for which an operation was performed, of tying the artery at the part, an operation which was attended with great difficulty, and the patient died.

Case. I once assisted Mr. Chandler in performing the operation for brachial aneurism, produced by bleeding; the sac was opened, and the orifices above and below were secured by ligatures, but still there was a free hæmorrhage, from an anastomosing vessel, which it was necessary to secure.

Treatment. The treatment of this injury consists in the immediate binding up of the wound, and applying a tourniquet to the middle of the arm, which should press upon the artery, and upon the opposite side of the arm only, leaving the circulation by anastomosis as free as possible.

If aneurism forms. If an aneurism still follows this accident, the tourniquet is to be continued, as described in the lecture on aneurism.

Operation. Should the tumour still continue to increase after this has been fully tried, it will be proper to make an incision upon the brachial artery, about midway between the elbow and shoulder joints, and place a ligature upon it, but upon no account cut down upon the wounded vessel at the elbow.

In one instance, after I had applied a ligature to the brachial artery, I was surprised to find the thread completely separated on the fifth day; but the ulcerative process was probably accelerated by the inflammation which existed previous to the application of the ligature. The patient recovered.

OF CONTUSED WOUNDS OF ARTERIES.

Danger of.

Gun-shot wounds and severe bruises sometimes destroy the vitality of a portion of artery. As it will afterwards slough, there is a remote danger in such a wound, which must be carefully guarded against. The slough will not separate until from eight to ten days, or more, after the wound has been inflicted; and then the patient, without precaution, may lose an immense quantity of blood, and sometimes be destroyed by the hæmorrhage.

The slough opens the vessel upon its side; and, no retraction ensuing, the hæmorrhage is unrestrained by the coagulation of the blood.

Treatment.

In these cases, it is required that the patient should be kept at rest until the sloughing process be completed; and he must be instructed in the tightening of a tourniquet, which must be applied, and left constantly upon the limb, until all the sloughing has ceased.

Case.

A gentleman received a shot through the calf of his leg, and was proceeding so well as to be suffered to sit up, and to put his limb to the floor; on the seventeenth day, he was seized with a severe bleeding, from the effects of which he sunk.

On the Treatment of Wounds of particular Arteries.

ARTERIES OF THE SCALP.

Wounds of these arteries require in their treatment,—first, a complete division of the injured vessel;—second, the application of pressure;—by the first, retraction is permitted, and future bleeding is prevented;—by the second, the present hæmorrhage is suppressed.

Case. I was called one night to see the son of Dr. Johnson, who was bleeding freely from the temporal artery, which had been opened by a leech. I did not like to make an incision, but advised the application of a small tourniquet, which completely succeeded; and this instrument I should advise in all wounds of arteries of the scalp, as the means of pressure.

Of aneurism. In aneurism, from wounds of the arteries of the scalp, I have, in each case that I have operated upon, been obliged to open the aneurismal sac, and to tie each communicating artery.

The aneurisms which I have seen on the scalp from injury, have been in the temporal and posterior aural arteries, and have arisen from wounds and contusions.

CAROTID ARTERY.

Speedily fatal. The wounds of this artery are usually so speedily fatal, that surgery is rarely able to preserve life.

Securing the artery. In tying the artery the pars vaga must be excluded from the thread, and although the dissection of parts from the artery cannot be made at the moment of securing the ligature, yet when the hæmorrhage is stopped, a fresh ligature may be placed upon the artery alone, instead of depending upon that which has been of necessity employed at first.

SUBCLAVIAN ARTERY.

Torn. I have never seen this artery wounded, but I have seen it torn through.

Case. A man was brought into Guy's Hospital with a fracture of the clavicle, in which accident the shoulder was very forcibly drawn back to the spine. The dresser had to bleed this man in the injured arm, but little blood could be drawn; and, thinking that he had not passed the lancet sufficiently deep, he plunged it so far as to wound the brachial artery. The blood which issued from the wound, was of a venous character, but it required a very

ight bandage to stop the hæmorrhage. Great tumefaction succeeded about the shoulder, gangrene began in the arm, great constitutional irritation followed, and the man died. Upon examination of the body after death, it was found that after the fracture of the clavicle, the scapula was forcibly drawn back, so that the subclavian artery was torn through, but a cord of cellular membrane united its ends, so that the extravasation of blood had been very slight.

AXILLARY.

Mr. Key operated, and tied the subclavian artery, on account of an aneurism of the axillary artery, which had been produced by a forcible extension of a dislocated os humeri. Mr. Key's case.

BRACHIAL ARTERY.

This artery I have often known wounded in bleeding. Wounded in bleeding.

A slight bandage, and a thick dossil of lint as a compress, have succeeded in healing the artery. Treatment.

If aneurism forms, the tourniquet should be employed, as I have described; and if this does not succeed, apply a ligature upon the brachial artery. Make an incision in the middle of the arm, on the inner side of the biceps, and take care to exclude the vein and median nerve from the ligature. When an aneurism forms.

ULNAR ARTERY.

The wounds of this artery are usually at the lower part of the fore arm, where the vessel is situated, between the tendons of the flexor carpi ulnaris, and the flexor profundus; it is accompanied by the cubital nerve, which is placed close to the artery, and which must be carefully excluded from the ligatures. On account of the free anastomosis between this artery and the radial, the application of two ligatures, one above, and another below the opening into the vessel, is absolutely necessary to effectually stop the hæmorrhage. Injuries of.

RADIAL ARTERY.

This artery is much more frequently wounded than the ulna, being in every respect more exposed. The application of two ligatures is equally necessary, as in the ulna, and for the same reason. This vessel is readily found on the outer side of the flexor carpi radialis, and it is not accompanied by any nerve of magnitude.

OF THE PALMAR ARTERIES.

Frequently wounded.

Wounds of the palmar vessels are very frequent, but generally the bleeding may be stopped by steady and continued pressure, by means of a compress and bandage, and by a tourniquet on the brachial artery; the application of cold, and attention to position, will materially assist. Should these means fail to arrest the bleeding, and if the openings of the divided vessel cannot be easily found, it will be necessary to secure the ulna, or radial arteries, or both; as from the very free communication of these vessels, the securing of one only, will not, in many instances, prevent further bleeding. It will be best, however, in wounds of the superficial palmar arch, under such circumstances, first to put a ligature upon the ulna artery, and then try pressure again, before the radial is taken up; which should not be done unless a troublesome hæmorrhage continues. On the contrary, should the deep palmar arch be the seat of injury, and it become necessary to secure an artery, the radial should be first tied, and afterwards, provided the bleeding does not stop, the ulnar should be likewise secured.

OF THE FEMORAL ARTERY.

High up in the groin.

If this artery be wounded high up in the groin, the finger must be thrust into the wound to stop the bleeding, until a compress can be applied upon the pubes, and the vessel be secured.

If it be wounded in the middle of the thigh, in the mode which I have described in the case of a relation of Mr. Saumarez, a large swelling will immediately form, and the artery will be deeply situated, under a large coagulum. A free incision must be made to give the surgeon ample room to proceed in securing the wounded vessel, a tourniquet being first applied. The direction of the incision will be that required in the operation for popliteal aneurism, only it must be more extensive. The coagulum, which is then exposed, must be scooped out from the wound by the fingers, and the parts be cleanly sponged. The tourniquet is then to be loosened, and the aperture in the vessel will be directly seen, when the tourniquet is to be again tightened, and two ligatures are to be placed in the artery, one above, and the other below the wound, an end of each thread being cut off; the edges of the wound are to be approximated, so as to favour the union by adhesion.

In the middle of the thigh.

Treatment.

It is always right in these cases to divide the artery, between the ligatures.

OF THE POPLITEAL ARTERY.

This vessel is so protected by the condyles of the os femoris, and so concealed behind the bone, that it is rarely lacerated, and when it is so, the wound must be highly dangerous, as it will be probably complicated with a division of the sciatic nerve.

Rarely wounded.

It was a case of this accident which first attracted my attention to surgery, and which taught me its value.

A foster brother of mine, named John Love, aged about thirteen years, was playing and fell, as a waggon was passing, and one of the wheels of the waggon went over the back of his knee, as he lay with his face to the ground. The waggon was stopped, and when he was drawn from under it, a stream of blood directly burst from his ham; a handkerchief was tied tightly over the wound, and he was put upon the waggon, and was carried home in a fainting state. Different surgeons in the neighbourhood were sent for; but when they heard the nature of the case they all made excuses;

Case.

one had a most dangerous case of fever, another was at a labour; a third with a pressing case of inflammation of the bowels; they were all engaged, and could not come, or, like the hare and many friends,—

> " She first, the stately bull implored,
> And thus replied the mighty lord;—
> Since every beast alive can tell,
> That I sincerely wish you well,
> I may without offence pretend,
> To take the freedom of a friend.
> *Love* calls me hence," &c.

Tired of waiting, an old woman (who was deemed a sorceress in the village) was applied to, and she sent back the messenger, saying, that the bleeding would be stopped by the time they returned; and so it was, for John Love had expired*.

This scene made a strong impression upon my mind, as it was the first death I had witnessed, and I was directly convinced how valuable a member of society a well informed surgeon must be, and how great a curse an ignorant surgeon was. If the artery could not have been tied, the limb might have been amputated.

Danger in tying the artery.

In tying the artery in the ham, there is some danger of including the sciatic nerve, as it is placed above the artery in cutting into the ham, and it must be carefully avoided; the artery must be drawn from the vein where the large nerve is placed upon it. Mr. Cline once saw the nerve included in a ligature in the operation for popliteal aneurism, and the patient died in a few hours.

OF THE POSTERIOR TIBIAL ARTERY.

Rare at the upper part.

These injuries at the upper part of the leg are very unfrequent, but they do sometimes occur.

* This is now fifty years ago, when a man who had recovered from the operation for popliteal aneurism, was deemed a sufficient curiosity to be annually shown to the students at our Hospitals.

A man was brought into Guy's Hospital, who had fallen from a considerable height, upon a cart, and an iron peg in the cart had passed through the calf of his leg, between the tibia and fibula; a profuse hæmorrhage ensued, but by the application of a tourniquet it was stopped. In six days the bleeding recurred, when the tourniquet was tightened, and the flow of blood was again suppressed; but in two days hæmorrhage again took place. I tied the femoral artery at the usual place, and for a week the man went on well, but then the bleeding was renewed, and I was obliged to amputate the limb. On examining it after removal, it was found that the iron had passed through the posterior tibial artery, at the origin of the anterior tibial, and had penetrated between the tibia and fibula. Case.

An immediate amputation would be the best course to pursue. Immediate amputation.

I have several times known the posterior tibial artery wounded by the bone in compound fracture; once, in a patient of Mr. Chandler, and a piece of lint was forced into the wound, which stopped the bleeding, but it was followed by gangrene, of which the patient died. In compound fracture.

In a case of Mr. Lucas's, in Guy's Hospital, Mr. Pollard, his dresser, secured the artery, and the patient did well. Case.

A patient of Mr. Key's, a boy, upon whom a tourniquet was applied, had the bleeding restrained, and it did not return. Case.

In a patient of Mr. Travers's, it was wounded by a scythe, and was tied by Mr. Travers, in the theatre at St. Thomas's Hospital; the patient did well. Case.

It is sometimes wounded by the employment of the adze. I was called to a case at Hunton Bridge, Herts, by Mr. Wingfield, surgeon, at Market Street. The wound was small, and the artery cut, but not divided; the injury had happened three weeks before I saw the man; the bleedings had been very frequent, and were restrained for a time by pressure on the wound, by means of a tourniquet. Case.

As the man had become excessively reduced by the last hæmorrhage, and could not have survived another, as soon as I was called

in I tied the artery; just as I had secured the vessel, the man fainted, and I thought he would have died, but he ultimately recovered.

Treatment. In wounds of this artery at the upper part of the limb, I should first apply a tourniquet, then place the limb in a bent position, so as to relax the gastrocnemius muscle, which I should raise from its attachment to the tibia, so as to expose the artery and its accompanying nerve, which I should be careful to exclude, whilst I put two ligatures upon the wounded vessel, and afterwards should carefully close the wound and unite by adhesion.

At the lower part. At the lower part of the limb the artery is easily found, and secured behind the malleolus internus, it is accompanied by the posterior tibial nerve on its fibular side, which must be avoided.

Interrossial artery. A wound of the interossial artery I have never seen; but in the case of such a wound I should cut upon the vessel from the outer part of the leg, and seek it between the tibia and fibula, close to the fibula.

OF THE ANTERIOR TIBIAL.

Protected above. This vessel is rarely wounded at the upper part of the limb, but frequently at the lower. Lying between the two bones above, it is much protected.

How secured. When wounded at the upper part of the limb, an incision must be made on the outer side of the tibialis anticus to find it: a tenaculum, or a pair of forceps, must be employed to raise the wounded artery, to remove it from the interosseous ligament; and then two ligatures are to be applied upon it.

In compound fracture. I have seen it wounded in compound fracture. First, in a brewer's servant, a patient of Mr. Birch's, in St. Thomas's Hospital; the artery being tied, the compound fracture proceeded quite favourably.

Case. In a second case the result was singular. A man was brought into Guy's Hospital, with a compound fracture of the leg. A few days after his admission, he had a free hæmorrhage from the wound which was stopped by the application of the tourniquet; but

different intervals the bleeding was frequently renewed, and I was at length compelled to amputate his limb. Upon examining it afterwards, a spicula of bone was found penetrating the anterior tibial artery, and the opening into the vessel thus produced, had been enlarged by a process of ulceration, so as to give rise to the hæmorrhage.

When the anterior tibial artery is wounded low down in the leg, it must, when it is tied, be completely raised from the tendons of the tibialis anticus, and extensor proprius pollicis, between which it is placed; both ends must be secured. Operation.

This artery is sometimes wounded on the upper part of the foot, where it is placed upon the navicular bone, and the middle cuneiform, by a knife or chisel being dropped upon the foot. On the dorsum of the foot.

Each extremity of the divided vessel must be carefully tied, otherwise the hæmorrhage will continue, on account of the free anastomosis of this artery with the plantar.

OF THE PLANTAR ARTERIES.

For a wound of either of these arteries, I should first try what the application of a bandage, with a compress upon the wound, and a tourniquet upon the thigh would effect, and should tie the posterior tibial artery, after an extended and unsuccessful trial of these means; for so deeply is the artery placed, and so situated amongst tendinous parts and nerves, that incisions should not be made at the wounded part. Treatment.

STYPTICS.

In bleeding from small vessels on wounded surfaces, very fine wool, laid down and confined by bandage upon the part, is one of the best styptics. The wool may be dipped in flour to add to its efficacy. Wool.

Turpentine is said to have power as a styptic, and I have seen bleedings stopped by it when it has been applied by lint, and with Turpentine.

pressure; but merely poured upon the wounded surface it appears to me to be quite powerless.

An old prescription.

There is an old prescription for a styptic in St, Thomas's Hospital, which I have seen useful.

℞. Pulv: Catechu
Pulv: Bol: Armen: āā ℥ij.
Alum: ust: ℥j.
Tinct: opii. q. s. ut fiat pasta.

This will stop the troublesome bleeding from leech-bites.

LECTURE L.

OF WOUNDS OF VEINS.

Travers's paper.

Mr. Travers has published a very good paper upon the mode in which they heal.

In healthy persons not dangerous.

In a healthy constitution they are little dangerous, as the cellular tissue adheres over the apertures which have been made in them, and inflammation speedily closes them.

Case.

I once saw the axillary vein wounded in removing a scirrhous gland from the axilla; a dossil of lint was placed in the wound, and the arm was confined to the side, when no bleeding of consequence ensued.

In unhealthy persons dangerous.

In unhealthy constitutions they inflame and suppurate; they also ulcerate, and sometimes life is destroyed, by bleeding or by the inflammation extending to the large vein, and to the heart.

Several cases of this kind I have witnessed; and in the greater number the wound of the vein had been made to abstract blood for inflammation of the lungs; and I have thought that the inflammation of the vein was the result of the impediment to the pulmonary circulation.

Symptoms of inflammation.

The patient, in a few hours after the bleeding, complains of tenderness in the arm, and requests to have the bandage loosened;

he next finds great pain in extending the limb; the wound looks red, and its lips are separated. Then the plexus of veins on the fore arm become swollen, hard, and very painful; afterwards the basilic vein of the upper arm feels as a solid body, and is much enlarged. High constitutional fever ensues. If the patient has sufficient power of constitution, abscesses form in the veins of the fore arm; and by opening these early, great relief is afforded; but if the habit be particularly feeble, the matter which is produced by the suppurative inflammation, does not point, but it remains in the veins, producing excessive constitutional irritation, which destroys life.

Appearances.

Upon inspecting the vein after death, it is found partly filled by adhesive matter, and in part by pus. There is in the collection at St. Thomas's Hospital, a beautiful specimen of abscess in the longitudinal sinus of the dura mater. I have seen the jugular vein inflamed and adherent throughout the greater part of its course.

Specimen.

We have, in the collection at Guy's Hospital, the femoral and iliac veins obliterated, taken from a patient who had phlegmatia dolens; which disease has been extremely well described by Dr. Davis, in the "Medico-Chirurgical Transactions."

Division of the saphena.

But the worst cases of inflammation of veins which I have seen, have arisen from the application of ligatures to the vena saphena.

Consequences.

First, I have seen a disease like phlegmasia dolens follow the division of this vein.

Secondly, numerous abscesses form and break, sometimes destroying life, at others producing excessive irritative fever, from which the patient has been with difficulty recovered. One patient became insane during the irritation, and did not afterwards recover her mental faculties.

Thirdly, they have died from suppurative inflammation, without any abscess appearing, and this is the cause of death after the operation of amputation, when it is performed during a very unhealthy state of the constitution. I have seen, under these circum-

stances, both artery and vein, in a stump, in a state of partial adhesion and suppuration.

I saw, in Paris, in 1792, a case in which life was destroyed by suppuration of the femoral vein, after a gun-shot wound.

OF THE TREATMENT OF WOUNDS OF VEINS.

Position.

The first and greatest object is to empty the veins as much as possible, by the position of the limb, which should be such as to allow of the gravitation of the blood to the heart. In the arm, an inclined plane; in the leg, the position for a fractured tibia. This prevents accumulation of blood, and distension of the vessels.

Gentle pressure.

Secondly, a roller from the extreme part of the limb, to the wound, wetted with the liquor plumbi subacetatis, and spirit should be applied to approximate the sides of the vein, and to make gentle pressure.

Thirdly, leeches should be freely applied, and if suppuration be produced, fomentations.

WOUNDS OF THE ABDOMEN.

Two kinds.

These injuries are of two kinds: 1. Those in which the cavity is opened, but the viscera are not wounded. 2. Those in which some of the viscera suffer.

First kind, often recovered from.

With respect to the first of these it is scarcely necessary to say, in the present state of surgical knowledge, that very extensive wounds of this description are often recovered from, as is proved by the operations for umbilical or ventral hernia, by the Cesarian section; and, recently, by the removal of enlarged ovaria*. But the most curious circumstance in these wounds, is the manner in which the intestines glide away from the sharpest instruments, and escape injury. I shall relate two cases:—

* See cases by Mr. Liston.

In the year 1785, my second year of being at the Hospital, a gentleman came almost breathless to the Hospital; and finding me the only person there, requested that I would immediately accompany him. He took me to a house in the Borough; and, leading me up stairs, showed me into a room, where I found a female in her shift only, lying upon the floor, weltering in her blood. I with difficulty raised her, and placed her upon the bed she had just quitted. On examining her, I found four wounds in her throat; one of which was deep and extensive. These I closed by sutures; after which she was able to speak; and I then asked her what had induced her to commit the act; she made an incoherent reply; but repeated the word stomach two or three times, which induced me to raise her linen, when I was surprised to find her bowels exposed by a wound reaching nearly from the pubes to the ensiform cartilage of the sternum; for, after cutting her throat with a razor, she had ripped up her belly with it, and let out her bowels, but the intestines were still distended with air; and I had a difficulty in returning them into the abdomen. They had not received the smallest wound. Dr. Key now came into the room, and I proceeded to sew up this extensive opening; but she died in nine hours. Case.

Mr. Tolman and myself were sent for to see a gentleman who had stabbed himself in several parts of his abdomen, with an old rusty dirk, and had for some time afterwards concealed himself from his family. When found, it was discovered, that a portion of omentum protruded through one of the openings; this was carefully returned; but notwithstanding the dirk still possessed its point, the intestines were not injured, and he recovered without a bad symptom. Case.

The free motions of the intestines upon each other, independent of the peristaltic motion, is a great preservative in wounds of, and blows upon the abdomen.

There is another curious circumstance in wounds into the abdomen; which is, that they immediately produce universal coldness and paleness, with nausea and faintness, excepting in the operation Peculiar symptoms.

for strangulated hernia; in which case the intestine has been accustomed to violence.

Treatment. In the treatment of these wounds, it is best to make interrupted sutures; the needle should penetrate the skin and muscles, but not the peritoneum. If the muscle be not included in the ligature, a hernia is sure afterwards to form; and if the thread is introduced through the peritoneum, it adds much to the danger of abdominal inflammation.

Between the sutures, strips of plaister, or of lint dipped in blood, should be applied, and the patient should be freely bled from the arm. If the local inflammation be great, leeches should be employed; purgatives must be avoided, and food must not be given for several days.

OF THE SECOND KIND OF WOUND OF THE ABDOMEN.

Rare. Wounds of the abdomen, extending to the stomach, or intestines, are extremely rare.

Dangerous. Their danger is much lessened, if the wounded portion of the viscus protrudes through the opening in the parietes; for, if not, they are generally fatal.

WOUNDS OF THE STOMACH.

The best case which I have heard of, is related by Mr. Scott, in the medical communications, from which the following account is taken:—

Mr. Scott's case. "During the election for Weymouth, in March, 1784, Charles Thomas, a seaman, aged twenty-five, of a strong and healthy constitution, had the misfortune to receive a thrust with a small-sword on the left side of his body. The sword passed in between the second and third of the lower false ribs, and penetrated into the cavity of the abdomen in an horizontal direction, to the extent of more than five inches, as appeared afterwards by the mark upon the blade.

" I saw him about half an hour after the accident. His whole appearance was then much altered; his countenance being quite collapsed, and covered with a cold sweat, while the pulse at his wrist was scarcely perceptible; he had also a constant hiccough, a frequent retching and vomiting of blood, and a considerable discharge of blood, and other fluids, from the external wound.

" From the place and manner in which the sword had entered, and the symptoms that followed, I was led to conjecture that the stomach was wounded; and that this was certainly the case, I was soon convinced, on examining the fluid discharged by the external wound, and finding in it several small pieces of meat in a soft digested state, together with some particles of barley.

" He had complained of thirst, and some barley-water had been given him to drink; but this had been immediately thrown up after passing the œsophagus. Other mild fluids were now tried, as were likewise a common saline draught, in an effervescent state, and some thebaic tincture, but with no better effect; and they were all instantly rejected, tinged with blood.

" The retching and action of the stomach continuing to be very violent, and the patient complaining, at the same time, of a lump, or dead weight, as he termed it, in his inside, he was desired to drink some warm water; this was soon thrown up, accompanied with a good deal of barley in solid grains, with the surface slightly broken, and some pieces of meat in a half-digested state. More water being given him, it was quickly returned, tinged with blood, but, otherwise, nearly as pure as when swallowed.

" I now proposed that we should avoid giving any thing farther by the mouth; but, as the spasms and hiccough were still very frequent, an emollient clyster was administered, by which a considerable quantity of fæces was discharged. Soon after this, another clyster, containing twelve ounces of barley-water, and ʒij of thebaic tincture, was thrown up, and the greater part of it retained. Warm fomentations were likewise applied externally; the surface of the wound was loosely dressed; and he was desired to lie as much as

possible upon the injured side, with a view to favour the discharge.

"On the first of April, the day after the accident, the symptoms were still very unfavourable. His pulse continued low and languid, with a great prostration of strength, and a coldness of the extremities. He had had several rigours towards morning, and the spasms were sometimes very violent. He complained of extreme coldness over his whole body, and of a constant gnawing pain about the pit of his stomach, to which part warm fomentations were frequently applied.

"A laxative clyster was again administered, which was followed by a copious discharge; soon after this, another clyster, consisting of fourteen ounces of veal broth, and two drachms of thebaic tincture, was thrown up and retained. A similar clyster was repeated in about four hours, with the same effect. Flannels, dipped in warm milk and water, were occasionally applied to his arms and legs, and hot bricks to the soles of his feet. He made a little water twice in the course of twenty-four hours; this was highly coloured, and deposited no sediment, though kept for a considerable time.

"April 2. He had passed a restless night, and now complained of intense thirst. The hiccough and spasms were less frequent, but he suffered much from a constant burning pain in the lower part of his stomach. His pulse was small, and beat about 120 in a minute. The fomentations were applied as usual; and ʒvj of the sal: cathart: amar: were dissolved in some broth, and thrown up into the bowels as a laxative. This produced a considerable discharge of soft, slimy fæces, in which were several small pieces of clotted blood enveloped in mucus. After this, in the course of the day, three clysters of broth and thebaic tincture were thrown up and retained. He was desired to use the pulp of an orange occasionally, to allay his thirst, and to wash his mouth frequently with barley water acidulated with lemon juice.

"April 3. I was called to him early in the morning, and told

he was at the point of death. A clergyman had been sent for at the same time to perform the last offices. The nurse informed me, that, whilst supported in bed to wash his mouth, he had been seized with a violent retching, accompanied with convulsions of the chest, but that nothing had been discharged from his stomach, except a small quantity of bloody fluid. When I saw him, the spasms still continued; his forehead and breast were covered with a cold sweat; his pulse was low and intermitted, so that it could only be felt at intervals; and his strength seemed to be quite exhausted. Warm fomentations were immediately applied to the region of the stomach; and, as there was always some of the veal broth kept in readiness, I threw up about fourteen ounces of it, with ʒij of the thebaic tincture. The violence of the symptoms was soon moderated, and he appeared very languid, and showed a disposition to sleep.

"When I saw him about four hours afterwards, I was told that he had enjoyed some rest. His pulse was now regular, but small and quick; he was very weak, and just able to inform me, that, in washing his mouth, he had accidentally swallowed some of the liquor, and that this had thrown his stomach into violent action. About one pint of the broth was now injected without any addition. This was likewise retained, and repeated at intervals of five or six hours. He now made water frequently, which, upon standing, deposited a considerable quantity of sediment, of a light brick, or straw colour.

"April 4. The hiccough, retching, and other unfavourable symptoms, were now entirely gone; but he still complained of a fixed pain in his stomach, accompanied with a sensation of heat, and of a soreness of the injured side, extending from the wound toward the middle of the abdomen. He was likewise troubled with thirst; his pulse was small, and about 110. The external wound had now begun to yield a discharge of good matter.

"The same mode of treatment was continued, and the symptoms became daily more favourable. The broth was administered in clysters, to the amount of two quarts, or five pints a day. The

fomentations were continued externally, and his feet and hands were frequently bathed in warm milk and water. He voided his urine regularly, and in about the proportion of three pints in the twenty-four hours, though it sometimes considerably exceeded this quantity, and continued to deposit a great deal of sediment. A little of the sal: cathart: amar: was occasionally added to the clysters in order to stimulate and cleanse the intestines; after the fourth day, however, there was scarcely any fæculent matter discharged, but only a small quantity of viscid bile.

"On the 10th day from the time of his being wounded, he appeared to be very sensibly relieved; his thirst and febrile symptoms were much abated, and his pulse was regular, and about ninety. As he was in good spirits, and expressed a wish that he might be allowed to swallow something, I procured some calf's-foot jelly, made lukewarm, of which he ate half a pint, without feeling any bad consequences. The only remarkable circumstance that attended the first time of his swallowing, was, that it occasioned frequent eructations, and a great discharge of air; but this, according to his own account, produced rather a grateful sensation than otherwise. Next day he was allowed some new milk for breakfast, and some chicken broth for dinner. The nutritious clysters were continued, however, till the 16th day, though less frequently than before. From that period, for about a fortnight, he lived wholly on bread and milk, and light broth. He was then allowed chicken, veal, and other meats easy of digestion. The external wound had been healed for some time, and he recovered his strength very gradually. The only inconvenience he suffered was from costiveness, and a sense of soreness and stricture which extended from the external wound towards the middle of the abdomen. This was particularly felt after a violent expiration, or any sudden extension of the body, when, to use his own expression, his side was drawn inwards and upwards. The costiveness was obviated by mild laxatives and gently stimulating clysters, and went off entirely as the intestines recovered their true and natural action. The other complaint, which I apprehend to have originated

from an adhesion of the inflamed stomach to the peritoneum, seemed to go off gradually as he recovered his strength; though it was still felt in a certain degree in stooping, walking quick, or any great exertion of the body. When I last heard of him, two months ago, he enjoyed good health *.

"This case affords a striking instance of the resources and peculiar powers with which nature has endowed the animal machine, for its preservation, and for remedying any injury it may sustain. The treatment was such as was necessarily suggested by the symptoms. The wounded stomach was so extremely irritable, that even the mildest fluids increased the violence of its action, and were rejected; for had any substance, whether of medicine or aliment, been admitted, it would probably have interrupted the union of the divided parts in the first instance, or afterwards, by the action necessary for its expulsion through the pylorus.

"The liquid contents of the stomach had been chiefly discharged by the external wound, though part of them must, no doubt, have passed into the cavity of the abdomen, and have been afterwards absorbed; but the wound of the stomach collapsing, the barley and indigested meat were left, which increased the irritation, and occasioned the uneasiness and sense of weight he complained of, and which was, in a great measure, removed by the vomiting that took place upon his drinking the warm water.

"He felt some relief after the retention of the first clyster, but at that time his strength was so reduced, and the symptoms were altogether so unfavourable, that neither himself, nor those who saw him, entertained any hopes of his recovery. It is indeed surprising what an extreme debility took place immediately after the accident, which could only arise from the nervous influence and general sympathy with a part so essential to life.

"The accident that happened on the fourth day, induced me to persevere in the mode of treatment we had adopted. Indeed there

* This was in the September twelvemonth following, as the paper is dated, November 15, 1785.

was great encouragement to continue it, as the broth clysters were not only retained, but there was a proof of an absorption having taken place, by the secretion and evacuation of urine, which then began to be considerable. It is a generally received opinion, that clysters seldom pass beyond the valve of the colon: the contrary has indeed been observed in the volvulus or iliac passion, but in that case the natural action of the intestines is inverted, and a violent degree of anti-peristaltic motion prevails; in this case, however, the broth was thrown up in a very gradual manner; and though, perhaps, it did not pass the valve of the colon, in the first instance, I am inclined to believe, from the sudden manner in which the absorption was afterwards carried on, that a gentle degree of anti-peristaltic motion took place, whereby it (the broth) was impelled to the smaller intestines; this will appear less surprising, when we consider, that, in the natural action, the first impulse is communicated by the stomach, in discharging the digested aliment at the pylorus, and continued through the intestines in determining the fæculent matter downwards: but here the natural action was suspended, the stomach was at rest, and there was no foreign matter to be discharged.

"The advantages to be derived from throwing up a supply of fluid, and supporting nature in this manner, in particular cases of morbid affections of the digestive organs, will readily occur to the attentive practitioner."

WOUNDS OF THE INTESTINES.

In operating for herniæ.

In a small wound of the intestine, which I witnessed in strangulated hernia, under the operation, I pinched up the opening with a pair of forceps, and tied a thread around it; I then passed up the intestine to the mouth of the hernial sac, leaving the ligature to hang from the wound, and the patient recovered, but he had severe symptoms for several days.

Large wounds.

In a more considerable wound of the intestine, I should make an

uninterrupted suture, and return the intestine into the abdomen, letting the end of the ligature hang from the external wound, which I should otherwise close with great care. I well know that, in experiments on animals, the ligature has been cut off close to the intestine, which has been returned into the cavity of the abdomen, and the external wound has been afterwards closed, so as to leave the ligature to separate into the intestine. Now I do not clearly understand that this plan, in any way, adds to the patient's security; but, on the contrary, it increases his danger, in my opinion, if the process of adhesion be deficient.

Treatment.

In the treatment of these wounds, it is right, if the wound be in the small intestines, to keep the patient without food, and support him by clysters of broth, &c. If it be in the large intestines, after a few days, a little jelly may be allowed. Perfect quiet is to be observed; and, if there be much tenderness of the abdomen, leeches should be applied.

Rupture of intestine.

Ruptures of the intestines from blows are more frequent accidents, arising from kicks of horses, falling upon projecting bodies, &c. The symptoms are, great depression, coldness, and paleness; the pulse is scarcely to be felt if the laceration be large, and the patient dies in from twelve to twenty-four hours after the accident, quite sensible to the last moment of his existence.

But if the laceration be small, the symptoms are less violent; there is coldness, tension of the abdomen, vomiting, costiveness, and not the least disposition for food; there is subsequently great abdominal tenderness and great enervation.

Case.

A patient was brought into Guy's Hospital, under the care of Mr. Forster; the man had been working in a gravel-pit, when the gravel fell in upon him. He vomited, his abdomen became tense, and as he made scarcely any urine, the case had been thought to be retention of urine. The man died six days after the accident, and, on examination after death, a rupture was found in the intestines.

Treatment.

The treatment in these cases, is perfect rest, to prevent any disturbance of the adhesive process, to apply leeches and foment-

ations to the abdomen, to avoid giving any medicine, and to check the desire of friends in giving food for several days after the accident.

Sometimes recovered from.

The intestines thus remaining for a length of time at rest*, and inflammation being kept within the adhesive bounds, I have seen (what I believe to have been) cases of this injury recovered from.

WOUNDS OF THE LIVER.

Case.

I have seen deep stabs with a pen-knife, in the situation of this organ, recovered from, after great inflammation in the abdomen. The patient was bled generally and by leeches, and fomentations were employed. Adhesive plaister had been applied to the stabs, and on its being removed, a bloody serum was discharged from the wounds.

WOUND OF THE GALL BLADDER.

Mr. Edlin, of Uxbridge, informed me of the following case:— Two soldiers quarrelled, and one struck the other with his bayonet in the right side, just below the margin of the ribs. The wounded man directly fainted and fell; when he recovered from his fainting state, he complained of agonizing pain in his abdomen, which became extremely tense and tender to the touch. In thirteen hours the man died; and, on examination of the body, the gall bladder was found to have been penetrated by the bayonet, and bile was extravasated into the abdomen. Mr. Edlin said, that wherever the bile rested, the peritoneum was highly inflamed.

WOUNDS OF THE SPLEEN.

Although this organ may be removed from the body, without

* The peristaltic motion is greater or less, as the intestines are full or empty.

the destruction of life, as is known from the case of the soldier mentioned by Dr. Gooch, and by numerous experiments on animals, yet a very small wound of it is sometimes destructive of life; the best example of which I shall give in the following case:—

A lieutenant of a press-gang was attempting to press a man, who resisted with much violence; a scuffle ensued, and the lieutenant struck the man with his dirk, which entered near the ensiform cartilage, and its blade was nearly buried in the body. The man was brought to St. Thomas's Hospital, pale and extremely depressed, his abdomen became tense, and he died. Upon examining his body, it was discovered that the dirk had passed from the ensiform cartilage, under the margin of the chest into the abdomen, on the left side, and that its point had penetrated the concave surface of the spleen; the cavity of the abdomen was filled with fluid blood. Case.

It is said, that the spleen has been often wounded by the trochar, when tapping was performed on the left side, which, under enlargement of this organ, might happen. Wounded in tapping.

I have several times known the spleen ruptured by carriages going over the abdomen, and once by the horn of an ox. Each of these cases proved fatal. Ruptured.

Twice have I known the spleen torn from its natural attachment to the diaphragm. The first instance, was in a patient of Drs. Babington and Letsom; a Miss Harris, who, having vomited violently, discovered soon after a swelling at the groin, and at the lower part of the abdomen. I was asked if it was hernia, and I declared it was not. She died after a week, vomiting constantly the liquids which she swallowed. When the abdomen was opened after her death, the swelling was found to arise from the spleen, which had been detached from the diaphragm, and was enlarged by the interruption to the return of blood from the veins, although the artery still contained blood. The spleen was turned half round on the axis of its vessels. Case.

The other case was that of a gentleman who was hunting in Case.

Surrey; he fell from his horse when going at full speed. He died the following day, or the day after. Dr. Pitt, who attended him, examined the body after death, and found the spleen torn from the diaphragm.

Treatment. In wounds or ruptures of the spleen, I believe nothing can be done. If the case could be accurately ascertained, pressure by a roller on the abdomen would be the best treatment.

WOUNDS OF THE KIDNEY.

A wound of this organ is not fatal.

Case. A boy called at my house, and showed me some chalky concretions which he had coughed up from his lungs or bronchial glands. I said, "How long have you been subject to this complaint?" He answered, "Ever since I have passed blood with my urine." I asked him to explain himself further, when he told me, that when quarrelling with another boy, he had been struck with a pen-knife in his back; and almost immediately he wished to make water, when he passed a large quantity of blood. This continued for several days, but subsided by his remaining quiet in bed. The recumbent posture is in such a case the very best security.

WOUNDS OF THE BLADDER.

Danger from state of bladder. These are dangerous, or not, as the bladder is full or empty when the injury is inflicted. If full, urine is extravasated into the abdomen, or extensively into the cellular tissue, and death ensues. If empty, or nearly so, the danger is greatly lessened.

The bladder is sometimes ruptured when the above observations are applicable. The cause of its laceration is generally a fracture of the pubes.

Treatment. The treatment of these cases, consists in leaving a catheter in the bladder, and enjoining perfect rest.

WOUNDS OF THE CHEST.

These are also of two kinds:—First, wounds of the parietes. Second, wounds of the viscera. Of two kinds.

Wounds of the parietes are not attended with much danger. Of parietes.

A boy fell from a tree upon some pales, which entered his chest between the seventh and eighth ribs, tearing his intercostal muscles freely. The air rushed violently into his chest at each respiration, and was again expelled, when the anterior surface of the lungs appeared at the wound. The edges of the wound were brought together by adhesive plaister, a roller was applied tightly round the chest to confine the motion of the ribs, and he was bled very freely. He did extremely well. Case.

A man was brought into St. Thomas's Hospital who had been stabbed between the cartilages of his ribs; he bled very profusely, and I thought the internal mammary artery was wounded, but the bleeding soon subsided, and he recovered. Case.

The treatment in wounds of the parietes of the chest, is to promote as much as possible the adhesive inflammation, to close the wound externally.

If there be bleeding from the intercostal artery, the finger should be pressed upon the orifice of the vessel, until the disposition to hæmorrhage ceases. Hæmorrhage.

A man died in Guy's Hospital, who had been wounded through the intercostal muscles with an iron spindle, the wound healed, but tetanus supervened, of which he died. Upon inspecting the chest after death, the lung was found to have assisted in closing the wound, by adhering to the injured pleura. Case.

OF WOUNDS OF THE LUNG.

When this happens, the circumstance is known by the patient's coughing up florid and frothy blood; by free bleeding from the wound, if sufficiently large to permit its escape; by considerable irritation and tickling in the larynx, and by dyspnea. Symptoms.

Danger of.

Danger in three ways results from wounds of the lung. First, from hæmorrhage, if any large branch of the pulmonary artery is wounded. If the vessel be wounded by a sword or knife, it bleeds very freely; but if by a broken rib, very little, as it has the nature of a lacerated wound.

Treatment.

In either case, the patient must be freely bled, to prevent the continuance of the hæmorrhage from the wounded lung, and the opening must not be closed in the parietes until all bleeding from the lungs have ceased, otherwise the blood will remain in the cavity of the chest, and produce irritation and inflammation.

Danger from inflammation.

The second danger is from inflammation of the lung, and effusion into the cavity of the pleura. The first is to be guarded against by large and repeated bleedings, determined by the dyspnea and hardness of the pulse; but there is little danger of bleeding too much in one of these cases, as it is an object not only to diminish the force of the circulation, but the quantity of the blood in the pulmonary vessels.

If effusion follows, it is the result of neglected inflammation, or of having closed the external wound too early. In the one case, it is a purulent secretion; in the other a bloody serum, which produces the dyspnea some days after the accident.

Operation for effusion.

For effusion into the chest, it is right to perform the operation for paracentesis of the thorax, to draw off the pus or bloody serum which has collected in the pleura. The mode of doing this has been already described.

Effusion in old persons.

In old persons there is great danger in fractured ribs with wounded lung, and I always give a guarded opinion, for I have seen several die from effusion of fluid into the cellular tissue of the lung. The greatest care and quiet are therefore required in such a case, and it is better to give digitalis than to bleed very largely.

Emphysema, the third consequence of wounded lung, is less dangerous than the others. It sometimes extends to the face, covering the neck, and also a large part of the trunk.

Treatment.

In the treatment, a bandage is to be placed so tight around the

chest, as to prevent any rattling during a deep inspiration; the patient is to lie on the wounded side, and punctures may be made into the cellular tissue, where it is much loaded, but not so large as the wound made in bleeding.

In all cases of wounds of the chest or lungs, rest is essentially necessary to recovery.

OF WOUNDS OF THE PERICARDIUM.

Mr. Saunders told me the following case, which occurred whilst he lived with Mr. Hills, of Barnstaple. Mr. Hills was called to attend a man who, in a quarrel, had been wounded by another with a reaping-hook through the cartilages of the ribs. The wound was small, but deep, and the man had the appearance of one who had sustained a dangerous injury. In two or three days after, he had much pain in the region of his heart, a quick and small pulse; and in a few days more, he began to swell, and could not lie down in bed. I forget exactly how long he lived, but I think for a fortnight or three weeks; and after his death, it was discovered that the hook had passed through the cartilages of the ribs into the pericardium, in which there was an effusion of bloody pus. Case.

WOUNDS OF THE HEART.

These wounds rarely occur, but in their consequences are so immediately fatal, as to preclude the possibility of affording relief. Two cases, however, of much interest, I have known, and of one there is a preparation in the museum of St. Thomas's Hopital. I will relate them.

The first case is published in the second volume of the "Medico-Chirurgical Transactions," and was sent to me by Mr. Featherton, who attended the patient.

"Richard Hollidge, a private in the Northampton regiment, while on duty on the 29th of March, 1810, with an unfixed bayonet Case.

in his hand, slipped down, and his bayonet entered his left side, between the sixth and seventh ribs, upon the superior edge of the latter. He was some yards distant from the gate at which he was posted, and being challenged, he returned to open it, with the bayonet still remaining in the wound; he was incapable of withdrawing it himself, but the person coming in extracted it for him. I was called to him within five minutes of the accident; he was then in a state of syncope, the extremities cold, and his pulse scarcely perceptible. In about the space of a quarter of an hour, he gradually revived, did not complain of any severe pain, and expressed, 'that he believed he was more frightened than hurt.' I examined the wound with much diligence, but could not trace its extent further than one inch and a quarter, though it was evident that the bayonet had penetrated two inches: the hæmorrhage was very inconsiderable. His wound was dressed; he was conveyed to the military hospital, and put to bed; he was incapable of lying on his right side, but slept tolerably well. On visiting him the following morning, he complained of lancinating pains extending from the wounded part across the chest, and of severe fugitive pains in different parts of the abdomen; his pulse was quick and thready, and tongue white and dry. These symptoms led to a suspicion, that the pleura costalis at least was wounded, though no opening could be ascertained extending into the cavity of the chest. ℥xvj. of blood were taken from his arm, a solution of sulphate of magnesia administered, and fomentations applied to the abdomen. He was obliged to be supported in bed nearly in a sitting posture, as respiration became much impeded when perfectly horizontal: in this position he appeared to breathe with freedom. In the evening, he expressed himself in every respect much relieved; his pulse was less quick, and had lost its thready sensation; tongue more moist; his medicine had operated moderately. On the following morning, I found he had passed a good night, his pulse was calm and steady, scarcely quicker than natural, and the tongue quite moist; the lancinating pains had subsided, and he merely complained of a trifling pain in the wounded part; this was

increased by a slight cough, with which he became affected only this morning, and which was unattended by any expectoration. His aperient draught was repeated, an emulsion ordered for his cough, and the antiphlogistic regimen strictly adhered to. Throughout the day he was walking about the ward, in very good spirits, quite jocular in his conversation with his fellow patients, and expressed himself to them, that 'low diet would not do for him any longer.' He retired to rest about nine o'clock, and fell asleep; at eleven, he got out of bed to the commode, had an evacuation, by no means costive; said, 'he felt himself chilly, and a sensation that he should die;' returned to bed, and expired immediately; forty-nine hours from his receiving the wound.

"I examined the body on the following morning, in the presence of two other surgeons. On opening the chest, the pleura was found slightly inflamed for some distance round the puncture, and an effusion of adhesive matter, emitting a small portion of the lung to the wounded part; the lung was not injured. At least two quarts of blood were effused into the cavity of the chest; the pericardium was nearly filled with blood, and had a puncture through it, extending three quarters of an inch into the muscular substance of the left ventricle, about two inches from its apex. A small coagulum was formed at the edge of the wound through the pericardium.

"Upon opening the left ventricle of the heart, it was discovered that the bayonet had penetrated the substance of the ventricle, and had cut one of the fleshy columns of the mitral valve.

"On a review of the case, I conceive it very curious, that an organ like the heart, possessing such excessive irritability, a point to which the most interesting of our sympathies are referred, and which is in some degree influenced by the most trifling, should be so materially wounded, and yet the system take so little cognizance of the injury. Death, in this case, it was perfectly evident, was not produced from any alarm excited in the system by the wound, but occurred as a secondary consequence, from the hæmorrhage increasing to such an extent, as to interrupt the actions of the

heart and lungs. That the hæmorrhage proceeded chiefly from the heart, must be admitted: there was no symptom whatever that indicated a wound of the lung; none could be found on the most deliberate examination; and the intercostal artery was entirely free from injury."

The second case has been published in the "Medical Records and Researches," from which the following particulars have been taken. It occurred during the time that Dr. Babington was employed as assistant surgeon at the Royal Hospital at Haslar, and by him the particulars were communicated:—

Case. "Henry Thomas, a marine, was received into the hospital, from his Majesty's ship Foudroyant, having a wound in his side. He had slipped from the gangway, where he had been placed as sentinel, to the deck below; and had fallen upon the point of his bayonet, which had penetrated his side a little below the false ribs, nearly in a perpendicular direction, as far as the hilt of the instrument. Immediately after the accident he drew out the bayonet without assistance, arose, took up his musket, walked eight or ten steps, and then dropped down in a fainting state; from this state he soon recovered, and was taken to the hospital about two hours after the receipt of the injury; he then complained of but little pain, was inclined to sleep, and when roused appeared in great distress. The wound was on the left side, about two inches above the ilium, and communicated with the cavity of the abdomen; but neither its direction nor depth could be ascertained. His body was cold, his pulse scarcely perceptible, but he had not apparently lost much blood. A portion of omentum, about ʒij in weight, protruded through the opening; this was cut off. A purgative enema was thrown up, which procured a motion, without any appearance of blood. He drank freely of coltsfoot tea, and took his medicines; the fluids produced nausea and attempts to vomit, but he did not eject any thing from the stomach. The breathing was at first slow, but free; by degrees it became more oppressed, and at length grew extremely quick and laborious, attended with a sense of weight on the right side of the thorax, which threatened suffo-

cation. The expectoration was not bloody. Soon after the injury he began to complain of a pain in the chest, and at the pit of the stomach, which gradually increased, and towards midnight became almost insufferable. The upper part of the thorax had swelled a little, and the motion of the right arm much increased his sufferings. This tumefaction gradually augmented, and at eleven o'clock had reached the head and face; it subsequently extended all over the body before his death, which took place a little after two o'clock in the morning, apparently from strangulation. He retained his senses to the last minute.

"On examining the body twelve hours after death, the following appearances were discovered:—

"The triangular wound from the bayonet, was seated on the left side, midway between the spine and the linea alba, having the last rib and the crista of the ilium at equal distances above and below it; it readily admitted the point of the finger. A portion of omentum still protruded, and appeared gangrenous. The direction of the wound was obliquely upwards and inwards, and had penetrated the following parts:—the integument, abdominal muscles, peritoneum, the colon near its termination in the rectum, again at its arch; the stomach inferiorly, two inches from the pylorus, and superiorly, under the left lobe of the liver, which was also wounded; the diaphragm in the centre of the tendon; after this the pericardium; the right ventricle of the heart in two places, first the inferior part, and again near the tricuspid valve; next the lungs were pierced; and last the anterior parietes of the right side of the thorax, between the cartilages of the second and third ribs, terminating in the substance of the pectoral muscle. The abdomen contained a little bloody serum; the pericardium a small quantity of blood; but the right cavity of the pleura had about two quarts of blood within it.

"Although so many parts of importance were injured, but little was indicated of the extent of mischief from the symptoms which occurred during life. Thus the colon was twice perforated, but the stools were not tinged with blood, nor was there any fœculent

matter in the cavity of the peritoneum. The stomach was also twice wounded, and yet vomiting did not take place, excepting once slightly, as he was brought to the hospital. The liver was opened to the extent of one inch, but yielded scarcely any hæmorrhage. The heart had been pierced in two places, but yet its action continued regular, and supported circulation for above nine hours. The middle and upper lobes of the right lung were both wounded; yet he did not cough up any blood. The emphysema had originated under the pectoral muscle, and had gradually extended over the whole body."

WOUNDS OF THE THROAT.

Parts injured.

Attempts to commit the act of suicide are the usual causes of these injuries, and usually one of the following parts suffer:—the pharynx, the larynx, the trachea, or the œsophagus.

Description of parts.

If the chin be a little elevated, its distance from the sternum is about nine inches. First: Three inches below is the thyroid cartilage, and the space has the muscles of the os hyoides and tongue on the fore part. Second: In the middle division is the larynx, with the pharynx behind it. Third: In the lower part is the trachea before, and the œsophagus behind. On the sides of these parts are situated the carotid arteries, which are divided near the os hyoides. The internal jugular veins are also placed laterally. The pars vaga accompany the carotid arteries, and the grand sympathetic nerves are found somewhat nearer the vertebræ.

OF THE WOUND ABOVE THE LARYNX.

This is the most frequent seat of injury, which is inflicted whilst the chin is elevated.

Symptoms.

Through the wound, air and blood issue with frightful impetuosity, more especially when the patient coughs. A lighted candle brought near the aperture is immediately blown out, and liquids,

when attempted to be swallowed, are violently ejected from the wound. Hence, those ignorant of the structure of the parts, suppose that the air tube is injured, but the anatomist is aware that the wound has passed through the muscles of the jaw and tongue into the pharynx, being generally inflicted between the chin and os hyoides.

The arteries, which bleed freely, are the sublingual, that pass just above the os hyoides on each side to the tongue; but sometimes the external carotid arteries are divided, when, from the rapid hæmorrhage, death is almost immediate. Arteries wounded.

TREATMENT.

The wound is generally in itself but little dangerous; and when persons die shortly after its infliction, it is frequently from the fever which has led to the commission of the act, if it be not from hæmorrhage.

Position in this wound is to be carefully attended to. If the chin be elevated, the wound gapes widely; but when the chin is depressed, the frightful aperture becomes closed; the head should therefore be brought down towards the chest, and confined in that position, in order to prevent a separation of the edges of the wound. Position.

I have generally put three sutures in the integument only, the more effectually to guard against any disturbance of the approximated edges, which may otherwise, from the constant motion of the patient during irritability or delirium, be produced. Such sutures, through the integument only, are in this respect very useful, and are not ever disadvantageous. Sutures.

The patient's mouth and tongue should be kept cool and moist, by the application of a portion of lemon dipped in water; but he should be chiefly supported by clysters of broth and gruel, to which opium should be added if they quickly return; and when the fever has subsided, the addition of port wine should be made. Enema.

I knew a lady who had a stricture in her œsophagus, who was supported forty-five days by clysters of broth and wine, when she could not swallow even a drop of water.

When food is given by the mouth, a small quantity of solid matter excites less irritation than fluid; and a small portion of jelly is the best.

The sutures should be removed in a week, and adhesive plaister be substituted for them.

When the wound is situated below the os hyoides, as it sometimes is, the epiglottis is injured at its junction with the thyroid cartilage.

In a case of this kind to which I was called at Walworth, I put a thread through the frœnum, on the dorsom of the epiglottis, and fixed it again to the thyroid cartilage. The man recovered; but whether it was post hoc, or propter hoc, God knows! In general, those cases are fatal, in which the epiglottis is separated from the thyroid cartilage, from a want of defence to the air tube.

OF THE WOUND INTO THE LARNYX.

Symptoms. This wound is either into the thyroid or cricoid cartilages, or into the ligament which unites them.

The air rushes out through the wound in expiration, and violently in coughing, and is also inspired through it. The person is not able to speak, unless the aperture be closed by pressure; but the food does not pass out from it.

A wound confined to the cartilages of the larynx, or to the ligament uniting them, is not dangerous, and by far the greater number of these cases, which I have seen, have done well. The treatment of them consists in approximation of the parts by position, and in the application of adhesive plaister to retain the edges in contact.

When the wound is inflicted with excessive violence, or by a stab, the pharynx may be wounded, as it is situated behind the

larynx, and then the treatment of the wound is to be similar to that of the wound of the larynx.

In a case of this nature, which was under the care of Dr. Ludlow, of Calne, he informed me that the thyroid cartilage, which was many weeks in healing, became ossified, and that portions of it exfoliated. Case.

In a patient of mine in Guy's Hospital, the wound upon the thyroid cartilage remained fistulous, and I raised a piece of skin from the surface of the neck, above the opening, and turned it over the opening, the edges of which I had previously pared; it united extremely well. Case.

OF THE WOUND BELOW THE LARYNX.

When the wound is inflicted within three inches of the sternum, it is more dangerous than in any other situation. The trachea is here on the fore part, the œsophagus behind, and the carotid arteries are situated close to the trachea, more especially the right. The thyroid gland crosses the upper part of the trachea, and its veins cover the fore part.

If the trachea be cut, the air rushes through the wound both in expiration and inspiration. The blood gets into the trachea, and excites a violent coughing, by which a bloody froth is forcibly ejected, but the food or liquids do not pass out through the aperture. Symptoms.

The external opening, in these cases, is generally small, as the wound often arises from a stab, and the consequence is, that the blood does not freely escape, but lodging in the bronchia, adds excessively to the dyspnea.

In the treatment, the first object is to stop the bleeding; and if the wound be not sufficiently large to lead to the easy discovery of the source of the hæmorrhage, an incision should be made, in a longitudinal direction, to expose the mouths of the vessels. If the trachea be widely opened, pass a needle and ligature Treatment.

through the cellular tissue, upon its surface, which, from its firmness, will support the ligature, and thus bring the edges of the aperture into contact; but do not penetrate the trachea itself with the needle. Thus securing the trachea, bring the edges of the external wound together by bending the head forwards; but do not apply adhesive plaister, as it prevents the escape of air and blood in coughing, produces additional difficulty of breathing, and occasions emphysema.

The ligature upon the cellular covering of the trachea, is to be separated by the ulcerative process, which will generally be effected in a week.

A transverse wound in the trachea, will be followed sometimes by a loss of voice, on account of the division of the recurrent nerves.

If one of the carotid arteries be opened, death is usually so instantaneous that the patient cannot be saved. If a surgeon were present, or the wound was very small, and he could reach the patient before he expired, he should thrust his finger into the wound to stop the flow of blood, and then cut down upon the vessel, to expose it sufficiently to place a ligature upon it, which he can afterwards better adjust*.

When the trachea is deeply cut, the œsophagus is sometimes wounded; and, if the injury be extensive, death will generally ensue; but a stab into the œsophagus, or a small wound, may be recovered from.

After an injury of this kind, the wound into the trachea is to be treated as in the former instance, by which that in the œsophagus will be best approximated; all food, liquid or solid, must be avoided, and the patient is to be supported, as long as nature can bear it, by clysters. I object entirely to the introduction of tubes into the pharynx and œsophagus, as worse than unnecessary; for they are highly injurious by the cough which they occasion,

* See case of wounded carotid.

by their irritating the wound; and if adhesion or granulation have taken place to close the wound, such tubes tear it open again and destroy the process of restoration.

LECTURE LI.

WOUNDS OF JOINTS.

These accidents are but trivial, or very dangerous, as the surgeon is directed by proper principles, or is ignorant of the treatment which they require.

Improper treatment.

If the patient has a poultice applied, or if the utmost attention be not paid to the immediate closure of the wound, inflammation of the synovial membrane arises, and suppuration ensues. The most violent constitutional irritation succeeds,—shivering, heat, flushing, and profuse perspiration; generally, great swelling and excessive pain in the joint. Abscesses form in different parts of the joint, one succeeding another, until the strength becomes exhausted.

In young or old persons.

In young and healthy constitutions, these wounds in the largest joints are recoverable from; but, in aged and weak persons, they destroy life.

Dissection of.

Upon dissection in the first stage, suppurative inflammation of the synovial membrane is found; in the second stage, the ligaments of the joint are thickened, and the synovial membrane in part ulcerated, in part granulating. The cartilages are absorbed; granulations arising from some parts of the bones, and exfoliation taking place from other portions.

Anchylosis.

Recovery from these injuries when inflammation has followed, is by adhesion, so as to destroy the synovial surface; or else

by granulation, when a partial or general ossific anchylosis is the result.

Treatment.

All these effects may be prevented by an intelligent surgeon. When called to treat a wound of from one to two inches extent into the knee joint, he will, with a fine needle and thread, passed through the skin only, (avoiding the ligaments,) bring the edges of the external wound together; for a wound in the joint is different to most others, as the synovia has a constant tendency to force a passage outwards, and it is more abundantly secreted than usual, so that adhesive plaister is apt to be separated, and union prevented; he will apply, therefore, lint dipped in blood over the surface of the wound, and place the plaister over it; then cover the surface of the knee with soft linen, dipped into a lotion of the liquor: plumbi subacet: and spirit. Afterwards he will place a splint behind the limb to prevent all motion of the injured joint, and enjoin positive rest.

Purgatives should be as much as possible avoided, and a rigid abstinence enforced. In eight days, the threads may be cut and drawn away, but the adhesive plaister and lotion should be continued. Three weeks should elapse before the patient be allowed to quit the bed.

If inflammation follow a wound into a joint, leeches and an evaporating lotion must be employed; and if it run high, the patient should be bled freely from the arm.

If suppuration be produced, fomentations and poultices are required locally; liquor: ammoniæ acet: and opium internally.

A fungous granulation forms at the wound, which must not be disturbed, as it is formed by nature to close the aperture; fresh irritation is produced by disturbing it.

When a limb is stiff from inflammation and adhesion, early motion of the joint is required, and its use may generally be restored. A joint thus circumstanced is not injured, but benefited by motion, whilst in a chronic or scrofulous inflammation of a joint, rest is most essential to its cure. In this case, therefore, a

patient should not only use the limb in common exercise, but he should sit upon a high table, and employ the muscles, for some length of time at once, in flexing and extending the limb.

Partial anchylosis, when the joint is not altered in form, may, in young persons, be considerably relieved.

Where ossific granulations have arisen from every part of the surface, permanent and complete anchylosis must be the result.

Removal of loose cartilages.

In removing loose cartilages from joints, it is proper first to draw down the skin to render the aperture afterwards valvular. The cartilage is fixed by an assistant, an incision is made over it after the skin has been drawn an inch to one side, then as soon as the surface of the cartilage is well exposed, it jumps from its situation, the skin is let go, and then no direct opening remains communicating with the joint.

The after-treatment is the same as in simple incised wounds, only a suture is not required.

WOUNDS OF TENDONS.

Tendo achillis.

The division of the tendo achillis is most frequently occasioned by a wound from an adze, and sometimes the injury arises from accident with a scythe.

Effects of.

In whatever way it is produced, the immediate effect of the division of the tendon is a great separation of its divided portions, the upper one being drawn up by the action of the gastrocnemei, and a falling of the heel, the foot being influenced by opponent muscles. Sometimes the posterior tibial artery and nerve are also divided with the tendon; where the surgeon should secure the former by a ligature as soon as possible, or else apply a tourniquet.

Mischief of.

The mischief arising from this accident depends in a great measure upon the treatment which may be adopted. If the edges of the wound be not approximated, and if the ends of the divided tendon are allowed to remain at a distance from each other, inflammation arises, granulations are produced, and a union of the ends

of the tendon takes place to the surrounding parts, destroying permanently the action of the muscles, and the motions of the tendon. But if the wound be united by adhesion, and the ends of the divided tendon brought into contact, or nearly so, the motions of the foot are generally restored.

Treatment.

The principle in the treatment is to approximate the ends of the tendon by raising the heel, extending the foot, and bending the knee; the external wound is then to be carefully closed, in order that it may be healed by the adhesive inflammation. To effect this, a shoe with a heel one inch and a half in height is to be placed on the foot of the injured limb, and a strap is to be carried from the heel of the shoe to the calf of the leg, then a roller is to be lightly applied upon the upper part of the leg, to confine the strap and to keep the foot extended. The edges of the external wound are to be brought together by a small suture, and all pressure at the part should be avoided, only an evaporating lotion being placed upon it. The patient is to be confined to his bed until the wound be healed, and then he may be allowed to walk a little with a high-heeled shoe. This shoe is to have the heel gradually lowered until it becomes of the same thickness as the heel of the shoe worn on the sound side. By this means, the muscle which had contracted, and the tendon which had been injured, are gently brought to their proper action.

If the divided extremities of the tendon are allowed to remain separate during the union, an addition is made to the tendon in its length, and the power of the muscle acting upon it is thus reduced.

Should much inflammation arise during the cure, the limb must be elevated to prevent all gravitation of blood, and leeches should be applied near the wound.

Division of extensor tendons.

If the extensor tendons of the fingers be divided, the fingers should be kept extended during the cure, by a splint placed under the hand and fingers. Indeed, it is only necessary to consider whether the divided tendon, in any case, belongs to a flexor or extensor muscle, to know what is to be done to assist its union.

PUNCTURED WOUNDS OF TENDONS.

Dangerous.

These are dangerous accidents, being often productive of tetanus. Several times within my knowledge, this has occurred from persons treading upon a nail, which has penetrated the shoe and wounded the tendinous aponeurosis of the sole of the foot; also an accident of a somewhat similar nature to the palm of the hand, I have seen productive of a similar effect.

Tetanus.

Tetanus seems to be the result of the wound of a structure difficult to heal, and requiring great constitutional efforts to produce the effect; and these efforts, in a very irritable constitution, produce the highest nervous excitement.

Treatment.

In these injuries, I have observed that it is best to foment and poultice the parts, so as to soothe and tranquillize them; also to carefully avoid depletion, even from the first to any great extent, either locally or constitutionally. The patient should be allowed his common diet, and if he be restless, or complain of much pain in the wound, opium should be given. Lowering the patient only adds to his irritability.

OF LACERATION OF TENDONS.

Of tendo achillis.

The tendo achillis, and sometimes, but not so frequently, other tendons are torn through.

This accident to the tendo achillis is produced either by a violent effort of the muscles, as in jumping or dancing, or by an unexpected extension of the tendon;—as for instance, by treading unawares with the toe only upon an elevated substance. Dr. Curry, late physician to Guy's Hospital, informed me that he tore his tendo achillis by catching his toes upon a scraper, when walking in a dark street; being at the time unprepared for such an occurrence.

Treatment.

In whatever way the accident may be produced, the treatment required will be to extend the foot, and bend the knee to allow the ends of the lacerated tendon to approximate. In this way the

tendon soon unites by the adhesive process, and the use of the limb is afterwards gradually restored. Some degree of thickening of the tendon for a long time remains, and the patient halts a little in rapid motion.

The position of the foot and leg is to be maintained in the same way as when the tendon is divided by incision, and an evaporating lotion should be employed. After the union, the same precautions are to be observed with respect to the employment of the high-heeled shoe.

OF PARTIAL LACERATION OF THE TENDO ACHILLIS AND GASTROCNEMIUS MUSCLE.

Cause of.

A person in running or walking fast, or if his foot slips backwards when it has been advanced, sometimes feels as if he had received a severe blow upon the back of his leg, and is immediately unable to walk but with the greatest difficulty, and with the foot extended.

The cause of this feeling is a laceration of some fibres of the tendo achillis, or of the gastrocnemius muscle, where it joins the tendon. There is great tenderness upon pressure on the following day, with some ecchymosis, which daily increases, until the limb becomes considerably discoloured. The least attempt to bend the foot is accompanied with great pain, and followed by swelling of the leg and ancle.

From a belief that the injury is slight, and from negligence in treating it, the lameness which results from this accident is often of very long continuance; but, if properly attended to from the first, it is in general soon recovered from.

A similar treatment to that recommended for division or laceration of the tendon, is requisite for the cure of this injury, and when the patient can bend the foot without producing pain, then the high-heeled shoe must be worn, and the heel be gradually lowered, as in the previous cases.

From three to six weeks are required to effect a cure.

OF WOUNDS OF THE NERVES.

The immediate effect of the division of a nerve of a limb, is the loss of volition in those muscles to which the nerve is distributed, and the antagonist muscles being unopposed, gradually contract. If the nerve supplying the flexors is divided, the limb becomes extended; if that distributed to the extensors is separated, the opponent muscles keep the extremity flexed. This arises from the tendency a muscle possesses to occupy the smallest space possible, and which differs from voluntary or involuntary contraction, as the latter can only continue for a time; but the former is permanent, or as long as the antagonist muscles are paralysed. Effect of.

The second effect of the division of a nerve is the diminution of sensibility; I call it diminished, because I do not find that the division of the branch of a nerve, although it benumbs the parts, entirely deprives them of sensation.

In the division of the infra orbitar nerve, or of one of the nerves of the fingers, some sensation remains, but numbness is produced; when, however, all the nerves passing to an extremity are divided, sensation is entirely destroyed.

I once saw a case, in which one of the branches of the median nerve was divided in the palm of the hand; and if pressure was made on the radio spiral nerve at the elbow, it produced a tingling sensation in the benumbed finger *. Case.

The temperature of the part to which the nerve is distributed, if it be covered so as to prevent the access of a colder medium, is greater than that of parts similarly covered; but if it be left altogether bare, it then has less power of resisting diminished temperature than the surrounding parts. I have seen severe chilblains, and during the winter incurable ulceration, follow the division of the median nerve.

* It would appear by this that nervous influence is supported in a degree by anastomosis.

Divided nerves unite.

When a nerve has been divided, if its extremities are brought together, it unites, and the function of the nerve becomes gradually restored.

Dr. Haighton's experiments.

Dr. Haighton divided the pars vaga on one side of the neck of a dog, and, after some time, he cut through the nerve on the other side: the dog lived, which he would not have done, had both the nerves been divided at the same time. When he had allowed time for the union of the second, he divided both at once, and the animal died under the same circumstances as would have occurred had no previous experiment been made.

The time required for the union and restoration of function, appears to depend upon the size of the nerve.

Case.

A young gentleman who had injured the external condyle of the os humeri, had numbness in the direction of the radial nerve, and he recovered the sensibility of the parts in four months.

The numbness sometimes produced by bleeding is recovered from in three months.

In a fracture of the thigh bone, by which the sciatic nerve was injured, so as to produce numbness in the limb below, the person recovered in nine months.

Case.

Kosciusko, the Polish General, had his sciatic nerve injured by a pike, and when in this country, many months after receiving the wound, he had not got rid of the effects; and I have heard since, that he remained lame.

At the place of union, after the division of a nerve, there is the appearance of a ganglion, as may be seen in a preparation I made from the finger of a person brought into the dissecting room at St. Thomas's Hospital; a cicatrix covered the ganglion.

Independent of the size of a nerve, the time in which union will be complete, must also depend much on the position and approximation of the ends.

Treatment.

In the treatment of a wounded nerve, the only objects are the approximation of its ends and union by adhesion.

Many bad symptoms have been attributed to the partial division of a nerve; but I have, in part, cut through the sciatic nerve of

a dog, without producing any other symptom than partial paralysis.

I removed from the median nerve, a tumour for a gentleman, and took away two-thirds of the nerve with it, and numbness with tingling were the only unpleasant symptoms following. Case.

A Mr. H. called at my house, who had a partial division of the median nerve, affecting the fore, middle, and ring fingers, but not the thumb; he had tingling with the numbness, but no other bad symptom. Case.

A nerve divided in part, therefore, occasions tingling and numbness; one completely separated, only numbness: the treatment of the former is as that of the latter.

If a ligature be applied upon a nerve of magnitude, the consequences are sometimes fatal, and sometimes productive of lingering suffering. Ligature on a nerve.

Mr. Cline informed me, that in a case of popliteal aneurism, operated upon in the old way, by opening the tumour in the ham, the popliteal nerve was included in the ligature with the artery, and the man died in a few hours. Case.

In a case of amputation at Guy's Hospital, I saw the whole sciatic nerve included in a ligature, which was applied to suppress hæmorrhage from the artery which accompanies the nerve. In four days, the man was seized with violent spasm in the stump. On the fifth day, spasms affected the limb, and from thence extended to the other muscles of the body. On the seventh day, he died. Case.

If a nerve be included in a ligature, when tying an artery, the process of ulceration is extremely slow, and the slightest drawing of the ligature produces agonizing pain.

Lord Nelson suffered excessively from this cause after his limb had been amputated; and with all his heroism, he could not bear the least touch of the ligature, without uttering the most violent expressions. Case.

After amputation, then, it is right to avoid, with the greatest cir-

cumspection, any nerve, or portion of a nerve, in placing the ligatures on the vessels.

The division of a nerve, or even pressure upon the spinal marrow, so as to destroy volition and sensation, does not prevent the involuntary action of the limb or limbs from proceeding. The circulation still proceeds, and the irritability of the part remains, as is shown in the application of a blister, which produces the usual vesication; also, a wound heals by the adhesive process.

Friction and electricity seem to have some influence in restoring action in a divided nerve, or of one which has partially lost its power from any other cause.

Pressure upon a nerve, occasions the sensation of a part being asleep; striking the cubital nerve at the elbow, occasions violent tingling in the little finger, and half the ring finger.

OF SPRAINS.

Definition. A sprain is an injury occurring to the ligaments or tendons surrounding a joint, which are either forcibly stretched or lacerated.

How produced. It usually happens from the sudden extension of the joint in a direction which the muscles are unprepared for; in the same manner as when a dislocation is produced, only that the violence is not sufficient to occasion a displacement of the bones.

Common seat of. The most common situations of these accidents are either at the wrist or ancle, arising from sudden falls, by which joints are unexpectedly and forcibly bent.

Symptoms. These injuries are attended with considerable pain at the time of the accident, and the part soon becomes swollen and tender; the former symptom arises from the effusion of blood, in the first instance, out of the lacerated blood vessels, and becomes subsequently much increased from inflammation; the tenderness and pain are generally in proportion to the tumefaction.

At first the surface of the skin presents its natural appearance,

but after a short time, as the effused blood coagulates it becomes much discoloured.

When inflammation has been set up, and given rise to effusion of fibrin, a sensation of crepitus is experienced on examining the injured part, which might, by an ignorant surgeon, be mistaken for the crepitus of fractured bone; but it never gives that distinct grating feeling which occurs from the rubbing of one portion of broken bone upon another. Sensation of crepitus.

Immediately after the receipt of the injury, the ordinary motions of the joints can be readily performed; but as the swelling takes place, these motions become much impeded, and ultimately cannot be performed without producing acute pain, and increasing the mischief. Motion of joint destroyed.

In the treatment of these cases, the first object is to arrest the hæmorrhage from the lacerated vessels, and then to prevent the occurrence of severe inflammation; afterwards to promote the absorption of the effused matter, and subsequently to restore the motions of the injured parts. Treatment.

In the first instance, the application of cold by means of evaporating lotions, and attention to the position of the limb, will effect much in arresting the effusion, and preventing acute inflammation. The position should be such as to relax those muscles which act on the injured tendons, and at the same time such as will favour the return of blood to the heart. Cold and position.

Should the pain and tumefaction increase in spite of these means, leeches should be freely employed over the seat of mischief, and the bleeding encouraged by tepid applications; purgatives should also be administered; and in very robust persons, when the injury is extensive, general blood-letting, and other constitutional remedies must be had recourse to. Bleeding.

When the inflammation is subdued, and the patient is free from pain, still the surgeon has much to do in effecting the absorption of the effused matter, and this he should be careful to remove, as it is from neglecting this stage of the injury that other and more After effects.

important disease originates, this more particularly in persons suffering from any constitutional disease, as in those affected with scrofula.

In healthy persons.

In persons free from constitutional disease, these injuries, if not very extensive, are rapidly recovered from; the effusion quickly subsides, and the motions of the joint are restored; but in no case should the patient be allowed to exercise the part as usual, until all pain has ceased, and the part has nearly regained its original form.

Too early motion.

By a too early use of the part, the effects of the injury are kept up, so that weeks, months, or even years may elapse; and the patient still suffer from them; whereas a little more attention to the disease in the first instance, would have completely removed all the suffering and danger.

In unhealthy persons.

In persons suffering from constitutional disease, a chronic form of inflammation is often set up, which terminates in suppuration, and often affects the bones, which become carious, and make it necessary for the surgeon to remove the diseased part by amputation, in order to save the patient's life.

Therefore, after the acute symptoms have been removed, be careful to get rid of all the effects of the injury before the patient be allowed to employ the limb as previous to the accident.

Treatment of chronic stage.

Rest, position, and the use of mild stimulants, with friction, and moderate pressure, are the best means of producing the desired effect. The liniment: ammoniæ; liniment: hydrargyri; liniment: saponis, may either of them be rubbed over the affected part, night and morning, afterwards making pressure by the application of a roller; or the part may be enveloped in strips of one of the following plaisters:—empl: ammon:—empl: ammon: c̄ hydrarg: empl: galbani, over which the roller should be placed. I have also known good effects produced from the pouring a continued stream of cold water on the part from a pump or large pitcher.

Should the disease prove obstinate, and be attended with occasional pain, the aid of counter irritation may with great advantage be produced, either in the form of blister, or the ung: antimon: tartarizat: I have known many cases quickly cured by these means.

When the marks of disease have been removed, the motions of the parts should be promoted by moderate, but regular exercise. Exercise.

ON DISLOCATIONS AND FRACTURES*.

TO THE

STUDENTS OF ST. THOMAS'S AND GUY'S HOSPITALS.

MY DEAR YOUNG FRIENDS,

This Work has been composed for your use; and if you derive advantage from it, my principal object will be attained. I cannot, however, omit the opportunity of expressing my gratitude for the affectionate and respectful manner in which you have always received me as your instructor. Your parents, and relatives, many of whom were my pupils, are also entitled to my most grateful acknowledgments,—they fostered me in early life,—and by their friendship and recommendation have largely contributed to procure me a degree of success which, I fear, is beyond my merits, and a course of uninterrupted happiness which few have been permitted to enjoy.

Believe me, always,

Your affectionate Friend,

ASTLEY COOPER.

* Extracted from Sir Astley's large quarto work.

PLATE I. OF DISLOCATIONS,

Shews the positions of the limb in the different dislocations of the thigh-bone, and in the fracture of the cervix femoris.

Fig. 1. The thigh-bone dislocated *upwards* upon the dorsum ilii. The limb shortened,—the hip projecting,—the knee and foot turned inwards, and the toes resting on the metatarsal bones of the other foot; the head of the bone is thrown back, and the trochanter major forwards.

Fig. 2. Shews a dislocation *downwards* into the foramen ovale. The limb is longer than the other,—the knee advanced and separated from the other,—the toes pointed,—the heel does not touch the ground; the body is bent forwards: in all other accidents of this joint, the limb is lengthened.

Fig. 3. Dislocation into the ischiatic notch. The limb shortened,—the patella nearly an inch above the other,—the knee and foot turned slightly inwards,—with the great toe resting against the ball of the great toe of the other limb; the leg is separated with difficulty from the other.

Fig. 4. Dislocation of the os femoris upon the pubes. The head of the bone projecting at Poupart's ligament,—the knee and foot turned out and widely separated from the other,—the limb shortened a little.

Fig. 5. Fracture of the neck of the thigh-bone. The limb is shortened,—the knee and foot everted,—the limb may be easily drawn to the same length as the other, and then if rotated a crepitus will be felt.

ON DISLOCATIONS.

DISLOCATIONS IN GENERAL.

Definition.

A DISLOCATION is a displacement of the articulatory portion of a bone from the surface on which it was naturally received.

Necessity of prompt assistance.

Of the various accidents which happen to the body there are few which require more prompt assistance, or which more directly endanger the reputation of a surgeon, than cases of luxation. If much time shall have elapsed before the attempt at reduction is made, the difficulty of accomplishing it is proportionably increased, and not unfrequently becomes insuperable: and if the nature of the injury be unknown, and the luxation consequently be left unreduced, the patient will remain a living memorial of the surgeon's ignorance or inattention.

Instances of mistake.

"What is the matter with me?" said a patient who came to my house, placing himself before me and directing my attention to his shoulder: "Why, Sir, your arm is dislocated."—"Do you say so! Mr. ——— told me it was not out."—"How long has it been dislocated?"—"Many weeks," he replied.—"Oh, then you had better not have any attempt at reduction made."—He said, "Well, I will take care that Mr. ——— has no more bones to set; for I will expose his ignorance in that part of the country in which I live." He was a man of malevolent disposition, and carried his threat into execution, to the great injury of the surgeon, who was also frequently reminded of his want of skill, by meeting his former patient in his rounds; and what was worse, by hearing the following observation frequently repeated: "Mr. ——— is a good apothecary, but he knows nothing of surgery."

In a dislocation of the os femoris, which still remains unreduced, a consultation was held upon the nature of the injury, and after a long deliberation, a report was made by one of the surgeons to this effect: "Well, Sir, thank God, we are all agreed that there is no dislocation." *Proh pudor!!!*

Knowledge of anatomy necessary.

A considerable share of anatomical knowledge is required to detect the nature of these accidents, as well as to suggest the proper means of reduction; and it is much to be lamented, that students neglect to inform themselves sufficiently of the structure of the joints. They often dissect the muscles of a limb with great neatness and minuteness, and then throw it away, without any examination of the ligaments, cartilages, or ends of the bones; a knowledge of which, in a surgical point of view, is of infinitely greater importance; and from such negligence arise the errors into which those novices fall when they embark in the practice of their profession; for the dislocations of the hip, the elbow, and the shoulder, are scarcely to be detected, but by those who possess accurate anatomical information. Even our hospital surgeons, who have neglected their anatomy, mistake these accidents; and I have known the pulleys applied to an hospital patient, in a case of fracture of the neck of the thigh-bone, which had been mistaken for a dislocation, and the patient exposed, through the surgeon's ignorance, to a violent and protracted extension. It is therefore proper, that the form of the extremities of the bones, their mode of articulation, the ligaments by which they are connected, and the direction in which their most powerful muscles act, should be well understood.

Difficult sometimes to detect from tumefaction.

Yet it would be an injustice not to acknowledge, that the tumefaction arising from extravasation of blood, and the tension resulting from the inflammation, which frequently ensues, will, in the early days of the accident, render it difficult for the best surgeon perfectly to ascertain the exact extent of the injury; and, therefore, conclusions drawn at a time when the muscles are wasted, and the swelling is dispersed, when the head of the bone can be distinctly felt, and the motions of the limb are found to be impeded in a particular direction,—if they tend to the prejudice of

the individual who may have given a different opinion under circumstances so much less favourable for forming a correct conclusion, will be both illiberal and unjust.

Symptoms.

The immediate effect of dislocation is to change the form of the joint, and often to produce an alteration in the length of the limb; to occasion the almost entire loss of motion in the part after the muscles have had time to contract, and to alter the axis of the limb. This altered position of the limb has been attributed, by some surgeons, to the influence of the remaining portion of ligament; but in every accident, the direction of the bone is too much the same to induce the belief that it is chiefly the effect of muscular influence; for the ligament is extensively torn, in most cases scarcely any portion of it remaining whole, particularly in dislocations of the thigh, yet the position of the limb under the different species of dislocation, is found subject to little variation. The form of the bone has, however, some influence on its future position: for in fractures of the neck of the thigh-bone, the knee is turned outwards; while in dislocations, it is turned inwards: a difference which arises from the greater capacity of the bone to roll upon its axis when the neck is broken.

At first much motion.

In the first moments, however, of the dislocation, considerable motion remains, and the position is not so determinately fixed as it afterwards becomes; for I have seen a man brought into Guy's Hospital, who, but a few moments before, had the thigh-bone dislocated into the foramen ovale, and I was surprised to find in a case otherwise so well marked, that a great mobility of the bone still existed at the dislocated part; but in less than three hours, it became firmly fixed in its new situation by the permanent, or, as it is called, *tonic* contraction of the muscles.

Length of limb altered.

In some dislocations the limb is rendered shorter, and thus the muscles influenced by it are immediately thrown into a state of relaxation; but if the limb be elongated, the tension of the principal muscles around the joint is extreme, and they are sometimes stretched to laceration.

Effusion of blood.

Blood is often effused in considerable quantity around the joint, which renders detec-

tion of the accident difficult; the swelling being sometimes so considerable as to conceal entirely the ends of the bones. This effusion is in proportion to the size and number of the vessels lacerated.

A severe but obtuse pain arises from the pressure of the head of the bone upon the muscles, and, in some cases, this pain is rendered more acute from its pressure upon a large nerve. From this cause also is produced a paralysis of the parts below, instances of which occur in dislocations of the shoulder. In other cases, the bone presses upon important parts so as to produce effects dangerous to life. I have for many years mentioned in my lectures, a case of dislocated clavicle pressing upon the œsophagus so as to endanger life; of which Mr. Davie, of Bungay, was so kind as to send me an account. A more detailed account of this case will be given hereafter.

Effects of pressure from the dislocated bone.

In most dislocations, the head of the bone may be readily felt in its new situation; and the rotation of the limb best discovers the nature of the accident, as by this movement, the head of the bone is found to roll. The natural prominences of the dislocated bone, in some instances, either disappear, or become less conspicuous,—as the trochanter in luxations of the hip-joint; but the contrary result ensues in dislocations of the elbow; for there the olecranon is more than usually prominent, and serves as the principal guide for discovering the nature of the injury.

Criterion of the accident by rotation.

The more remote effects of the accident are, that frequently a sensation of crepitus is produced by the effusion of adhesive matter *(fibrin)* into the joint and bursæ; the synovia becomes inspissated, and crackles under motion,—a circumstance of which every practitioner should be aware, as he may be otherwise induced erroneously to suspect the existence of fracture.

Crepitus.

The degree of inflammation which succeeds to these accidents, is generally slight; but in some cases it becomes so considerable as to produce a tumefaction, which, added to that resulting from

Inflammation and suppuration.

extravasation of blood, frequently renders the detection of the injury exceedingly difficult. Sometimes, after the reduction of dislocations, suppuration ensues, and the patient falls a victim to excessive discharge and irritation. Mr. Howden, who was one of our most intelligent apprentices at Guy's Hospital, and was afterwards surgeon in the army, related the following case:—"A man had his thigh dislocated upwards and backwards on the ilium, which was soon after reduced; the next day a considerable swelling was observed on the part, which continued to increase, accompanied with rigours, and in four days the patient died. On dissection, the capsular ligaments, and ligamentum teres, were found entirely torn away, and a considerable quantity of pus extravasated in the surrounding parts." I attended the master of a ship, who had dislocated his thigh upwards; an extension was made, apparently with success; but in a few days a large abscess formed on the thigh, which destroyed the patient. Fortunately, however, such a result is by no means common.

When, from length of time, or any other cause, the reduction of the limb is rendered impracticable, the bone forms for itself a new bed, and some degree of motion is gradually recovered; although in neglected dislocations of the lower extremity, the patient is ever after lame; and in those of the upper, the motion and power of the limb are very much diminished.

Appearances on dissection.

On examination of the bodies of persons who die in consequence of dislocations arising from violence, the head of the bone is found completely removed from its socket. The capsular ligament is torn transversely to a great extent; the peculiar ligaments of joints, as the ligamentum teres of the hip, are torn through: but the tendon of the biceps, in dislocation of the os humeri, remains uninjured, as far as I have been able to ascertain by dissection; although I would by no means be understood to say that this is universally the case.

Ligaments.

Tendons.

The tendons which cover the ligaments are also torn; as the tendon of the subscapularis muscle, in the dislocation in the axilla; and according to the extent of this laceration, is the

facility with which the accident recurs after reduction,—a circumstance frequently very difficult to obviate.

Muscles.

The muscles are also influenced by the nature of the accident, being in some cases put upon the stretch, even to laceration; as the pectineus and abductor brevis, in dislocations of the thigh downward: and large quantities of blood become extravasated into the cellular membrane.

Dissections of old dislocations.

The appearance of joints which have long been dislocated, depends not only on the length of time that has elapsed from the accident, but also on the structure upon which the head of the dislocated bone is thrown; for if it be found embedded in muscle, its articular cartilage remains, and a new capsular ligament forms around it, which does not adhere to its cartilaginous surface. This ligament in dislocations of the femur, contains within it the head of the bone, with the lacerated portion of the ligamentum teres united to it. In these instances, the bones themselves undergo little change. The capsular ligament is formed from the surrounding cellular tissue; which, being pressed upon by the head of the bone, becomes inflamed, thickened, and condensed. By this means a substance is produced somewhat less dense than original ligament, but still possessing sufficient firmness to bear considerable pressure, and to furnish some degree of support.

Head of the bone embedded in muscle.

Formation of a new capsular ligament.

Manner of its formation.

Head of the bone resting on another bone.

But if the head of the dislocated bone be placed on the surface of another bone, or upon a thin muscle over it, that muscle becomes absorbed, and the bone undergoes a remarkable change: thus it is found, if the dislocation be not reduced, that both the ball and the bone which receives it are changed in their form. The pressure of the head of the bone produces absorption of the periosteum, and of the articular cartilaginous surface of the head of the bone; a smooth hollow surface is formed, and the ball becomes altered in its shape to adapt it to its new surface; and whilst this absorption proceeds upon the part on which the head of the bone rests, an ossific deposit takes place around it from the periosteum, which is there irritated, but not absorbed.

By the deposition of this bony matter between the periosteum and the original bone, a deep cup is formed to receive the head of the bone; and perhaps no instances can be adduced which more strongly mark the powers of nature in changing the form of parts to accommodate them to new circumstances, than these effects of dislocation.

Formation of a new socket.

The new cup which is thus formed, sometimes so completely surrounds the neck of the bone, as to prevent its being separated without fracture; and the socket is smoothed upon its internal surface, so as to leave no projecting parts which can interrupt the motion of the bone in its new situation.

The muscles losing their action, become diminished in bulk, and reduced in their length, in proportion to the displacement of the bone towards their origin; and if the dislocation has been long unreduced, they lose their flexibility, and tear rather than yield to extension.

Dislocation from relaxation.

Although dislocations happening from violence are accompanied by laceration of the ligaments of the joint, yet they may occur from relaxation of the ligaments only, of which the following case is an example.

Case.

A girl came to my house who had the power of throwing her patellæ from the surfaces of the condyles of the os femoris. Her knees were bent considerably inwards; and when the rectus muscle acted upon the patella, it was drawn from the thigh-bone into a line with the tubercle of the tibia, and laid nearly flat upon the side of the external condyle of the femur. She came from the south of Europe, where she had been brought up as a dancing girl from her earliest years, gaining her daily bread, as we see children in the streets of London, by dancing upon elevated platforms; and she imputed to these continued and early exertions the weakness under which she laboured.

Dislocation from accumulation of synovia.

A similar relaxation of ligaments, is also produced by an accumulation of synovia in joints. Mr. Shillito, surgeon at Hertford, requested me to see a female domestic belonging to a family in my

neighbourhood, who had a great enlargement of the knee-joint from an inordinate secretion of synovia; and when this became absorbed, the ligaments remained so much relaxed, that the efforts of the muscles in walking dislocated the patella outwards. I ordered her into the hospital, that the students might observe this case, of which the following is an account.

Cases of dislocation from relaxation.

Ann Parish was admitted into Guy's Hospital in the autumn of 1810, for a dislocation of the left patella from relaxation of the ligaments. She had for four years previously a large accumulation of synovia in that knee, causing some pain and much inconvenience in walking. Blisters had been applied without much effect, and other means tried for four months before her admission. When the knee had acquired considerable size, the swelling spontaneously subsided, and she then first discovered that the patella became dislocated when she extended the limb. She suffered some pain whenever this happened, and she lost the power of the limb in walking, so that she fell when the patella slipped from its place, which it did whenever she attempted to walk without a bandage. The patella was placed upon the external condyle of the os femoris, when thrown from its natural situation, to which it did not return without considerable pressure of the hand. In other respects, her health was good. Straps of adhesive plaster were ordered to be applied, and a roller to be worn, which succeeded in preventing the dislocation so long as they were used; but the bone again slipped from its place whenever they were removed. A knee-cap, made to lace over the joint, was ordered for her.

Paralysis.

Dislocation sometimes arises from a loss of muscular power; for when the muscles are kept long and forcibly extended, their tone becomes destroyed; or if, from a paralytic affection, they lose their action, a bone may be dislocated easily, but it is as readily replaced: of the first of these two causes, the following case is an illustration.

Case.

Mr. ——, a gentleman who had passed some of his early life in the East Indies, happened, as a junior officer on board his ship, to

be placed under the orders of one of the mates when the captain was on shore; and for some trifling offence was punished in the following manner:—His foot was placed upon a small projection on the deck, and his arm was lashed tightly towards the yard of the ship, and thus kept extended for an hour. When he returned to England, he had the power of readily throwing that arm from its socket merely by raising it towards his head, but a very slight extension reduced it; the muscles were also wasted, as in a case of paralysis.

I have also seen in a dislocation of the thumb, the first phalanx capable of being thrown from the os metacarpi pollicis, merely by the action of the muscles, from a relaxed state of the ligament.

Of the influence of paralysis, the following case is an example.

Case.

I was desired to see a young gentleman, who had one of those paralytic affections in his right side, which frequently arise during dentition. The muscles of the shoulder were wasted; and he had the power of throwing his os humeri over the posterior edge of the glenoid cavity of the scapula, from whence it was easily to be reduced.

In these cases, particularly in the latter, no laceration of the ligaments could have occurred; and they shew the influence of the muscles in preventing dislocation from violence, and in impeding its reduction.

Dislocation from ulceration.

Dislocations arise from ulceration, by which the ligaments are detached, and the bones become altered in their form. We frequently find this state of parts in the hip-joint; the ligaments ulcerated, the edge of the acetabulum absorbed, the head of the thigh-bone changed both in its magnitude and figure, escaping from the acetabulum upon the ilium, and there forming for itself a new socket. There is in the anatomical collection at St. Thomas's Hospital, a preparation of the knee dislocated by ulceration, anchylosed at right angles with the femur, and the tibia turned directly forwards. A boy, in Guy's Hospital, had his knee dislocated by ulceration, with the tibia thrown on the inner

side of the external condyle of the os femoris; and a girl, in the same hospital, had the knee dislocated by ulceration, the head of the tibia being placed behind the condyles of the os femoris.

Fractures and dislocations.

Dislocations are sometimes accompanied with fracture. At the ancle-joint, it rarely happens that dislocation occurs without a fracture of the fibula; and at the hip-joint, the acetabulum is occasionally broken.

Dislocations of the os humeri, are also accompanied sometimes with fracture of the head of that bone; of which there is a specimen in the Museum of St. Thomas's Hospital. The coronoid process is occasionally broken in dislocations of the ulna, producing a species of luxation, which does not permit the bone to be afterwards preserved in its natural situation.

Dislocation and fracture.

When a bone is both broken and dislocated, it is proper to endeavour to reduce the dislocation without loss of time, taking care that the fractured part be strongly bandaged in splints, to prevent any injury to the muscles; for if this be not done at first, it cannot be afterwards effected without danger of re-producing the fracture.

If a compound fracture of the leg, and a dislocation of the shoulder happen in an individual at the same time, the reduction of the arm should be immediately undertaken, after the fractured limb has been secured in splints. The Rev. Mr. H——, from the accident of being thrown from his chaise, had a compound fracture of the leg, and a dislocation of the shoulder forwards. The dislocation was not at first observed, nor was its reduction attempted till a fortnight had elapsed. The trial, however, proved unsuccessful; for, from a dread of fever and injury to the leg, sufficient extension could not be used.

The accidents which have been called dislocations of the spine, are generally fractures of the vertebræ, followed by displacement of the bones, but not of the intervertebral substance: even the articulatory processes are broken, as well as the bodies of the vertebræ; so that they are not true dislocations of the spine, ex-

cepting those of the upper cervical vertebræ,—dislocations of which are said to have occasionally occurred. The injuries of the spine, which produce paralysis of the lower extremities, arise from fractured portions of the bodies of the vertebræ pressing upon, and sometimes lacerating, the medulla spinalis.

Compound dislocations.

In *compound dislocation*, not only the articulatory surfaces of the bone are displaced, but the cavity of the joint is laid open by a division of the skin and the capsular ligament. The immediate effect of compound dislocation is to occasion the extravasation of blood into the joint, and to allow the escape of the synovia.

Danger.

Compound dislocations are attended with great danger, and for the following reason:—

When a joint is opened, inflammation of the lacerated ligaments and synovial surface speedily succeeds; in a few hours suppuration begins, and granulations arise from the surface of the secreting membrane; which, being of the mucous kind, is more disposed to the suppurative, than to the adhesive inflammation. But the same process does not immediately ensue upon the extremity of the bone, because it is covered by the articular cartilage. This cartilage, before the cavity fills with granulations, becomes absorbed, by an ulcerative process instituted on the ends of the bones, but sometimes beginning from the synovial surface. The bone inflames, the cartilage becomes ulcerated, numerous abscesses are formed in different parts of the joint, and at length granulations spring from the extremities of the bones deprived of their cartilages, and fill up the cavity; generally these granulations become ossified, and anchylosis succeeds; but sometimes they remain of a softer texture, and some degree of motion in the joint is gradually regained.

This process of filling up joints requires great general as well as local efforts; a high degree of irritation is produced, and if the constitution be weak, the patient, to preserve his life, is sometimes obliged to submit to amputation.

Injury to muscles, blood-vessels, &c.

In addition to the above, in compound dislocations the violence necessarily inflicted on the parts, the injury of the muscles and

tendons, and the laceration of blood-vessels, necessarily lead to more important and dangerous consequences than those which follow simple dislocations.

Treatment.

With respect to the treatment of compound dislocations, I propose to reserve my remarks for that part of the work which relates to injuries of the ancle, where such observations will be required, and where they will be better understood; and thus a repetition, superfluous, and perhaps irksome, will be avoided. I shall just remark, that some joints are more liable to compound dislocations than others. The hip-joint is scarcely ever so dislocated; of the shoulder I have known two instances; but the elbow, wrist, ancle, and fingers, are frequently the seats of this accident; and I have seen an instance of it in the knee.

Some joints more easily dislocated than others.

In consequence of their different formation, we find that in some joints dislocation is much more frequent than in others. Those which have naturally extensive motions are easily luxated, and hence the dislocation of the os humeri occurs much more frequently than that of any other bone; and having once occurred, it happens again readily in the mere natural elevation of the arm. It is wisely ordained that, in those parts to which extensive motion is assigned, and for which great strength is required, there is a multiplicity of joints. Thus, in the spine, in which great strength is necessary to protect the spinal marrow, numerous joints are formed; and the motion between any two of the bones is so small, that dislocations, except between the first and second vertebræ, rarely occur, although the bones are often displaced by fracture.

The carpus and the tarsus are constituted on a similar principle; they allow of considerable motion, yet maintain great strength of union. For if the motion between two bones, as in the spine, be multiplied by twenty-four, and that at the carpus by eight, the result will shew that great latitude of motion is given, and the strength of the part preserved; whilst, if the spine had been formed of a single joint, dislocations might have easily happened, and death from this cause have been a frequent occurrence.

Partial dislocations.

Dislocations are not always complete, since bones are sometimes but partially thrown from the articulatory surface on which they rested; this species of dislocation now and then occurs at the

Instance.

ancle-joint. An ancle which was dissected at Guy's Hospital by Mr. Tyrrell, and afterwards given to the Museum at St. Thomas's was found partially dislocated; the end of the tibia still rested in part upon the astragalus, but a larger portion of its surface rested on the os naviculare; and the tibia, altered by this change of place, had formed two new articulatory surfaces, with their faces turned in opposite directions towards the two tarsal bones. The dislocation had not been reduced. The knee-joint is, I believe, rarely dislocated laterally in any other way; for its extensive articular surfaces almost preclude the possibility of complete displacement. The os humeri sometimes rests upon the edge of the glenoid cavity, and readily returns into its socket; and the elbow-joint is dislocated partially, both in relation to the ulna and the radius.

The lower jaw is also sometimes partially dislocated, but in a different manner; one of the joints being luxated, and the other remaining in its place.

Cause.

Dislocations are generally occasioned by violence, and the displacing force usually takes effect whilst the bone is in an oblique direction to its socket; but the muscles must necessarily have been in a great degree unprepared for resistance, otherwise the greatest force would hardly have produced the effect: when they are unprepared, the injury will often ensue from very slight accidents. A fall in walking will sometimes dislocate the hip-joint, when the muscles have been prepared for a different exertion.

While dwelling on this subject in my lectures, I have usually adverted to the execution of Damien, as illustrative of this position.

Resistance of muscles.

Damien was executed for the attempt to murder Lewis XV. Four young horses were attached to his legs and arms, and were forced to make repeated efforts to tear his limbs from his body, but could not effect this purpose; and after fifty minutes, the executioners were obliged to cut the muscles and ligaments to effect

his dismemberment; or, in homelier phrase, to hew him limb from limb.

The following is the French account of this execution.

Execution of Damien.

"Il arriva à la place de Grève à trois heures et un quart, regardant d'un œil sec et ferme le lieu, et les instrumens de son supplice. On lui brula d'abord la main droite; ensuite on le tenailla, et on versa, sur ses plaies, de l'huile, du plomb fondu, et de la poix-resine. On procéda ensuite a l'écartellement. Les quatre chevaux firent pendant cinquante minutes des efforts inutiles pour demembrer ce monstre. Au bout de ce tems là, Damien, etant encore plein de vie, les bourreaux lui couperent avec de bistouris, les chairs et les jointures nerveuses des cuisses, et de bras; ce qu'on avoit été obligé de faire en 1610 pour Ravaillac. Il respiroit encore après que les cuisses furent coupées, et il ne rendit l'ame que pendant qu'on lui coupoit les bras. Son supplice depuis l'instant qu'il fut mis sur l'echafaud, jusqu'au moment de sa mort, dura près d'une heure et demie. Il conserva tout sa connoissance, et releva sa tête sept ou huit fois, pour regarder les chevaux, et ses membres ténaillés et brulés. Au milieu des tormens les plus affreux de la question il avoit laissé echapper des plaisanteries."—*Dictionnaire Historique.*

Dislocations rare in old age.

Old persons are much less liable to dislocations than those of middle life, because the extremities of bones in advanced age are often so soft as to break under the force applied, rather than quit their natural situations. Persons of lax fibre are prone to dislocation, because their ligaments easily tear, and their muscles possess little power of resistance. From these circumstances old people would be exposed to frequent dislocations, but for the softened state of the extremities of their bones.

Dislocations rare in the young.

Young persons are also very rarely the subjects of dislocations from violence; but now and then such accidents do occur: and I have described an instance of them in a child at seven years of age. It generally happens that their bones break, or their epiphyses give way, rather than that the parts suffer displacement. I read of dislocations of the hip in children, but their history is that of

diseases of the hip-joint, in which the dislocation has arisen from ulceration.

A child was brought to me from one of the counties north of London, for whom repeated extensions had been made by one of those people called *bone-setters*,—but who ought rather to be called *dislocators*,—for a supposed dislocation of the hip-joint. Upon examination, I found it to be that disease of the hip so common in children: and for this only, was a child wantonly exposed to a most painful extension.—That in this enlightened country, men, without education, should be suffered with impunity to degrade a most useful profession, and torture those who have the folly or the simplicity to apply to them, is a disgrace to our laws, that calls loudly for prevention.

Elbow-joint dislocations.

Dislocations of the elbow-joint in children are said to be of frequent occurrence. Surgeons have been heard to say, "I have a child under my care with luxation of its elbow, and I can easily return the bone into its place, but it directly dislocates again." Such a case is, in reality, an oblique fracture of the condyles of the os humeri, which produces the appearance of dislocation, by allowing the radius and ulna, or the ulna alone, to be drawn back with the fractured condyle, so as to produce considerable projection at the posterior part of the joint.

TREATMENT.

Difficulty of reduction.

The reduction of dislocations is often difficult; and in some of the joints, the form of the bone may occasion impediments. Thus, when the socket is surrounded by a lip of bone, as in the hip-joint, the head of the bone, during the act of reduction, stops at this projection, and requires to be lifted over it; another difficulty occurs when the head of the bone is much larger than its cervix; as for example, in the dislocation of the head of the radius; but still these causes are slight in comparison with others which we have to detail.

Capsular ligaments.

The capsular ligaments are by some supposed to resist reduc-

tion; but those who entertain this opinion must forget their inelastic structure, and cannot have had opportunities of witnessing by dissection, the extensive laceration which they sustain in dislocations from violence. The capsular ligaments, in truth, possess but little strength either to prevent dislocation, or to resist the means of reduction; and if the tendons with which they are covered, and the peculiar ligaments of the joints did not exist, dislocation must be of very frequent occurrence.

Tendons.

The joint of the shoulder, and those of the knee and elbow, are strongly protected by tendons; the shoulder by those of the spinati, subscapularis and teres minor muscles; the elbow by the triceps and brachialis; the knee by the tendinous expansion of the vasti: but still some ligaments resist dislocations: these, however, are the peculiar, not the capsular ligaments. The wrist and the elbow have their appropriate lateral ligaments to give additional strength to these joints. The shoulder, instead of a peculiar ligament, has the tendon of the biceps received into it, which lessens the tendency to dislocation forwards; the ligamentum teres of the hip-joint prevents facility of dislocation downwards; the knee has its lateral and crucial ligaments; and the ankle, exposed as it is to the most severe injuries, is provided with its deltoid and fibular tarsal ligaments, of very extraordinary strength, to prevent dislocation. The bones of this joint often break rather than their ligaments give way; however, in many of the joints, as these ligaments are torn, they afford no resistance to the reduction of dislocations, as in the hip, elbow, and wrist; but if one of them remain, it produces difficulty in the reduction, as I have seen in the knee-joint.

Peculiar ligaments.

Muscles.

The difficulty of reducing dislocations arises principally from the resistance which the muscles present by their contraction, and which is proportioned to the length of time which has elapsed from the injury; it is therefore desirable that the attempt at reduction should not be long delayed.

The common action of the muscles, are voluntary or involun-

tary; but they have a power of contraction independent of either state.

Fatigue of muscles.

A muscle, when excited to action by volition, soon becomes fatigued, and requires rest. The arm can be extended only for a few minutes, at right angles with the body, before it feels a fatigue which requires a suspension of action; and, indeed, the same law governs involuntary action, as the heart has its contraction and relaxation.

Permanent contraction.

But when a muscle is divided, its parts contract; or when the antagonist muscle is cut, the undivided muscle draws the parts into which it is inserted, into a fixed situation. Thus, if the biceps muscle be divided, the triceps keeps the arm constantly extended; if the muscles on one side of the face be paralytic, the opposing muscles draw the face to their side. This contraction is not succeeded by fatigue or relaxation, but will continue an indefinite time, even until the structure of the muscle becomes changed; and its contraction increases from the first occurrence of the accident. Thus it is, that when a bone is dislocated, the muscles draw it as far from the joints as the surrounding parts will allow, and there retain it by their contraction. It is this resistance from muscles, aided by their spontaneous contraction, which the surgeon is required to counteract. If an extension be made almost immediately after a dislocation has happened, the resistance produced by the muscles is easily overcome: but if the operation be postponed for a few days only, the utmost difficulty occurs in its accomplishment.

Vis tonica of muscles.

Mr. Forster, son of the surgeon of Guy's Hospital, informed me that in a fatal case of fracture of the thigh-bone, which he had an opportunity of dissecting before its union, the ends of the bones overlapped, and the muscles had acquired a contraction so rigid, that he could not, even in the dead body, bring the bones to their natural position, after employing all the force he was capable of exerting. It is this state of muscles in dislocations, which gives rise to the difficulty in their reduction, and which, even in the

dead body, is still capable of opposing a very considerable resistance.

That the muscles are the chief cause of resistance, is strongly evinced by those cases in which the dislocation is accompanied by injury to any vital organ, and when the power of muscular action is diminished; for it is then found, that a very slight force is sufficient to return the bone to its situation. Thus, in the case already mentioned, of the man who had an injury to his jejunum, and a dislocation of his hip, the bone was reduced with little difficulty.

Other difficulties.

When a dislocation has long existed, difficulties arise from three other circumstances. The extremity of the bone becomes united to the surrounding parts, by adhesive matter, so that even when in dissection the muscles are removed, the bone cannot be reduced. In this state I found the head of a radius, which had been long dislocated, resting upon the external condyle of the os humeri, and which is preserved in the collection at St. Thomas's Hospital; and in a similar state I have seen the os humeri when dislocated. The socket is also sometimes so filled with adhesive matter, that if the bone were reduced, it could not remain in its original situation, and the original cavity is in part filled with ossific matter, so as to render it incapable of receiving the head of the bone. Lastly: a new bony socket is sometimes formed, in which the head of the bone is so completely confined, that nothing but its fracture will allow it to escape from its new situation.

Means of reduction.

The means to be employed for the reduction of dislocations, are both constitutional and mechanical; force alone is in general objectionable, since it would be required in so great a degree as to occasion violence and injury; and it will in the sequel be shewn, that the most powerful mechanical means fail when unaided by constitutional remedies. The power and direction of the larger muscles are, in the first instance, to be duly appreciated, as these form the principal causes of resistance.

Constitutional.

The constitutional expedients applicable for the purpose of reduction, are those which produce a tendency to syncope, and this necessary state may be best induced by one or other of the fol-

lowing means: viz., *bleeding*, *warm-bath*, and *nausea*. Of these remedies, I consider bleeding the most powerful; and, that the effect may be produced as quickly as possible, the blood should be drawn from a large orifice, and the patient kept in the erect position, for by this mode of depletion, syncope is produced before too large a quantity of blood is lost. However, the activity of this practice must be regulated by the constitution of the patient; if he be young, athletic, and muscular, the quantity removed should be considerable, and the method of taking it away should be that which I have described.

The warm bath.

In those cases in which the warm-bath may be thought preferable, or where it may be considered improper to continue the bleeding, the bath should be employed at the temperature of 100° to 110°; and, as the object is the same as in bleeding, the person should be kept in the bath at the same heat till the fainting effect is produced, when he should be immediately placed in a chair, wrapped in a blanket, and the mechanical means employed which I shall hereafter particularly describe.

Antim. Tart.

Of late years, I have practised the mode of lowering the action of the muscles, by exhibiting nauseating doses of tartarized antimony; but as its action is uncertain, frequently producing vomiting, which is unnecessary, I rather recommend its application merely to such extent as to keep up the state of syncope already produced by the two preceding means; this its nauseating tendency will most readily effect, and so powerfully overcome the tone of the muscles, that dislocations may be reduced with much less effort, and at a much more distant period from the accident, by these means, than in any other way.

Combination of remedies.

The two cases related in the follow pages, one from Mr. Norwood, surgeon at Hertford, and the other from Mr. Thomas, apothecary to St. Luke's Hospital, will illustrate the efficacy of the treatment recommended. By the combination of bleeding, the warm-bath, and nauseating doses of tartarized antimony, two dislocations were reduced at a more distant period from the accident than I have ever known in any other example. One of these

cases occurred at Guy's, and the other at St. Thomas's Hospital, at the time when these gentlemen were officiating as dressers.

Opium.

The effect of opium I have never tried, but it would probably be useful in a large dose, from its power of diminishing muscular and nervous influence.

Mechanical means.

The reduction of the bone is to be attempted, after lessening the power of the muscles, by fixing one bone, and drawing the other towards its socket. It is now generally agreed among the most eminent surgeons, that force should be only gradually applied; for violence is as likely to tear sound parts, as to reduce those which are luxated; and it is apt to excite all the powers of resistance to oppose the efforts of the surgeon. Hence it becomes necessary to produce, gradually, that state of fatigue and relaxation which is sure to follow continued extension, and not to attempt at once to overpower the action of the muscles.

Cause of failure.

One great cause of failure in the attempt to reduce dislocations, arises from insufficient attention to the fixation of that bone in which the socket is placed. For example: in attempting to reduce a dislocation of the shoulder, if the scapula be not fixed, or if one person pull at the scapula and two at the arm, the scapula will be necessarily drawn with the os humeri, and the extension will be very imperfectly made; the one bone, therefore, must be firmly fixed, or drawn in the opposite direction, while the other is extended.

Compound pulley.

The force required may be applied either by the exertion of assistants, or by a compound pulley; but the object is to extend the muscles by gradual, regular, and continued efforts; in cases of difficulty recourse should always be had to the pulley; its effect may be gentle, continued, and directed by the surgeon's mind; but when assistants are employed, their exertions are sudden, violent, and often ill directed; and the force is more likely to produce laceration of parts, than to restore the bone to its situation. Their efforts are also frequently uncombined, and their muscles as necessarily become fatigued as those of the patient, whose resistance they are employed to subdue.

In dislocation of the hip-joint, pulleys should always be employed; and in those dislocations of the shoulder, which have long remained unreduced, they should also be resorted to. I do not mean to doubt the possibility of reducing dislocations of the hip by the aid of men only, but to point out the inferiority of this mode to the mechanical means. The employment of pulleys in dislocations, is not a modern practice: Ambrose Paré frequently had recourse to them, and good practical surgeons have used them since his time:—most writers on surgery have also mentioned their use, but they have not duly appreciated them. Mr. Cline, whose professional judgment every one must acknowledge, always strongly recommended them.

Relaxation of the stronger muscles.

During the attempt to reduce luxations, the surgeon should endeavour to obtain a relaxation of the stronger opposing muscles. The limb should therefore be kept in a position between flexion and extension, as nearly as that medium can be obtained. Who has not seen, in the attempt to reduce a compound fracture in the extended position of a limb, the bone, which could not be brought into apposition under the most violent efforts, quickly replaced by an intelligent surgeon, who has directed the limb to be bent, and the muscles to be placed in a comparative state of relaxation?

Whether the extension should be applied to the dislocated bone.

A difference of opinion prevails, whether it is best to apply the extension on the dislocated bone, or on the limb below. M. Boyer, who has long taken the lead in surgery in Paris, prefers the latter mode. As far as I have had an opportunity of observing, it is generally best to apply the extension to the bone which is dislocated. There are, however, exceptions to this rule in the dislocation of the shoulder, which I generally reduce by placing the heel in the axilla, and by drawing the arm at the wrist in a line with the side of the body.

Influence of the mind.

In the reduction of dislocations, great advantage is derived from attending to the patient's mind; the muscles opposing the efforts of the surgeon, by acting in obedience to the will, may be made to desist from that action by directing the mind to other muscles. Several years since, a surgeon in Blackfriars' Road, asked me to

see a patient with a dislocated shoulder, which had resisted the various attempts he had made at reduction. I found the patient in bed, with his right arm dislocated. Sitting down on the bed by his side, I placed my heel in the axilla, and drew the arm at the wrist; the dislocated bone remained unmoved. I said, "Rise from your bed, Sir:" he made an effort to do so, whilst I continued my extension, and the bone snapped into its socket. For a similar reason a slight effort, when the muscles are unprepared, will accomplish the reduction of dislocation, after violent measures have failed.

The reduction of the limb is ascertained by the restoration of its natural form, by the recovery of its original motion, and by a snap or sudden sound, which is heard when the bone returns into its articulatory cavity.

After a bone has been reduced by the pulleys, it will not remain in its situation without the aid of bandages to support it, until the recovery of muscular action. In the hip, however, dislocations rarely occur a second time; but the shoulder and the lower jaw very frequently slip again from their sockets, owing to the little depth of the cavity into which the head of the bone is received; and therefore they require bandages for a considerable period.

Second dislocation.

Rest is necessary for some time after the reduction of the limb, in order to produce a union of the ruptured ligament, which would be prevented by exercise. The strength of the muscles and ligaments may also be greatly promoted by affusion of cold water upon the limb, and by subsequent friction.

Rest of the limb.

I believe that much mischief is produced by attempts to reduce dislocations of long duration in very muscular persons. I have seen great contusion of the integuments, laceration and bruises of muscles, tension of nerves, inducing an insensibility and paralysis of the hand, occasioned by an abortive attempt to reduce a dislocation of the shoulder; so that the patient's condition has been rendered much worse than before. In such cases, even when the bone is replaced, it has often proved rather an evil than a benefit, from the violence of the extension.

Old dislocations not to be reduced.

In those instances in which the bone remains in the axilla, in dislocations of the shoulder, a serviceable limb, and very extensive motions of it, may be regained, although reduction has not been effected. Captain S——, who had dislocated his shoulder four years before, called to shew me how much motion he had recovered, although the arm still remained unreduced.

Time for attempting reduction.

I am of opinion, that three months after the accident for the shoulder, and eight weeks for the hip, may be fixed as the period at which it would be imprudent to make the attempt at reduction, except in persons of extremely relaxed fibre, or of advanced age. At the same time, I am fully aware, that the shoulder has been reduced at a more distant period than that which I have mentioned; but, in most instances, the reduction has been attended with the results I have just been deprecating.

In cases of unreduced dislocation, the only course which the surgeon can adopt, after the inflammation which the injury produces has subsided, is, to advise motion of the limb, and friction of the injured part:—The former, to produce a new cavity for the head of the bone, to assist in forming a new ligament, and to restore action to muscles, which they would otherwise lose by repose;—the latter, to promote absorption, and to remove the swelling and adhesions which the accident has caused.

PARTICULAR DISLOCATIONS.

DISLOCATIONS OF THE HIP-JOINT.

Anatomy of the joint.

The acetabulum of the hip-joint is deepened by a cartilaginous ridge, which surrounds its brim; and although in the skeleton it is not a complete cup, yet it is rendered such in the living subject, by

PLATE XI.

Shewing the positions of the limb in the different dislocations of the hip, and in the fracture of the cervix femoris.

Fig. 1. The dislocation upwards upon the dorsum ilii. The limb shortened—the hip projecting—the knee and foot turned inwards, with the toes resting over the metatarsus of the sound limb.

Fig. 2. The dislocation downwards into the foramen ovale. The limb lengthened—the knee advanced and separated from the other—the toes pointed—the heel does not touch the ground—the body bent forward.

Fig. 3. The dislocation into the ischiatic notch. The limb shortened—the knee and foot a little turned inwards, with the great toe resting against the ball of the great toe of the sound limb.

Fig. 4. The dislocation on the pubes. Projection at Poupart's ligament from the head of the bone, the limb widely separated from the other, and the knee and foot turned outwards—the limb a little shortened.

Fig. 5. Fracture of the cervix femoris. The leg is shorter, the knee turned out; the patella from one to two inches above the other; foot everted: the limb may be extended to the same length as the other, and then, if rotated, a crepitus will be felt.

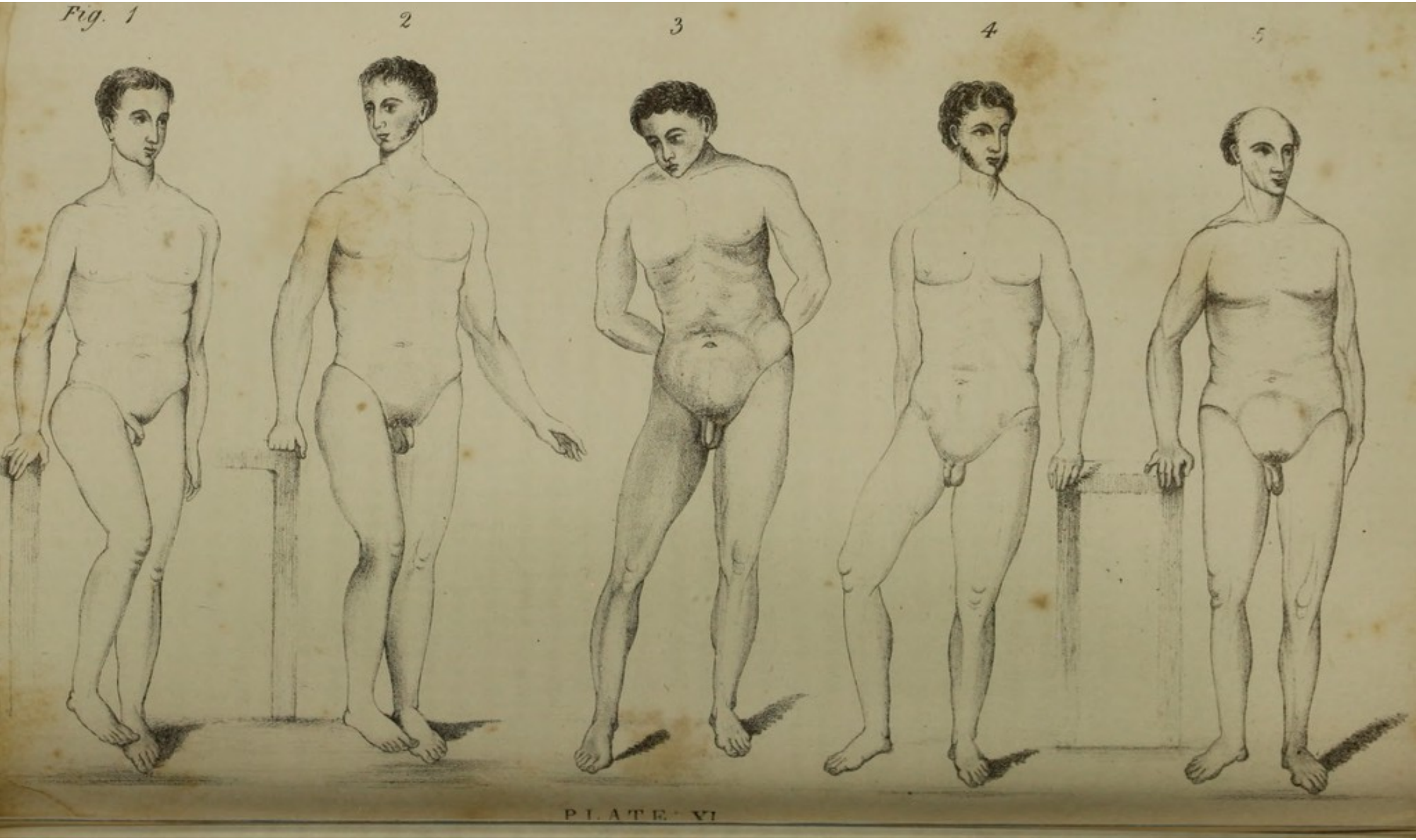


PLATE VI

an additional portion of cartilage, which fills up a depression in the bone in the inferior and anterior part of the cavity.

Ligaments.

The ligaments are two: the capsular arises from the edge of the acetabulum, and passing over the head and neck of the bone, is inserted into the cervix of the os femoris at the root of the trochanter major. It is much more extensive on the anterior than on the posterior portion of the neck of the bone. The inner side of this ligament is a secreting surface, producing the synovia; and a reflected portion of it towards the head of the bone is also provided with a similar secreting surface.

On the anterior surface of the neck of the thigh-bone, the capsular ligament is received into a line, which extends from the trochanter major to the trochanter minor. The synovial secreting surface is reflected towards the head of the bone, and the ligament is reflected close on the neck of the bone, to form the periosteum; whilst its fibres are intersected with the common periosteum, below the insertion of the ligament, into the bone.

On the posterior surface, the capsular ligament is received upon the neck of the bone, nearly midway between the edge of the head of the bone and the trochanter major. The common periosteum on the neck of the bone incorporates with the reflected ligament to form the periosteum of the neck of the bone within the capsule*.

The ligamentum teres is contained within the capsular ligament, and proceeds from a depression in the lower and inner part of the acetabulum, to be fixed in a hollow upon the inner side of the thigh-bone: it has a tendency to prevent dislocations in all directions, but particularly the dislocation downwards; for when this dislocation occurs, the thighs are widely separated from each other, as in fencing; and the head of the thigh-bone would be in danger of slipping from its socket, were it not prevented by this liga-

* *Query.*—Can this ligamentous periosteum be one cause of a ligamentous union in fractures within the joints? I believe that when a union of the neck of the thigh-bone is met with, it must be in a case in which this ligamentous sheath of the cervix has not been torn.

ment:—an example of its use, which shews the principal reason of its formation.

Mode of dislocation.

The thigh-bone I have seen dislocated in four directions:—First, upwards, or upon the dorsum of the ilium; secondly, downwards, or into the foramen ovale; thirdly, backwards and upwards, or into the ischiatic notch; and, fourthly, forwards and upwards, or upon the body of the pubes. A dislocation downwards and backwards, has been described by some surgeons, who have had opportunities for observation; but I have to remark, that no dislocation of that description has occurred at St. Thomas's or Guy's Hospitals, within the last thirty years, or in my private practice; and although I would not deny the possibility of its occurrence, yet I am disposed to believe that some mistake has arisen upon this subject.

DISLOCATION UPWARDS, OR ON THE DORSUM ILII.

Dislocations on the dorsum ilii.

This dislocation is the most frequent of those which happen to the hip-joint: and the following are the signs of its existence.

Symptoms.

The dislocated limb is from one inch and a half to two inches and a half shorter than the other, as will be seen by comparing the malleoli interni, when the foot is bent at right angles with the leg. The toe rests upon the tarsus of the other foot; the knee and foot are turned inwards, and the knee is a little advanced upon the other. When the attempt is made to separate the leg from the other, it cannot be accomplished, for the limb is firmly fixed in its new situation, so far as regards its motion outwards; but the thigh can be slightly bent across the other. If the bone be not concealed by extravasation of blood, the head of the thigh-bone can be perceived during rotation of the knee inwards, moving upon the dorsum ilii; and the trochanter major advances towards its anterior and superior spinous process, so as to be felt much nearer to it than usual. The trochanter is less prominent than on the opposite side, for the neck of the bone and the trochanter rest in the line of the surface of the dorsum ilii; and upon a comparison of the two

hips, the roundness of the dislocated side will be found to have disappeared. A surgeon, when called to a severe and recent injury of the hip-joint, looks for difference in length, change of position inwards, diminution of motion, and decreased projection of the trochanter.

Distinction from fracture of the neck of the femur.

The accident with which the dislocation upwards is liable to be confounded is, the fracture of the neck of the thigh-bone within the capsular ligament. Yet the marks of distinction are, in general, sufficiently strong to be unequivocal to a person commonly attentive. In a fracture of the neck of the thigh-bone, the knee and foot are generally turned outwards; the trochanter is drawn upwards and backwards, resting upon the dorsum ilii; the thigh can be readily bent towards the abdomen, although with some pain; but above all, the limb, which is shortened according to the duration of the accident, from one to two inches, by the contraction of the muscles, can be made the length of the other by a slight extension: and when the extension is abandoned, the leg is again shortened. If the limb when drawn down be rotated, a crepitus can often be felt, which ceases to be perceived when rotation is performed under a shortened state of the limb. Fracture of the neck of the thigh-bone, within the capsular ligament, rarely occurs but in advanced age; and the most trifling accident is sufficient to produce it, in consequence of the interstitial absorption which this part of the bone undergoes at advanced periods of life. Fractures externally to the capsular ligament, occur at any age, and they are easily distinguished by the crepitus which attends them, if the limb be rotated and the trochanter compressed with the hand. The position is the same as in fractures within the ligament. Fractures of the neck of the thigh-bone are very frequent accidents when compared with dislocations.

Diseases of the hip-joint.

Diseases of the hip-joint can scarcely ever be confounded with dislocations from violence, but by those who are ignorant of anatomy, and who are very superficial observers. The gradual progress of the symptoms, the pain in the knee, with the apparent elongation at first, and real shortening afterwards; the capacity

for motion, yet the pain given under extremes of rotation, as well as of flexion and extension, are indications of difference which would strike the most careless observer. The consequences of a disease of this kind, when it has existed for a great length of time, are, ulceration of the ligaments, acetabulum, and head of the bone, which allow of such a change of situation of parts, as sometimes to give the limb the position of dislocation; but the history of the case at once explains to the medical attendant the nature of the disease.

Cause. This dislocation may be caused by a fall when the knee and foot of the patient are turned inwards, or by a blow whilst the limb is in that position;—the head of the bone being thus displaced upwards, and turned backwards.

In the reduction of this dislocation, the following plan is to be adopted:—let the patient lose from twelve to twenty ounces of blood, or even more if he be a very strong man; then place him in a warm bath, at the heat of 100°, and gradually increase it to 110°, until he feels faint. During the time he is in the warm-bath, give him a grain of tartarized antimony every ten minutes, until he feels some nausea; then remove him from the bath, and put him in blankets; he is then to be placed between two strong posts, about ten feet asunder, in which two staples are fixed; or rings may be screwed into the floor, and the patient be laid upon it. My usual method is, to place him on a table covered with a thick blanket upon his back; then a strong girth is passed between his pudendum and thigh, and this is fixed to one of the staples. A wetted linen roller is tightly applied just above the knee, and upon this a leathern strap is buckled, having two straps with rings at right angles with the circular part. The knee is to be slightly bent, but not quite at a right angle, and brought across the other thigh a little above the knee of that limb. The pulleys are fixed in the other staple, and in the straps above the knee. The patient being thus adjusted, the surgeon slightly draws the string of the pulley; and when he sees that every part of the bandage is upon the stretch, and the patient begins to complain, he waits a little to

give the muscles time to become fatigued; he then draws again; and when the patient suffers much, again rests, until the muscles yield. Thus he gradually proceeds until he finds the head of the bone approach the acetabulum. When it reaches the lip of that cavity, he gives the pulley to an assistant, and desires him to preserve the same state of extension, and the surgeon then rotates the knee and foot gently, but not with a violence to excite opposition in the muscles, and in this act the bone slips into its place. In general, it does not return with a snap into the socket when the pulleys are employed, because the muscles are so much relaxed, that they retain not sufficient tone to act with violence: and the surgeon ascertains the reduction only by loosening the bandages, and comparing the length of the limbs.

It often happens that the bandages get loose before the extension is completed, an accident which should be carefully prevented by having them well secured at first; but if they require to be renewed, this should be expeditiously performed, to prevent the muscles having time to recover their tone.

It is sometimes necessary for the operator to lift the bone, by placing his arm under it near the joint, when there is difficulty in bringing over the lip of the acetabulum; or a napkin may be passed under the bone, as near the head as possible, and by its means an assistant may raise it. After the reduction, in consequence of the relaxed state of the muscles, great care is required in removing the patient to his bed.

I have seen reduction of the bone effected, even where the extension was not made in the best possible direction: for when the muscles have not had time to settle, they will allow the bone to be restored into its socket, even when extension is made in a direction not the most favourable for its reduction. I cannot by any means subscribe to the method adopted by the late Mr. Hey, although no person ever felt greater respect for his talents, more highly appreciated his acquirements, or is more disposed to pursue the study of the profession in the mode which he so successfully adopted. The direction which he gave to a limb, in the case

which he has represented of this accident, was one little calculated for success, in cases where the means were not used immediately after the injury had been sustained. But I state this with great deference, because I am not sure, that in all respects, I understand the description of the method which he adopted; nor do I think that I should be able, from that description, to be certain that I was pursuing the means by which he succeeded.

I may here observe, and I trust without ostentation, that the methods which I have recommended, are the result of considerable experience; that they have been successful in a great number of cases; and that they have very rarely failed, under the most disadvantageous circumstances. They may require a little variation, from some slight difference in the position, but this will only be an exception to a general rule, and will very rarely occur.

The following cases will serve as illustrations of the history and treatment of dislocations on the dorsum ilii; the first of them points out, in a striking manner, the evils that ensue when dislocation of the hip-joint remains unreduced, and the advantages arising from the use of pulleys in effecting its reduction. It shews also that such dislocation may happen in a strong healthy man, even after he has attained the age of sixty.

DISLOCATION ON THE DORSUM ILII.

Case. James Ivory, aged sixty-two, of Pottensend, Herts, on the 7th of February, 1810, was working in a clay-pit, twenty-five feet below the surface of the earth, when a large quantity of clay fell in upon him, while he was in the act of stooping with his left knee bent rather behind the other; and he was, in this position, buried under the earth. Being soon removed from this perilous situation and carried home, a surgeon was sent for, who discovering the accident to be a dislocation, directly employed some men to extend the limb, whilst he attempted to push the head of the bone into the acetabulum; but all his efforts were unavailing, as, unfortunately

for the patient, pulleys were not employed. The appearance of the limb, after nine years have elapsed since the accident, are these:— the limb is three inches and a half shorter than the other, and he is obliged to wear a shoe with an additional sole of three inches on that side, which lessens, though it does not prevent his halt in walking. When he stands, the foot of the injured limb rests upon the other; the toes are turned inwards; and the knee, which is advanced upon the other, is also inverted, and rests upon the side of the patella of the sound limb, and upon the vastus internus muscle; it is also bent, and cannot be completely extended. The thigh, from the unemployed state of several of the muscles, is very much wasted; but the semi-tendinosus, semi-membranosus, and biceps, in consequence of the shortened state of the limb, form a considerable rounded projection on the back part of the thigh. The trochanter major is seven-eighths of an inch nearer to the spine of the ilium of the injured side than of the other. On viewing him behind, the trochanter major is seen projecting on the injured side much farther than on the other; the situation of the head of the bone on the dorsum ilii, is easily perceived; and when the limb is rotated inwards, it is still more obvious. The spinous processes of the ilia are of an equal height. In the sitting posture, the foot is turned very much inwards, and the knee is placed behind the other, whilst the toe only reaches the ground. If fatigued, he experiences pain in the opposite hip, and in the thigh of the injured limb. This unfortunate man finds it an arduous task to gain his bread by his labour, as he cannot stoop but with the greatest difficulty; for when he attempts to take anything from the ground, he bends the knee of the injured limb at right angles with the thigh, and throws it far back. He can now stand for a few seconds upon the dislocated limb, but it was twelve months before he could endure that posture. When in bed, he finds it painful to lie on the injured side. His hip, without any apparent cause, is much weaker at some times than at others. When sitting down to evacuate his fæces, he is obliged to support himself by resting the injured knee against the tendo achillis of

the other leg, placing his right hand on the ground. He now walks with two sticks: at first he employed crutches, and these he used for twelve months, after which he was enabled to trust to one crutch and a stick, until his limb acquired greater strength. In getting over a stile, he raises the injured limb two steps, and then turns over the sound limb; but this he cannot accomplish when the steps are far apart; and he is frequently obliged either to turn back, or to take a circuitous route. When lying with his face downwards, the dislocated hip projects very much. He sometimes falls in walking, and would very frequently fall, but that he takes extreme care, as the least check to his motion throws him down. The knee is bent, and the shortening of the limb partly originates in that circumstance.

The following cases were sent me by the gentlemen whose names are attached; they illustrate the method of reduction detailed in the preceding pages, and shew in strong colours the advantages to be derived from constitutional treatment, and the use of pulleys.

Case of dislocation on the dorsum ilii.

John Forster, aged twenty-two years, was admitted into the Chester Infirmary, July 10, 1818, with a dislocation of the thigh on the dorsum ilii, occasioned by a cart passing over the pelvis. Upon examination, I found the leg shorter than the other, and the knee and foot turned inwards. The patient being firmly confined upon a table, I extended the limb by pulleys for fifty minutes without success, and he was returned to bed for three hours; after which he was put in the warm bath for twenty minutes, and the extension was repeated for fifteen minutes unsuccessfully; I therefore took twenty-four ounces of blood from him, and gave him forty drops of tinct. opii. Continuing the extension, but not succeeding in producing faintness, I gave small doses of a solution of tartrate of antimony, which in quarter a of an hour produced nausea: in ten minutes afterwards I succeeded in reducing the limb, and in less than a fortnight he left the Infirmary quite well.

S. R. Bennet.

Chester.

John Lee, aged thirty-three, of a strong and robust constitution, in passing over a foot-bridge, October 9th, 1819, fell from a height of about four feet on a large stone, and dislocated his left hip. I did not see him until the fourth of December, when I found the limb full three inches shorter than the other, the knee turned in, the foot directed over the opposite tarsus, and the trochanter major brought nearer the spinous process of the ilium. On laying the man on his face, the head of the femur and trochanter could be distinctly seen on the dorsum ilii, so as to leave not the slightest doubt of the nature of the injury. With the assistance of a neighbouring practitioner, I immediately set about to reduce it. A girth was applied between the legs, and a bandage over the knee, to fix the pulleys, &c., in the usual manner. I then made the extension downwards and inwards, crossing the opposite thigh two-thirds downwards: and immediately when the extension was commenced, I gave him a solution of two grains of tartar emetic, which was repeated five times every ten minutes, but it produced very slight nausea. I shortly after bled him to sixty ounces without syncope; and after keeping up the extension gradually for about two hours, with all the force one man could employ with the pulleys, we found the limb as long as the opposite; we then endeavoured to lift the head of the bone over the acetabulum, by means of a towel under the thigh and over one of our heads, at the same time rotating the limb outwards with all the force we were able to exert; the foot at length became somewhat turned out, and the head of the bone to be less distinctly felt, and in about half an hour we heard a grating of the head of the bone, when the man instantly exclaimed it was replaced*; and, upon examination, finding the foot turned out, the limb of its natural length, and no appearance of the head of the bone on the dorsum ilii, we concluded it must be within the acetabulum, and desisted from any further violence, put the man to bed, and tied his legs

Case.

* In dislocations which have long remained unreduced, the bones do not usually snap into the socket at its reduction.—A. C.

together; his foot immediately became sensible, which it had not been before, since the accident, and he altogether felt easier. A large blister was applied over the trochanter, and he slept well in the night, and complained only of pain in the perineum and just above the knee, where the bandages had been applied; there was no subsequent fever, nor any unpleasant symptom whatever.

In a few days the man could bear slight flexion and extension without pain, and in a week some degree of rotation; the limb became gradually stronger, and the power of motion so increased, that on the twelfth day he could by himself bring the thigh at right angles with the body. He was now taken out of bed; bandages were applied round the thigh and pelvis; and he could stand perfectly upright, so as to walk with his heel on the ground with the assistance of crutches: and from exercise, he grew so rapidly stronger, that on the twenty-second day he left off one crutch, and on the twenty-fifth the other. In a month he was able to walk without a stick; and in five weeks, having particular business, he walked nearly twenty miles, perfectly upright and without the least limping.

S. Nott.

Collumpton, Devon, Jan. 27, 1820.

I attended the following case, which forms a striking contrast to the preceding, and to some of those hereafter related.

Case. I was desired to visit a man aged twenty-eight years, who, by the overturning of a coach, had dislocated his left hip more than five weeks before; and who had been declared not to have a dislocation, although the case was extremely well marked. His leg was full two inches shorter than the other; his knee and foot were turned inwards; and the inner side of the foot rested upon the metatarsal bones of the other leg. The thigh was slightly bent towards the abdomen, and the knee was advanced over the other thigh. The head of the thigh-bone could be distinctly felt upon the dorsum of the ilium: and when the two hips were compared, the natural roundness of the dislocated side had disappeared.

I used only mechanical means in my attempts at reduction; and although I employed the pulleys, and varied the direction of repeated extensions, I could not succeed in replacing the bone, and this person returned to the country with the dislocation unreduced.

The next case was communicated to me by Mr. Norwood, surgeon, Hertford.

William Newman, a strong muscular man, nearly thirty years of age, was admitted into Guy's Hospital on Wednesday, December 4, 1812, for a dislocation of the hip-joint. In springing from the shafts of a waggon, on Thursday, November 7th, his foot slipped, and his hip was driven against the wheel with considerable force. He immediately fell, and being unable to walk, was carried to Kingston Workhouse, near the place where the accident happened. On the evening of that day, he was examined by a medical man, but the nature of the accident was not ascertained. He remained at Kingston until the 30th of November, and was then removed to Guildford, his place of residence, and on the 4th of December, to Guy's Hospital. On examination, the head of the thigh-bone was found resting on the dorsum ilii: the trochanter was thrown forward towards the anterior superior spinous process of the ilium. The knee and foot were turned inwards, and the limb was shortened one inch and a half; the great toe rested upon the metatarsal bone of the other foot, and there was but little motion in the limb. Case.

On Saturday, the 7th of December, thirty days after the accident, an extension was made to reduce the limb; and previously to the application of the bandage, he was bled to twenty-four ounces from his arm; in about ten minutes after, he was put into a warm bath, where he remained until he became faint, which happened in fifteen minutes: a grain of tartarized antimony was then given him, and repeated in sixteen minutes, as the first dose did not produce nausea. The most distressing nausea was now quickly produced, but he did not vomit; and while under the influence of

this debilitating cause, he was carried into the operating theatre in a state of great exhaustion. Being placed on a table on his left side, the bandage was applied in the usual manner to fix the pelvis, and the pulleys were fastened to a strap around the knee; the thigh was drawn obliquely across the other, not quite two-thirds of its length downwards, and the extension was continued for ten minutes, when the bone slipped into the socket. The man was discharged from the hospital in three weeks from the period of his admission, making a rapid progress towards a recovery of the perfect use and strength of the limb.

From the following cases it will be seen we are not to despair of success, even when a considerable time has elapsed after the accident.

Case. Mr. Mayo has mentioned the case of William Honey, who came into the hospital in August, 1812. The dislocation had taken place seven weeks before, and was reduced the day after his admission. He was discharged cured, on the 18th of November. —This was a dislocation on the dorsum ilii.

Case. Mr. Tripe, surgeon at Plymouth, has sent to the Medico-Chirurgical Society, an account of a case of dislocation of the thigh-bone on the dorsum ilii, which had happened seven weeks and one day prior to his making an extension, in which he was so fortunate as to succeed in restoring the bone to its natural situation.

The following instances prove, indeed, that the dislocation on the dorsum ilii may be reduced without pulleys; but they show at the same time how desirable that mechanical aid would have been especially in the first two instances.

Case. William Piper, aged twenty-five years, sustained an injury from the wheel of a cart, laden with hay, which passed between his legs and over the upper part of his right thigh. Mr. Holt, surgeon at Tottenham, was sent for nearly a month after the accident: he found him in great pain, attended with fever, and with much local inflammation and tension. He bled him copiously, purged him

freely, and applied leeches. The injured leg was shorter than the other, and the head of the bone was seated upon the dorsum ilii: the knee and foot were turned inwards.

As I visited Tottenham frequently at that time, Mr. Holt asked me to accompany him to see the man, and we agreed on the propriety of making a trial at reduction. Mr. Holt and myself, assisted by five strong men exerted our best endeavours for that purpose. Repeatedly fatigued, we were several times obliged to pause and then renew our attempt. At length exhausted, we were about to abandon any further trial, but agreed to make one last effort; when at fifty-two minutes after the commencement of the attempt the bone slipped into its socket.

Case. In a case also, which I attended with Mr. Dyson, in Fore-street, I succeeded in reducing the limb without the use of pulleys; but the violence used was so great, and the extension so unequal, (our fatigue being nearly as severe as that of the patient,) that I am confident no person who had used pulleys in dislocation of the hip, would have recourse to any other mode, excepting in dislocation into the foramen ovale.

In the following case, sent me by Mr. Oldknow of Nottingham, the extension was made at the ancle; it is consequently worthy of notice.

Case. William Sharpe, an athletic young man, in wrestling received a fall; his antagonist falling with and upon him, their legs were so entangled that he cannot say how he came to the ground. He complained of great pain in the hip, and was incapable of rising. About twenty minutes after the accident, I found him lying on his belly in the field where it had occurred, and the left limb in a trifling state of abduction, shortened, and the knee and foot turned inwards; the prominency of the trochanter gone, and the head of the bone obscurely felt on the dorsum ilii. He was conveyed home; and in order to reduce the dislocation,—for such I considered it,—I placed the man on his right side diagonally across a four post bedstead. The centre of a large sheet rolled up, was

passed in front and behind the body, and fastened to the upper bed-post as low as possible. The centre of a napkin, rolled in like manner, was then applied upon the dorsum ilii, between its crista and the dislocated bone; and each extremity being brought under the sheet, forwards and backwards, was reflected over it and tied in the centre, by which means I hoped to keep the pelvis secure. The counter extending force was applied above the ancle, (it appearing to me to interfere less with the muscles upon the thigh,) first by rolling round a wetted towel, and then placing upon this the end of a long or jack-towel. Three men were now directed to pull gradually and steadily: and when I perceived that the head of the femur was brought down to the edge of the acetabulum, I raised it a little with my clasped hands placed under the upper part of the thigh, and immediately the head of the bone entered the cotyloid cavity with a smart snapping noise. The man had considerable pain about the hip and knee for some time, but is now quite well.

I have met with many instances of these accidents conjoined with another injury, which at first sight presented a complication sufficiently embarrassing, but without being, in reality, productive of much additional difficulty. I allude to cases in which, with dislocation of one hip, there has been a fracture of the bone of the opposite thigh. In such circumstances, I have fixed some splints temporarily, but very firmly upon the broken limb, and then, turning the patient on that side, have proceeded to the reduction of the dislocated hip in the usual way. After this has been accomplished, I have taken the splints from the broken limb, and bound it up again in the customary manner; and every case which I have seen, has done well, without any additional inconvenience.

DISLOCATION OF THE THIGH UPON THE DORSUM ILII, WITH FRACTURE OF THE THIGH-BONE.

Case. Abraham Harman, aged thirteen years, a patient under Mr. Forster in Guy's Hospital, gave the following account of his acci-

dent:—About four months prior to this time, he drove his master's horses to a chalk pit; he went down into the pit to pack the chalk, and to break it into small pieces; and while he was thus occupied the side of the pit gave way and a large piece of chalk striking him violently on the hip knocked him down. Being immediately taken to a neighbouring public-house, a surgeon was sent for. The thigh was discovered to be fractured near its middle, but very considerable contusions prevented the dislocation from being at first discovered. Fomentation and other means of reducing the swelling at the hip having been employed, it was ascertained that the thigh was also dislocated, and some attempts were made to reduce it; but the fracture would not then bear the extension, and the boy was sent to the hospital. No attempt has since been made to reduce the bone.

This case presented unusual difficulties; and the probability is, that dislocation thus complicated with fracture, will, generally, not admit of reduction; as extension cannot be made until three or four months have elapsed from the accident, and then only with strong splints upon the thigh, to prevent the risk of disuniting the fracture.

DISLOCATION DOWNWARDS, OR INTO THE FORAMEN OVALE.

Anatomy.

The foramen ovale is formed by the junction of two bones—the schium and pubes: it is situated below the acetabulum, and is omewhat near the axis of the body. It is filled by a ligament which proceeds from the edges of the foramen, and has an opening n its upper and anterior part, to permit the passage of the obtuator blood-vessels, and the obturator nerve. It is covered on its external and internal surface by the obturator externus and obtuator internus muscles.

Cause of accident.

This dislocation happens when the thighs are widely separated rom each other. The ligamentum teres and the lower part of the apsular ligament are torn through, and the head of the bone beomes situated in the posterior and inner part of the thigh, upon ne obturator externus muscle.

It has been erroneously supposed, that the ligamentum teres is

not torn through in this dislocation; because in the dead body, when the capsular ligament is divided, the head of the bone can be drawn over the lower edge of the acetabulum without tearing the ligamentum teres. But the dislocation in the foramen ovale happens whilst the thighs are widely separated, during which act the ligamentum teres is upon the stretch; and when the head of the bone is thrown from the acetabulum, this ligament is torn through before it entirely quits the cavity.

Symptoms.

The limb is in this case two inches longer than the other. The head of the bone can be felt by pressure of the hand upon the inner and upper part of the thigh towards the perinæum, but only in very thin persons. The trochanter major is less prominent than on the opposite side. The body is bent forwards by the tension of the psoas and iliacus internus muscles. The knee is considerably advanced if the body be erect; it is widely separated from the other, and cannot be brought without great difficulty near the axis of the body to touch the other knee, in consequence of the extension of the glutei and pyriformis muscles. The foot, though widely separated from the other, is generally neither turned outwards nor inwards, although I have seen it varying a little in this respect in different instances; but the position of the foot does not in this case mark the accident. The bent position of the body, the separated knees, and the increased length of the limb, are the diagnostic symptoms. The position of the head of the bone is below, and a little anterior to, the axis of the acetabulum; and a hollow is perceived below Poupart's ligament.

Specimen dissected by Sir Astley.

There is an excellent preparation of this accident in the collection at St. Thomas's Hospital, which I dissected many years ago. The head of the thigh-bone was found resting in the foramen ovale, but the obturator externus muscle was completely absorbed, as well as the ligament naturally occupying the foramen, now entirely filled by bone. Around the foramen ovale bony matter was deposited, so as to form a deep cup, in which the head of the thigh-bone was inclosed, but in such a manner as to allow of considerable motion; the cup thus formed, surrounded the neck of the

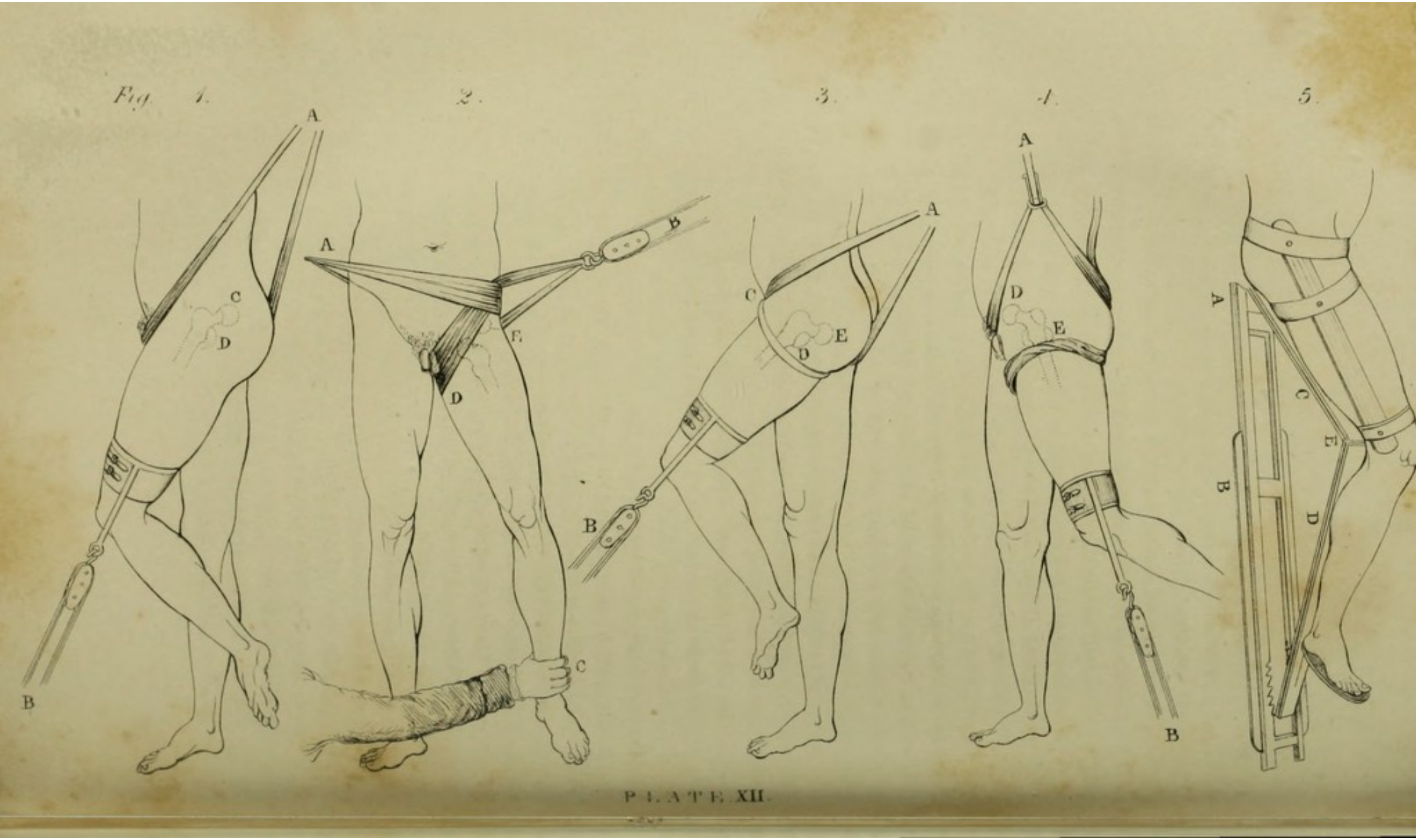


PLATE XII.

PLATE XII.

Fig. 1. The mode of reducing the dislocation upwards, on the dorsum ilii.

a, The band passed between the thighs to fix the pelvis.

b, The pulley fixed above the knee, and the direction shewn in which the thigh is to be drawn: i. e. obliquely across the sound thigh.

c, Head of the bone upon the dorsum ilii.

d, Acetabulum.

Fig. 2. Dislocation in the foramen ovale.

a, Bandage to fix the pelvis.

b, The pulley to draw the head of os femoris outwards and upwards.

c, The surgeon's hand grasping the ancle to draw the one leg across the other, and to throw the head of the bone outwards.

d, The head of the bone in the foramen ovale.

e, Acetabulum into which the head of the bone is to be brought.

Fig. 3. The mode of reducing the dislocation in the ischiatic notch.

a, The bandage to fix the pelvis.

b, The pulleys fixed above the knee.

c, A band surrounding the thigh, by which the surgeon is to elevate the bone, when the extension has been continued for some time.

d, The acetabulum.

e, The head of the bone in the ischiatic notch.

Fig. 4. Best mode of reducing the dislocation of the os femoris upon the pubes.

a, The bandage to fix the pelvis.

b, The pulleys, applied downwards and backwards.

c, A band passed around the thigh to enable the surgeon to raise the head of the bone during the extension.

d, The head of the os femoris on the pubes.

e, The acetabulum.

Fig. 5. The inclined plane for simple fracture of the thigh and trochanter major.

a, Frame to rest upon the bed.

b, Two lateral supporters to *a*.

c, The plane for the thigh.

d, The plane for the leg.

e, The joint.

thigh-bone without touching it, and so inclosed its head, that it could not be removed from its new socket without breaking its edges. The inner side of this new cup was extremely smooth, not having the least ossific projection at any part to impede the motion of the head of the bone, which was only restrained by the muscles from extensive movements. The original acetabulum was half filled by bone, so that it could not have received the ball of the thigh-bone if an attempt had been made to return it into its natural situation. The head of the thigh-bone was very little altered; its articular cartilage still remained; the ligamentum teres was entirely broken, and the capsular ligament was partially torn through; the pectinalis muscle and adductor brevis had been lacerated, but were united by tendon; the psoas muscle and iliacus internus, the glutei and pyriformis, were all upon the stretch. Nothing can be more curious, or, to the surgeon and physiologist, more beautiful, than the changes produced by this neglected accident, exemplifying the resources of nature in producing restoration.

Reduction.

The reduction of this dislocation, is, in general, very easily effected. If the misfortune be of recent occurrence, it is requisite to place the patient upon his back, to separate the thighs as widely as possible, and to place a girth between the pudendum and the upper part of the luxated thigh, fixing it to a staple in the wall. The surgeon then puts his hand upon the ancle of the dislocated side, and draws it over the sound leg, or, if the thigh be very large, behind the sound limb, and the head of the bone slips into its socket. I saw a dislocation thus reduced, which had happened very recently, and which was subjected to an extension in St. Thomas's Hospital, almost immediately after the patient's admission. In a similar case, the thigh might be fixed by a bed-post received between the pudendum and the upper part of the limb, and the leg be carried inwards across the other. But in general it is required to fix the pelvis by a girth passed around it, and crossed under that which passes around the thigh, to which pulleys

are to be attached, otherwise the pelvis will move in the same direction with the head of the bone.

In those cases in which the dislocation has existed for three or four weeks, it is best to place the patient upon his sound side; to fix the pelvis by one bandage, and to carry under the dislocated thigh another bandage, to which the pulleys are to be affixed perpendicularly; then to draw the thigh upwards, whilst the surgeon presses down the knee and foot, to prevent the lower part of the limb from being drawn with the thigh-bone. Thus the limb is used as a lever of very considerable power. Great care must be taken not to advance the leg in any considerable degree, otherwise the head of the thigh-bone will be forced behind the acetabulum into the ischiatic notch, from whence it cannot be afterwards reduced.

DISLOCATION OF THE RIGHT THIGH INTO THE FORAMEN OVALE.

Case. A gentleman riding on horseback on the 4th of January, 1818, the animal suddenly started to the right side; and in endeavouring to keep his seat by the pressure of the right thigh against the saddle, he was thrown, and the fall occasioned a severe contusion upon his head, which produced alarming symptoms. On the following day it was observed the right thigh was useless, and that the knee was raised and could not be brought into a straight line with the other, having at the same time a direction outwards, which required it to be tied to the other knee: the symptoms of injury to the head precluded, at this time, any attempt at reduction. In fourteen days he was so far recovered that he was able to rise from his bed, and in a month he began to walk with crutches.

On November 1st, 1818, I first saw him; and the appearances of the injured limb were then as follow:—The thigh was longer than the other by the length of the patella; the knee was advanced; and when he was in the recumbent posture, the injured leg could not be drawn down to the same length with the other.

The upper part of the thigh-bone was thrown backwards, so as to render the hollow of the groin on the injured side deeper than that on the other. The toes were rather everted; but when the body was erect, were capable of resting on the ground, though the heel was not. The head of the bone could not be felt, and the trochanter was much less prominent than usual. When the upper part of the thigh-bone was pressed against the new acetabulum, and moved, there was a sensation of friction between two cartilaginous surfaces; which, although not easily described, is readily distinguished from the crepitus occasioned by a fractured bone. In a sitting posture the injured leg was two inches longer than the other; and to that degree the knee was projected beyond the sound one. In progression, the knee was bent; and the body being thrown forwards, the patient rested chiefly upon his toe, and halted exceedingly in walking. The sartorius and gracilis muscles were put very much upon the stretch. At first he suffered from pain in the dislocated hip and thigh, but that is not now the case unless he attempts to stand on that limb only. His toe at first was with difficulty brought to the ground, but he is now improved in walking; for on the first trial, with the assistance of a crutch and stick, he could not exceed half a mile, but is now able to walk two miles. In flexion his thigh admits of considerable motion, but he cannot extend it further than to bring the ham to the plane of the other patella. The knees cannot be brought together, but he advances one before the other in the attempt. He can sit without pain, but the jolting of a carriage hurts him exceedingly; and the attempt to sit on horseback produces excessive suffering. He cannot straighten his leg when his body is erect, nor can he stoop to tie his shoe on the injured side. Pain is produced by resting on that hip in bed. No attempt was made to reduce the limb; the injury to the head might have rendered it dangerous in the commencement, and at the time when I saw him there was no chance of success.

DISLOCATION OF THE RIGHT FEMUR DOWNWARDS, OR INTO THE FORAMEN OVALE.

Case. Mr. Thomas Clarke, a farmer, about fifty years of age, was driving home in his cart from market, when the horse took fright and ran away with him. The following is the account he gives of the manner in which the accident happened:—In his endeavour to stop the horse, he fell over the front of the cart on his face, and the knee struck against some part of it in the act of falling, by which means the thighs were separated; the wheel, he also states, passed over his hip *.

My friend, Mr. Potter, of Ongar, in Essex, whose ability as a surgeon in that neighbourhood is justly appreciated, was consulted in this case, between two and three weeks after the accident happened. The nature of the accident was extremely evident: the limb was full three inches longer than the other, the body bent forwards, the knees separated, and the foot rather inclined outwards; these were the leading diagnostic marks. Mr. Potter, having clearly ascertained the position of the dislocated limb, I accompanied him the following morning, in order to assist in the reduction; and the following were the means employed.

Our first object was to produce relaxation; and finding the patient was sufficiently strong to bear the plan usually recommended in cases of dislocation, where much resistance is expected, we drew away some blood from the arm; this, however, was not sufficient for our purpose, and a solution of tartar emetic, which we had brought with us, was administered. The patient was laid upon his side, close to the edge of the bed, (that being the most convenient place,) a girth was passed round the pelvis, and carried through the frame of the bedstead, which completely prevented the possibility of the body moving whilst extension was going on; a second girth was applied between the thighs, fixed to the one above, to which the pulleys were attached. Whilst extension was making, Mr. Potter took hold of the limb at the knee, and drew it

* *Query.*—Was this, or the extended state of the limbs, the cause of the dislocation?

rather upwards, and towards the sound thigh, occasionally rotating the limb. When the extension had been continued about ten minutes, the nausea produced by the tartar emetic was so excessive, that the patient begged of us to desist until the morrow, observing, he felt so bad that he was fearful of falling off the bed; this exclamation, it hardly need be said, was a stimulus to our proceeding; and in five minutes after, the limb was suddenly heard to snap into its original cavity. The patient was put to bed, a roller being applied round the pelvis. At the end of five days, he felt so well that he left his room; and in a short time suffered no other inconvenience than stiffness in the joint.

Mischief from improper extension.

Although a dislocation into the foramen ovale may be occasionally reduced by attempts made in a very inappropriate direction, yet an instance has occurred that shews the mischief that may arise from an error in this respect. I subjoin the following.

Case.

A boy, sixteen years old, had a dislocation of the thigh into the foramen ovale: he was placed upon his sound side, and an extension of the superior part of the thigh was made perpendicularly; the surgeon then pressed down the knee, but the thigh being at that moment advanced, the head of the bone was thrown backwards, and passed into the ischiatic notch; from which situation it could not be reduced.

DISLOCATION BACKWARDS, OR INTO THE ISCHIATIC NOTCH.

Anatomical structure.

The space which is called the ischiatic notch, is bounded above and anteriorly by the ilium, posteriorly by the sacrum, and inferiorly by the sacro-sciatic ligament. It is formed for the purpose of giving passage to the pyriformis muscle and to the sciatic nerve, as well as to the three arteries—the glutæi, the ischiatic, and the internal pudendal. In the natural position of the pelvis, it is situated posteriorly to the acetabulum and a little above its level. When the head of the bone is thrown into this space, it is placed backwards and upwards, with respect to the acetabulum; therefore, although I call this the dislocation backwards, it is

to be remembered that it is a dislocation backwards and a little upwards.

Nature of the accident.

In this dislocation the head of the thigh-bone is placed on the pyriformis muscle, between the edge of the bone which forms the upper part of the ischiatic notch, and the sacro-sciatic ligaments, behind the acetabulum, and a little above the level of the middle of that cavity.

Detection difficult.

This dislocation is the most difficult both to detect and to reduce: to detect, because the length of the limb differs but little, and its position, in regard to the knee and foot, is not so much changed as in the dislocations upwards: to reduce, because the head of the bone is placed deep behind the acetabulum, and it therefore requires to be lifted over the edge of that cavity as well as to be drawn towards its socket.

Signs.

The signs of this dislocation are, that the limb is from half an inch to one inch shorter than the other, but generally not more than half an inch; that the trochanter major is behind its usual place, but is still remaining nearly at right angles with the ilium, with a slight inclination towards the acetabulum. The head of the bone is so buried in the ischiatic notch, that it cannot be distinctly felt, except in thin persons, and then only by rolling the thigh-bone forwards as far as the comparatively fixed state of the limb will allow. The knee and foot are turned inwards, but less than in the dislocation upwards; and the toe rests against the ball of the great toe of the other foot. When the patient is standing, the toe touches the ground, but the heel does not quite reach it. The knee is not so much advanced as in the dislocation upwards, but is still brought a little more forwards than the other, and is slightly bent. The limb is so fixed that flexion and rotation are in a great degree prevented.

Specimen in St. Thomas's Hospital.

There is a good specimen of this accident in the collection at St. Thomas's Hospital, which I met with accidentally, in a subject brought for dissection. The original acetabulum is entirely filled with a ligamentous substance, so that the head of

the bone could not have been returned into it. The capsular ligament is torn from its connection with the acetabulum, at its anterior and posterior junction, but not at its superior and inferior. The ligamentum teres is broken, and an inch of it still adheres to the head of the bone. The head of the bone rests behind the acetabulum on the pyriformis muscle, at the edge of the notch, above the sacro-sciatic ligaments. The muscle on which it rests is diminished, but there has been no attempt made to form a new bony socket for the head of the os femoris. Around the head of the thigh-bone a new capsular ligament is formed; it does not adhere to the articulatory cartilage of the ball of the bone which it surrounds, but could, when opened, be turned back to the neck of the thigh-bone, so as to leave its head completely exposed. Within this new capsular ligament, which is formed of the surrounding cellular membrane, the broken ligamentum teres is found. The trochanter major is placed rather behind the acetabulum, but inclined towards it relatively to the head of the bone.

In this specimen, from the appearance of the parts, the dislocation must have existed many years; the adhesions were too strong to have admitted of any reduction, and if reduced, the bone could not have remained in its original socket.

This species of dislocation is produced by the application of force, when the body is bent forward upon the thigh, or when the thigh is bent at right angles with the abdomen; in which positions, if the knee be pressed inward, the head of the bone is thrown behind the acetabulum. Cause.

The reduction of the dislocation into the ischiatic notch, is, in general, extremely difficult, and is best effected in the following manner:—The patient should be laid on a table upon his side, and a girth should be placed between the pudendum and the inner part of the thigh, to fix the pelvis: then a wetted roller is to be applied around the knee, and the leathern strap over it. A napkin is to be carried under the upper part of the thigh. The thigh-bone is then to be brought across the middle of the other thigh,

measuring from the pubes to the knee, and the extension is to be made with the pulleys. Whilst this is in progress, an assistant pulls the napkin at the upper part of the thigh with one hand, rests the other upon the brim of the pelvis, and thus lifts the bone, as it is drawn towards the acetabulum, over its lip. For the napkin I have seen a round towel very conveniently substituted, and this was carried under the upper part of the thigh, and over the shoulders of an assistant, who then rested both his hands on the pelvis, as he raised his body, and lifted the thigh.

Although the preceding is the method in which this dislocation is most easily reduced, yet I have seen a different mode practised; and I shall mention it here, as it shows how the muscles opposing the pulleys will draw the head of the bone to its socket, when it is lifted from the cavity into which it has fallen.

Case. A man, aged twenty-five, was admitted into Guy's Hospital under the care of Mr. Lucas; upon examination, the thigh was found dislocated backwards; the limb scarcely differed in length from the other, being not more than half an inch shorter; the groin appeared depressed; the trochanter was resting a little behind the acetabulum, but inclined upon it; the knee and foot were turned inwards, and the head of the bone could, in this case, be felt behind the acetabulum. An extension was made by pulleys in a right line with the body; at the same time the trochanter major was thrust forward with the hand, and the bone returned in about two minutes into its socket with a violent snap.

I have already mentioned, that I have seen no instance of a *dislocation downwards and backwards;* and when I state, that I have been an attentive observer of the practice of our hospitals for thirty years, was also for many years in the habit of daily seeing the poor of London at my house early in the morning, and have had a considerable share of private practice, I may be allowed to observe, that if such a case does ever occur, it must be extremely rare. I cannot help thinking, also, that some anatomical error must have given rise to this opinion, as in the dislocation down-

wards and backwards, the head of the bone is described as being received still into the ischiatic notch; but this notch is, in the natural position of the pelvis, above the level of the line drawn through the middle of the acetabulum; and hence it is, that the leg becomes, not shorter, but longer, when the bone is dislocated into the ischiatic notch.

The following case I received from Mr. Rogers, a very intelligent surgeon at Manningtree. The kind manner in which he has expressed himself, may savour a little of vanity; but I shall readily suffer this imputation, and not shrink from avowing the satisfaction which I feel, whenever my endeavours have in any degree conduced to the advantage of my professional brethren, or to the benefit of those who may be placed under their care.

DISLOCATION OF THE THIGH INTO THE ISCHIATIC NOTCH.

Case. William Dawson, aged thirty-four, on the 15th of August, 1818, while spending his harvest home with several of his companions, was thrown down and trod upon. Upon extricating himself and endeavouring to rise, he found that some serious injury to his right thigh rendered him incapable of standing: in this state he was dragged by his associates for many hundred yards into a stable, where he lay till the next morning. I then saw him lying upon a mattress, with the hip and thigh on the right side prodigiously swollen and painful; and was particularly struck with the appearance of the knee and foot on the same side, which were very much turned inwards, but the limb was scarcely shortened. I ordered him to be carefully conveyed home upon a shutter, supported by six men, a distance of about half a mile. From the immense swelling and general enlargement of the whole thigh, and of the soft parts around the pelvis, it was impossible to ascertain exactly the state of the injury; but I was fully impressed there was some unusual dislocation of the head of the thigh-bone. He was accordingly bled, both by general and topical means, and emollient poultices applied to the whole of the swollen parts;

brisk purgatives were also administered, succeeded by saline medicines, and a quiet position was enjoined for eleven days, by which time the swelling began somewhat to subside. Still the precise nature of the injury was not satisfactorily evident; but it was thought by Mr. Nunn of Colchester, and Mr. Travis of East Bergholt, who had kindly come over to witness it, that there was a luxation. The only difficulty we had in reconciling ourselves to this notion was, the belief in our minds that no author adduced an instance of this accident, without an alteration in the length of the limb, except it might be Mr. Astley Cooper, in his new publication, which neither of us had yet seen. We accordingly had recourse to a minute examination of the skeleton; when we immediately fancied we could account for the absence of the usual marked signs of displacement of the head of the bone, excepting the inversion of the knee and foot, in this kind of luxation; for we noticed, that if the head of the bone be luxated sideways into the ischiatic notch, it will produce scarcely any difference in the length of the limb. Trusting that a little further delay might not be attended with any material disadvantage, but give a chance for the entire subsidence of all the inflammation and swelling, we proposed meeting again as soon as we conveniently could, by which time we might consult Mr. Cooper's work. We accordingly met on Sunday, the 30th of August, which was fifteen days after the accident; and from the complete removal of all swelling, the whole of the femoral bone was satisfactorily traced to its rounded head, which was lodged in the ischiatic notch.

Upon referring to the book, which we had now before us, we found the case delineated and described; and as it was exhibited in a plate, we had only to imitate, in order to accomplish the reduction of the bone. In the presence of two or three other medical gentlemen we commenced the operation; but as it would be unnecessary to state every particular, considering the manner in which the position of the patient, and the fixing of the pulleys and towels, are demonstrated by that publication, suffice it to say,

that after ten or twelve minutes of gradual extension, the reduction of the bone was most readily and admirably accomplished.

Preparatory to commencing the operation we took thirty ounces of blood from the arm *ad deliquium*, and afterwards, while fixing the pulleys, &c., we gave four grains of tartarized antimony at intervals to produce nausea. Immediately after the operation, we gave one grain of opium, applied sedative lotions to the parts, and proceeding carefully for about a fortnight, the patient was enabled to move upon crutches, and shortly after went home perfectly well.

Incorrect description by authors.

The dislocation into the ischiatic notch has been as far as I know, in every author who has written on the subject, incorrectly described; for it has been stated, that the limb was lengthened in this accident, and I need scarcely mention the mistakes in practice which have originated in so erroneous an opinion; one instance however of such an error I must here give. A gentleman wrote to me from the country in these words:—"I have a case under my care of injury of the hip, and I should suppose it a dislocation into the ischiatic notch, but that the limb is shorter, instead of being longer as authors state it to be." Into this error those authors must have fallen from having examined a pelvis separated from the skeleton, and observed that the ischiatic notch was below the level of the acetabulum when the pelvis was horizontal, although it is above the acetabulum in the natural oblique position of the pelvis, at least as regards the horizontal axis of the two cavities. It is to be remembered, that there is no such accident as a dislocation of the hip downwards and backwards.

DISLOCATION ON THE PUBES.

Cause.

This dislocation is more easy of detection than any other of the high. It happens when a person, while walking, puts his foot into some unexpected hollow in the ground; and his body at the moment being bent backwards, the head of the bone is thrown forwards upon the os pubis. A gentleman who had met with this dislocation in his own person, informed me that it happened

whilst he was walking across a paved yard in the dark: he did not know that one of the stones had been taken up, and his foot suddenly sunk into the hollow, and he fell backwards. When his limb was examined, the head of the thigh-bone was found upon the os pubis.

Symptoms.

In this species of dislocation the limb is an inch shorter than the other, the knee and foot are turned outwards, and cannot be rotated inwards, but there is a slight flexion forwards, and outward; and in a dislocation which had been long unreduced, the motion of the knee backwards and forwards was full twelve inches; but the striking criterion of this dislocation is, that the head of the thigh-bone may be distinctly felt upon the pubes, above the level of Poupart's ligament, on the outer side of the femoral artery and vein; and it feels as a hard ball there, which is readily perceived to move by bending the thigh-bone.

Not detected.

Although this dislocation is apparently easy of detection, I have known three instances in which it was overlooked, until it was too late for reduction: of one, there is a preparation at St. Thomas's Hospital; another occurred to a gentleman from the country, in whom it was not discovered until some weeks after the accident, who then submitted to an extension which did not succeed, and came to London to ask my opinion, when I advised him against a further attempt: to which, indeed, he himself was disinclined. The third, a patient in Guy's Hospital, who was admitted for an ulcerated leg, and found to have a dislocation upon the pubes which had happened some years before. It really must be great carelessness which leads to this error, as the case is so strikingly marked.

Dissection of a case.

I dissected one of these dislocations, and we have it preserved in our anatomical collection. It shews changes of parts nearly equal to those of the dislocation into the foramen ovale. The original acetabulum is partly filled by bone, and partly occupied by the trochanter major, and both are much altered in their form. The capsular ligament is extensively lacerated, and the ligamentum teres is broken. The head of the thigh-bone had torn up Pou

part's ligament, so as to penetrate between it and the pubes. The head and neck of the bone were thrown into a position under the iliacus internus and psoas muscles; the tendons of which, in passing to their insertions over the neck of the bone, were elevated by it, and put on the stretch. The crural nerve passed on the fore part of the neck of the bone upon the iliacus internus and psoas muscles. The head and neck of the thigh-bone were flattened, and much changed in their form. Upon the pubes a new acetabulum was formed for the neck of the thigh-bone, the head of the bone being above the level of the pubes. The new acetabulum extended upon each side of the neck of the bone, so as to lock it laterally upon the pubes. Poupart's ligament confines it on the fore part; on the inner side of the neck of the bone passed the artery and vein, so that the head of the bone was seated between the crural sheath and the anterior and inferior spinous process of the ilium.

Distinguished from fracture.

This accident might, by an inattentive observer, be mistaken for a fracture of the neck of the thigh-bone; but the head of the bone felt upon the pubes will decide its nature.

Reduction.

In the reduction of this dislocation, the patient is to be placed on his side on a table; a girth is to be carried between the pudendum and inner part of the thigh, and fixed in a staple a little before the line of the body. The pulleys are to be fixed above the knee, as in the dislocation upwards, and then the extension is to be made in a line behind the axis of the body, the thigh-bone being drawn backwards. After this extension has been for some time continued, a napkin is to be placed under the upper part of the thigh, and an assistant should press with one hand on the pelvis, and lift the head of the bone, by means of the napkin, over the pubes and edge of the acetabulum.

The following case was admitted into St. Thomas's Hospital, under the care of Mr. Tyrrell.

Case.

Charles Pugh, aged fifty-five, a cooper, about the middle size, on the evening of the 23d of January, while standing at the corner of a street was struck on the back part of the right hip by the

wheel of a cart, which knocked him down. He was taken up by some persons passing, who, finding that he was not able to walk, took him to St. Thomas's Hospital. The accident happened about nine o'clock in the evening, and I was sent for between twelve and one o'clock, when I found a dislocation of the right femur on the pubis; the particulars of which were as follow.

The head of the bone could be distinctly felt below Poupart's ligament, immediately on the outer side of the femoral vessels. The foot and knee were turned outwards, with very little alteration in the length of the limb. The thigh was not flexed towards the abdomen, and almost immoveable, admitting only of partial adduction and abduction. The limb could be rotated outwards, but not at all inwards. I immediately had the man taken into the operating theatre, and speedily succeeded in reducing the dislocation by the following means:—The patient was placed on his left side, a broad band was passed between the thighs, and, being tied over the crista of the ilium on the right side, was made fast to a ring fixed in the wall. A wet roller having been put on above the right knee, a bandage was buckled over it, and its straps attached to the hooks of the pulleys, by which a gradual extension was made, drawing the thigh a little backwards and downwards. When this extension had been kept up a short time, I directed another bandage to be applied round the upper part of the thigh, close to the perinæum, by means of which the head of the bone was raised, and in the course of a few minutes the reduction was easily accomplished. The patient had not been bled, or taken any medicine; he suffered but little after the reduction, and was able to walk without pain or inconvenience five or six days afterwards. On the day following the accident, he could move the limb freely in all directions without pain, but did not attempt to walk until the period I have mentioned.

From what I have had an opportunity of observing on the subject of dislocations, I believe that the relative proportion of cases will be in twenty as follows:—*twelve* on the dorsum ilii; *five* in the ischiatic notch; *two* in the foramen ovale; and *one* on the pubes.

The cases I have here detailed, with the dates at which they were presented, manifest the frequent occurrence of this accident to the thigh. How it escaped the observation of surgeons of eminence of former times, is a matter of surprise that can only be accounted for by the difficulties which then existed in the pursuit of anatomy, and more especially of morbid anatomy; and it is a curious circumstance, that Mr. Sharpe, formerly surgeon of Guy's Hospital, author of a Treatise on Surgery, and in many respects an excellent surgeon, who had a large share of the practice of this metropolis, did not, as I was informed by Mr. Cline, believe that a dislocation of the thigh-bone ever occurred.

It is gratifying to observe the advancement of knowledge in the profession at the present period, compared with that of fifty years ago. What should we think of a surgeon of the present day, with all his opportunities of seeing disease in the large hospitals of this city, who doubted the existence of a dislocation of the thigh, when we find that our provincial surgeons immediately detect the nature of these injuries, and generally succeed in their attempts to reduce them? Let them never forget, however, that it is to the knowledge of anatomy, and more especially of morbid anatomy, that they are indebted for this superiority.

FRACTURES OF THE OS INNOMINATUM.

As these accidents are liable to be mistaken for dislocations, and as any extension made for them adds extremely to the patient's sufferings, and would be liable to produce fatal consequences if there existed previously a probability of recovery, I am anxious to say a few words upon them. Mistakes.

When a fracture of the os innominatum happens through the acetabulum, the head of the bone is drawn upwards, and the trochanter somewhat forwards, so that the leg is shortened, and the knee and foot are turned inwards: such a case may be readily mistaken for dislocation into the ischiatic notch. If the os innominatum is disjointed from the sacrum, and the pubes and ischium are broken, the limb is a slight degree shorter than the other; but Symptoms.

in this case, the knee and foot are not turned inwards, but outwards. Of the first of these accidents, I have seen two examples, of the latter only one.

Detection.

These accidents are generally to be detected by a perceptible crepitus on the motion of the thigh, if the hand be placed upon the crista of the ilium; and they are attended with more motion than occurs in dislocations.

Appearances on dissection.

A man was brought into St. Thomas's Hospital, in January, 1791, on whom a hogshead of sugar had fallen. Upon examination, the right leg was found about two inches shorter than the left, and the knee and foot were turned inwards; these circumstances induced the surgeon under whose care he fell to think the case a dislocation, although, as he stated, the limb appeared to be more moveable than usually happens in such accidents, and there was a great contusion and considerable extravasation of blood. The surgeon used the utmost caution in making a very slight extension, in order to bring the legs to an equal length, in which he did not succeed; and whilst it was performing, a crepitus was discovered in the os innominatum. The man had a remarkable depression of strength, and paleness of countenance, and appeared to be sinking.—In the evening he died.

Upon examination of the body, the following appearances were observed:—The posterior part of the acetabulum was broken off, and the head of the thigh-bone had slipped from its socket; the tendon of the obturator internus, and the gemini, tightly embraced the neck of the bone; the fracture extended from the acetabulum across the os innominatum to the pubes; the ossa pubis were separated at the symphisis nearly an inch asunder, and a portion of the cartilage was torn from the right pubes, and adhered to that on the left side; the ilia were separated on each side, and the pubes, ischium, and ilium broken on the left side: the abdomen contained about a pint of blood, and the left kidney was greatly bruised; the integuments were stripped off the patella and knee on one side, so as to expose the capsular ligament.

In a second case of this kind, which was admitted into St.

Thomas's Hospital, having the appearance of the dislocation backwards, the patient lived four days. On examination, the fracture was found passing through the acetabulum, dividing the bone into three parts; and the head of the thigh-bone was deeply sunk into the cavity of the pelvis.

The following case of fracture and dislocation of the bones of the pelvis occurred in Guy's Hospital:—

Case. Mary Griffiths, aged thirty, was admitted into Guy's Hospital in the afternoon of the 8th of August, 1817. Her pelvis had sustained a severe injury from her body having been pressed by the wheel of a cart against a lamp-post.

A small quantity of blood had been taken from her arm previous to her admission; and as she was very pale, her pulse extremely weak, and her fæces passed involuntarily, no more blood was drawn.

Soon after admission she was examined; when by placing her on the face with one of my hands on the back of the right ilium, and the other on the pubes of the same side, a distinct motion and crepitus could be perceived. The posterior spine of the ilium projected upwards, above its usual junction with the sacrum, and it was thought that the ilium was dislocated from the sacrum, with some fracture either of the ilium or the sacrum. When turned on her back, and examined *per vaginum*, the pubes were found passing more into the cavity of the pelvis than usual. A large quantity of blood was effused from the last rib to the upper part of the thigh, on the right side.

It was now a question whether this extravasated blood should not be discharged by making an opening through the integuments as it appeared to be fluid; but upon consideration, it was thought that the vessels would still bleed, that she could not bear the loss of blood in her weakened state, and that the blood, when coagulated, would form the best security against further effusion. All that was done, therefore, was to roll a broad bandage round the pelvis to fix it firmly, to give tinct. opii. gt. xxx., and to draw off the urine from her bladder, which contained about a pint.

In the evening, the extravasation of blood was somewhat increased, and she complained of a pricking sensation in the right thigh and leg, which induced her to loosen the bandage. She had vomited; her feet were cold; she had severe pain, and great thirst; her pulse was 90, and small.

On the 9th, she complained of a sensation of one side tearing from the other, and, upon examination of the lower extremities, that on the right side was found shorter than the other; there was numbness also on that side. Her tongue was furred, but her pain and thirst somewhat less; and she had not the same coldness in her feet as on the night previous. As her bowels had not been relieved since her admission, aperient medicine was given; and the bladder being incapable of emptying itself, a catheter was employed. The ecchymosis was of great extent, and it was doubtful whether it could be absorbed. A pillow was placed against the right side to support the pelvis, and another was put under the knee to preserve the limb in an easy position.

On the morning of the 10th, she complained that the bones of the pelvis moved upon each other, even more than at any former period, and that she had suffered severe pain; the tongue was now furred, pulse fuller, but her bowels had been relieved, and her water passed without assistance. At one o'clock this day, her pulse being fuller, and 120 in a minute, with great heat of skin, I bled her to the amount of ten ounces; but the blood did not exhibit any signs of inflammation, nor did the loss of blood produce any apparent effect in relieving her symptoms. In the evening, her pain and fever had increased; and as she complained of the tightness of the bandage which still surrounded the pelvis, it was removed. The catheter was then obliged to be employed. Some saline medicine, with opium, was ordered.

On the 11th, she stated that she had passed a good night. Pulse 120 and softer; tongue furred; she was directed to continue her medicines. A stimulating lotion was ordered on the 12th, to produce an absorption of the extravasated blood. Some spots appeared of a very dark colour, where the ecchymosis had been most

severe, and the cuticle was abraded upon those parts. From this day the excoriated parts, which had been excessively bruised, began to slough. On the 21st, the sloughing had increased; the tongue was furred; pulse 120. On the 22d, she was worse; and on the 23d, her stomach rejected every thing; she had a strong impression that she should not recover; she refused her medicine and the slough had increased. In the evening of the 24th, she died.

EXAMINATION.

On the 25th, the body was examined.—A fracture was found passing through the body of the pubes on the left side, and through the ramus of the left ischium.

The right os innominatum was separated from the sacrum at the sacro-iliac symphisis, and a part of the transverse processes of the sacrum was broken off, and torn from the sacrum with the ligaments. The cartilage and ligaments of the symphisis pubis were torn, and the left sacro-iliac symphisis had given way; the ligament over it being torn, and the bones separated sufficiently to admit the handle of a scalpel being received between them.

Blood was found extravasated in the pelvis behind the peritoneum.

I have known three instances of recovery from simple fracture of the os innominatum: two of these were fractures of the ilium, and the nature of the accident was easily detected by the crepitus which was perceived upon moving the crista of the ilium; the third case was a fracture at the junction of the ramus of the ischium and pubes. In the two first a circular roller was applied upon the pelvis, and the patient was freely bled: but in the latter no bandage was employed. I have also known a compound fracture of the os innominatum, recover; but Mr. Hulbert, surgeon, sent me a compound fracture of the ilium, which had proved fatal.

Several cases have also occurred within my knowledge of fracture of the pubes, near its symphisis, accompanied with laceration of the bladder, each of which proved destructive; but when the bones have been broken without injury to the bladder, the patients

have recovered*. The bladder is burst or not, in this accident, according to its state of distension or emptiness at the moment of the accident; for, if empty, it escapes injury.

FRACTURES OF THE UPPER PART OF THE THIGH-BONE.

Before I enter into a description of the dislocations of other joints, it will be proper to point out the fractures incident to the upper part of the thigh-bone, as it is essentially necessary that these accidents should not be confounded with dislocations, or with each other; a mistake which has but too frequently happened. Indeed, it must be confessed, that their discriminating marks are sometimes with difficulty detected, and that the different species of fracture are likewise frequently confounded; for three distinct species, very different in their nature and in their result, have been described and classed under the indiscriminate appellation of fracture of the neck of the thigh-bone. Hence has arisen that difference of opinion, which has led to much discussion respecting the processes which nature employs for their cure, and which less hypothetical reasoning, and more attention to the development of such accidents by dissection, would have been the means of preventing. Whilst one surgeon asserts that all attempts to cure them are unavailing, another maintains that they admit of union like fractures of other bones; which latter opinion is only true as far as regards two species of these fractures.

I shall now, therefore, proceed to state the results of my observations in living persons who have been the subjects of these accidents; of my examination of the dead body; and of some experiments upon inferior animals, which illustrate this subject.

These accidents are more frequent than dislocations of the thigh-

* There is at this time (Sept. 1823), a case in Guy's Hospital, in which the bladder is believed to be ruptured below the reflection of the peritonæum, and between it and the pubes, and the man appears to be recovering by wearing a catheter. But in cases where the injury is above the line of reflection of the peritonæum, the urine escapes into the cavity of the abdomen, and excites great inflammation.

bone; for, whilst there are received into the hospitals of Guy's and St. Thomas's, (containing about nine hundred persons,) not more upon an average than two such dislocations in a year, the wards are seldom without an example of fracture of the upper part of the thigh-bone.

DIFFERENT SPECIES OF FRACTURE OF THE UPPER PART OF THE THIGH-BONE.

The different species of fracture of the upper part of the thigh-bone, as already observed, are three in number.

First: That in which the fracture happens through the neck of the bone entirely within the capsular ligament.

Secondly: A fracture external to the ligament, through the neck of the thigh-bone at its junction with the trochanter major; by which the trochanter is split, and the neck of the thigh-bone is received into its cancelli.

Thirdly: A fracture through the trochanter major, beyond its junction with the cervix femoris.

FRACTURES OF THE NECK OF THE THIGH-BONE, WITHIN THE CAPSULAR LIGAMENT.

Appearance.

The appearances which are produced by this fracture are as follow:—The leg becomes from one to two inches shorter than the other; for the connection of the trochanter major with the head of the bone, by means of the cervix, being destroyed by the fracture, the trochanter is drawn up by the muscles as high as the ligament will permit, and consequently rests upon the edge of the acetabulum, and upon the ilium above it. The difference in the length of the limbs is best observed by desiring the patient to place himself in the recumbent posture on his back, when, by comparing the malleoli, it will be generally found that one leg is shorter than the other. The usual state of the limb is, that the heel on the injured side rests in the hollow between the malleolus internus and tendo achillis of the other leg; but there is some variety in this respect; a fork is sometimes formed in the trochanter minor, which

Difference in length.

catches the neck of the bone, and prevents a greater ascent than half an inch. Mr. Brodie informed me that he dissected a case in which the cervix was obliquely broken, and in which the upper part of the bone prevented the ascent of the lower. On the other hand, when the fracture has happened for a length of time, and the patient has borne upon the injured limb, the ligament becomes extended, and the leg is shortened four inches: of this Mr. Langstaff mentioned to me an instance in a man of the name of Campbell, aged eighty-two, in whom the heel was obliged to be elevated four inches to make the bearing of the limbs equal. I saw the fractured parts in this man, and the shoe he wore, which entirely verified Mr. Langstaff's statement. The retraction is at first easily removed by drawing down the shortened limb, when it will appear of the same length with the other; but immediately this extension is abandoned, and the patient exerts himself, the muscles draw it into its former position; and this appearance may be repeatedly produced by extending the limb. This evidence of the nature of the accident continues until the muscles acquire a fixed contraction, which enables them to resist an extension, unless it be of a powerful kind.

Foot turned outwards.

Another circumstance which marks the nature of this injury is, the eversion of the foot and knee; and this state depends upon the numerous and strong external rotatory muscles of the hip-joint, which proceed from the pelvis to be inserted into the thigh-bone, and to which very feeble antagonists are provided: the obturatores, the pyriformis, the gemini and quadratus, the pectinalis and triceps, all assist in rolling the thigh-bone outwards; whilst a part of the glutæus medius and minimus, and the tensor vaginæ femoris, are the principal agents of rotation inwards. It has been denied that this eversion is caused by the muscles, and it has been attributed to the mere weight of the limb; but any one may satisfy himself that it arises chiefly from the muscles, by feeling the resistance which is made to any attempt at rotation of the thigh inwards. This difficulty is also in some measure attributable to the length of the cervix femoris, which remains attached to the

trochanter major; because in proportion to its length, by resting against the ilium, the trochanter is prevented from turning forwards.

Directly that the bed-clothes are removed, two circumstances strongly arrest the attention of the surgeon: namely, the diminished length of the injured limb, and the eversion of the foot and knee. In the dislocation upwards, the head and neck of the bone prevent the trochanter from being drawn backwards, whilst the broken and shortened neck of the thigh-bone, in fracture of this part, readily admits it; and hence the reason that the foot is inverted in luxation, and everted in fracture. It is, however, proper to state, that an exception to this rule does now and then exist, and that the limb is found inverted; but it is of extremely rare occurrence. Several hours must elapse before this eversion assumes its most decisive character, as the muscles require some time to assume a determined contraction; and this is the reason why the injury has been mistaken for dislocation on the dorsum ilii. The surgeon having been called soon after the accident has happened, before the muscles had acquired that state of contraction to which they are liable, has been led to mistake the nature of the injury, because the foot is not so decidedly everted as it afterwards becomes; and for this reason patients, even in hospital practice, have been exposed to useless and painful extensions.

Degree of pain.

In fractures of the neck of the bone within the ligament, the patient, when perfectly at rest in the horizontal posture, suffers but little; but any attempt at rotation is attended with some pain, because the broken extremity of the bone then rubs against the inner surface of the capsular ligament, upon which it is drawn by the action of the muscles. The pain is felt in this accident in the upper and inner part of the thigh, opposite to the insertion of the iliacus and psoas muscles into the trochanter minor, or sometimes just below this point.

Degree of motion.

The perfect extension of the thigh may be easily effected, but flexion is more difficult, and somewhat painful; and its degree depends upon the direction in which the limb is bent; if the

flexion be outwards, it is accomplished with but little comparative suffering; but if the thigh be directed towards the pubes, the act of bending the limb is with difficulty accomplished, and is attended with greater pain; for the movement is easier or more difficult, in proportion as the neck of the bone is shorter or longer.

Situation of the trochanter major.

In this accident the trochanter major is drawn up towards the ilium, but the broken neck of the bone attached to the trochanter is placed nearer the spine of the ilium than the trochanter itself, in which situation it afterwards remains; and this alteration of position makes the trochanter project less on the injured side, because it is no longer supported by the neck of the bone, as in its natural state, but rests in close apposition with the edge of the acetabulum, and is, consequently, much more concealed than usual, until the muscles waste from the duration of the injury, when the trochanter can be distinctly felt upon the dorsum ilii; but there will be a greater or less projection according to the length of the fractured cervix attached.

Appearance in the erect position.

If doubt exists of the nature of the accident, let the patient be directed to stand by his bed-side, supported by an assistant, and to bear his weight upon the sound limb; the surgeon then observes the shortened state of the injured leg; the toes rest upon the ground, but the heel does not reach it; the knee and foot are everted; and the prominence of the hip is diminished. The least attempt to bear upon the injured limb is productive of pain, which seems to be occasioned by the tension of the psoas, iliacus, and obturator externus muscles in the attempt, as well as by the pressure of the broken neck of the bone against the interior surface of the capsular ligament.

Crepitus.

A crepitus like that which accompanies other fractures might be expected to occur in this accident, but it is not discoverable when the patient rests on his back with the limb shortened; if, however, the leg be drawn down, so as to bring the limbs to the same length, and rotation be then performed, the crepitus will be observed, as the broken ends of the bone are thus brought into contact: but the rotation inwards most easily detects the fracture. When the

patient is standing on the sound leg, with the fractured limb unsupported, by rotating it inwards, the crepitus will sometimes be perceived, as the weight of the limb brings the broken bones nearer in apposition.

More frequent in women.

Women are much more liable to this species of fracture than men: we rarely in our hospitals observe it in the latter, but our wards are seldom without an example of it in the aged female. The more horizontal position of the neck of the bone, and the comparative feebleness of the female constitution, are the probable reasons of this peculiarity.

Age.

To the circumstances I have already mentioned, as strongly characterizing this accident, must be added the period of life at which it usually occurs; for the fracture of the neck of the thigh-bone within the capsular ligament, seldom happens but at an advanced period of life, whilst the other fractures which I have to describe, happen at all periods; and hence has arisen the great confusion with respect to the nature of this injury; for we find that surgeons of the highest character have confounded fractures external to the capsular ligament with those which are within the articulation; and mention the latter as occurring at a period of life in which they scarcely ever happen *. It has been also said, that in early life these bones will readily unite; an assertion which I notice only to shew the confusion which has arisen on this subject.

Changes in bone occasioned by age.

Old age, however, is a very indefinite term; for in some it is as strongly marked at sixty, as in others at eighty years. That regular decay of nature which is called old age, is attended with changes which are easily detected in the dead body; and one of the principal of these is found in the bones, for they become thin in their shell, and spongy in their texture. The process of absorption and deposition varies at different periods of life; in youth the arteries, which are the builders of the body, deposit more than the absorbents remove, and hence is derived the great source of its

* I allude particularly to Dessault.

Effects of absorption and diminished arterial action.

growth. In the middle period of life the arteries and absorbents preserve an equilibrium of action, so that, with a due portion of exercise, the body remains stationary; whilst in old age the balance is destroyed, because the arteries act less than the absorbents, and hence the person becomes diminished in weight; but more from a diminution of the arterial than from an increase of the absorbent action. This is well seen in the natural changes of the bones, their increase in youth, their bulk, weight, and little comparative change during the adult period, and the lightness and softness they acquire in the more advanced stages of life; hence the bones of old persons may be cut with a pen-knife, which is incapable of making any impression on those of adults. Even the neck of the thigh-bone in aged persons is sometimes undergoing an interstitial absorption, by which it becomes shortened, altered in its angle with the shaft of the bone, and so changed in its form as to give an idea, upon a superficial view, that it has been the subject of fracture, thus leading persons into the erroneous supposition, that the bone has been partially broken and reunited; but it requires very little knowledge of anatomy to distinguish, in the skeleton, the bone of advanced age from that of the middle period of life.

Age at which it occurs.

The age at which fractures of the neck of the thigh-bone within the capsular ligament generally occur, is a most important consideration; and as it is one on which the practice to be pursued by the surgeon very much depends, I shall take the liberty of making the following statement.

I have been forty years at St. Thomas's and Guy's Hospitals; and, for thirty years, have had more than my share, and much more than I merited, of the practice of London. We have eight hundred and fifty patients in the two hospitals; and I believe that in the two hospitals, eight cases of fractures of the upper part of the thigh-bone occur in each year; but in order to avoid exceeding the average number, I will consider them only as five per annum: thirty-nine multiplied by five, produce one hundred and ninety-five; add to these one case only in each year, in my private prac-

tice of thirty years, they will collectively amount to two hundred and twenty-five cases. Now in that time, I have only known *two cases* of fracture of the neck of the thigh-bone within the capsular ligament *occur under fifty years of age:* one was in a patient aged thirty-eight, who had an aneurism of the iliac artery; and the other has been kindly shewn to me by that excellent anatomist Mr. Herbert Mayo.

This fracture, then, rarely occurs under fifty years of age; and dislocation seldom at a more advanced period, although there are exceptions to this rule: for I have myself once seen the fracture at thirty-eight years of age, but it was very oblique; and a dislocation of the thigh at sixty-two: but the period of life between fifty and eighty years is that at which the fracture most usually occurs; for from the different state of the bone, the same violence which would produce dislocation in the adult, occasions fracture in old age. But when dislocation does occur between the age of sixty and seventy, it is in persons whose constitutions are particularly strong, and in whom age has not produced those changes in the bones which I have endeavoured already to point out.

Slight cause producing this fracture.

That this state of bone in old age tends much to the production of fractures, is shewn by the slight causes which often occasion them. In London, the accident most frequently occurs when persons, walking on the edge of the elevated foot-path, slip upon the carriage pavement; though the descent be only a few inches, yet, being sudden and unexpected, and the force acting perpendicularly, with the advantage of a lever in the cervix, it produces a fracture of the neck of the thigh-bone; and as a fall is the consequence, the fracture is imputed, by ignorant persons, to the fall, and not to its true cause. Other trivial accidents may occasion the misfortune. I was informed by a person who had sustained a fracture of this kind, that being at her counter, and suddenly turning to a drawer behind her, some projection in the floor caught her foot; and preventing its turning with the body, the neck of the thigh-bone became fractured. A fall upon the trochanter major will also produce it. But I have dwelt particularly on the *slight*

causes by which it is occasioned, that the young surgeon may be upon his guard respecting it, as he might otherwise believe that an injury of such importance could scarcely be the result of a slight accident, and that excessive violence is necessary to break the neck of the thigh-bone: such an opinion is as liable to be injurious to his reputation, as the error of confounding this accident with dislocation.

Union of this fracture.

Much difference of opinion has existed upon the subject of the union of the fractured neck of the thigh-bone: it has been asserted, that these fractures unite like those of other parts of the body; but the dissections which I made in early life, and the opportunities I have since had of confirming my observations have convinced me, that fractures of the neck of the thigh-bone,—those of the patella—olecranon,—and condyles of the os humeri,—and that of the coronoid process of the ulna, *generally* unite by ligament, and not by bone. This principle I have taught in my lectures for thirty years; and it is a most essential point, as it affects the reputation of the surgeon. I was called to a case of this fracture, in which the medical attendant had been promising, week after week, a union of the fracture, and the restoration of a sound and useful limb. After many weeks, the patient became anxious for further advice: I did all in my power to lessen the erroneous impression which had been made by telling the patient that she might ultimately walk, although with some lameness: and taking the surgeon into another room, asked him upon what grounds he was led to suppose there would be union? to which he replied, he was not aware but that the fracture of the neck of the thigh-bone would unite like those of other bones of the body. The case, however, proved unfortunate for his character, as the patient did not recover in the usual degree.

Young medical men find it so much easier a task to speculate than to observe, that they are too apt to be pleased with some sweeping theory, which saves them the trouble of observing the processes of nature; and they have afterwards, when they embark in their professional practice, not only every thing still

to learn, but also to abandon those false impressions which hypothesis is sure to create. Nothing is known in our profession by guess; and I do not believe, that from the first dawn of medical science to the present moment, a single correct idea has ever emanated from conjecture. It is right, therefore, that those who are studying their profession, should be aware that there is no short road to knowledge; that observations on the diseased living, examinations of the dead, and experiments upon living animals, are the only sources of true knowledge; and that inductions from these are the sole basis of legitimate theory.

In all the examinations which I have made of transverse fractures of the cervix femoris entirely within the capsular ligament, I have never met with one in which a bony union had taken place, or which did not admit of a motion of one bone upon the other. To deny the possibility of this union, and to maintain that no exception to the general rule can take place, would be presumptuous; especially when we consider the varieties of direction in which a fracture may occur, and the degree of violence by which it may have been produced: as for example, when the fracture is through the head of the bone*, and there is no separation of the fractured ends; or, when the bone is broken without its periosteum being torn; or, when it is broken obliquely, partly within and partly externally to the capsular ligament: but I wish to be understood to say, that if ever it does happen, it is of extremely rare occurrence,

* Some pains have been taken to impress the public mind with the idea, that I have in this work denied the possibility of union of the fracture of the neck of the thigh-bone; and therefore I beg at once to be understood, that I believe the reason why fractures of the neck of the thigh-bone do not unite is, that the ligamentous sheath and periosteum of the neck of the bone is torn through; and that there is, in consequence of this circumstance, a want of nourishment of the head of the bone. But if a fracture should happen without the reflected ligament being torn, I can readily believe that as the nutrition would continue, the bone might unite. But the character of the accident would differ: the nature of the injury could scarcely be discerned, and the patient's bone would unite with little attention on the part of the surgeon.

and that I have not yet met with a single decisive example of it*. As a proof that the general principle which I have stated is correct, I subjoin the following account of forty-three cases, from different collections, of non-union by bone, in fractures of the neck of the thigh-bone.

In the collection at St. Thomas's . . .	7	specimens.
In the College of Surgeons	1	ditto.
In St. Bartholomew's	6	ditto.
At Dublin	12	ditto.
In Mr. Langstaff's, of Basinghall-street .	6	ditto.
In Mr. Bell's and Mr. Shaw's . . .	6	ditto.
In Mr. Brookes's	2	ditto.
In Dr. Monro's	2	ditto.
Mr. Mayo's collection	1	ditto.
Total .	43	

To these I have to add another, from an experiment upon a living animal; while, on the contrary, only a single instance meriting a moment's attention has yet been produced: in this case, the same appearances were found in both the thigh-bones; and even these resembled what I have several times observed in the dead body, arising from a softened state of the bones. I have given a plate of some of these appearances, and the preparations I shall at all times be happy to shew to any of my professional brethren who may wish to see them.

Cause of the want of union.

Having thus explained the ordinary result of these cases, in relation to their want of union, I shall now proceed to state the reasons which may be assigned for the absence of ossific union in the transverse fracture of the neck of the thigh-bone within the capsular ligament.

Want of proper apposition.

The first reason is the want of proper apposition of the bones:

* In Mr. Cross's account of his visit to the French hospitals, some interesting matter upon this subject will be found.

for if their broken extremities in any part of the body be kept much asunder, ossific union is prevented.

In a boy, who had a compound fracture of the tibia, without the fibula being broken *, and who had the protruded end sawn off, the two extremities were prevented from coming in contact by the fibula, and union never occurred. My friend, Mr. Smith, an excellent surgeon, at Bristol, had a similar case under his care, in which a portion of the tibia having been sawn off, the fibula, remaining whole, prevented ossific union †.

This fact is easily seen by experiments on animals. I sawed seven-eighths of an inch of the radius from a rabbit, and the ends of the bones were not united to each other, but only to the ulna. I also sawed off the extremity of the os calcis, and suffered it to be drawn up by the action of the gastrocnemius muscle; and it united only by ligament.

The neck of the thigh-bone when broken, is placed under similar circumstances; for, by the contraction of the muscles, it is no longer in apposition with the head of the bone, and is, therefore, prevented from uniting: if this, however, were the only obstacle, it would be argued that the retraction of the thigh-bone might be prevented by bandaging and extension,—the truth of

* If the fibula be broken, large pieces of the tibia will separate, and yet ossific union will ensue.

† The particulars of the case were as follow:—The boy was admitted into the Bristol Infirmary for disease of the tibia; and the diseased portion not exceeding more than from two to three inches in length, that part of the bone was removed by a saw. In a month the limb had acquired so much firmness, that the boy was permitted to walk about the ward, which he was able to perform tolerably well; and in six weeks no doubt was entertained that ossification had taken place in the uniting substance; at this time he sickened with the small pox and died. Upon examination, the edges of the extremities of the tibia were found absorbed and rounded; and on the inferior portion, a bony callus had formed, about three quarters of an inch in extent; no ossific matter was discoverable in the greater part of the space originally occupied by the diseased bone; but a tough, though thin ligamentous band extended from the superior to the inferior portion of the tibia.—*See Medical Records and Researches.*

which cannot be denied; but it is scarcely possible, even for a few hours, to preserve the limb in exact apposition, as the patient, on the slightest change of posture, produces instant retraction, by bringing into action those powerful muscles, which pass from the pelvis to the thigh-bone.

So in fractures of the patella, although we often do all in our power to prevent retraction of the muscles, yet it very rarely happens that we are able to support a complete approximation of the bones.

Absence of continued pressure.

The second circumstance which prevents a bony union in these fractures is the want of pressure of one bone upon the other even if the length of the limb were preserved: and this will operate in preventing an ossific union in cases where the capsular ligament is not torn; and in all those which I have had an opportunity of examining, it has not been lacerated. The circumstance to which I allude proceeds from the secretion of a quantity of fluid into the joint; from the increased determination of blood to the capsular ligament and synovial membrane; a superabundance of serous synovia,—that is, synovia much less mucilaginous than usual,—which extends the ligament, and thus entirely prevents the contact of the bones, by pushing the upper end of the body of the thigh-bone from the acetabulum. After a time this fluid becomes absorbed, but not until the inflammatory process has ceased, and ligamentous matter has been effused into the joint from the interior of the synovial surface. The muscles, also, do not in this accident produce pressure between the broken extremities of bones, which so greatly conduces to the union of other fractures; for if two broken bones overlap each other, on that side on which they are pressed together, there is an abundant ossific deposit; but on the opposite side, where there is no pressure, scarcely any change is observed. So also we find that, if the ends of the bones be drawn from each other by the action of muscles, as sometimes happens in the fractures of the os femoris, tibia, os humeri, radius and ulna, union is not effected until the surgeon, by a strong leathern bandage tightly buckled around the limb, compels the

bones to press upon each other, and thus support the necessary inflammation for the production of ossific union. When a fracture occurs amidst muscles, those which are inserted into the fractured part of the bone, have generally a tendency to keep the extremities of the bones together, with some few exceptions; but when a fracture occurs in the neck of the thigh-bone, the muscles have only an influence upon one portion of the fractured bone; and this influence serves to draw one part from the other.

Little action in the head of the bone.

But the third and principal reason which may be assigned for the want of union in this fracture is, the almost entire absence of ossific action in the head of the thigh-bone when separated from its cervix; its life being supported by the ligamentum teres, which has only a few minute vessels, ramifying from it to the head of the bone. The structure of the neck of the thigh-bone, and of the parts surrounding it, is explained in the account of the anatomical plate connected with this part of my subject. But here it may be observed, that the neck and head of the thigh-bone are naturally supplied with blood by the periosteum of the cervix, and that when the bone is fractured, if, as most frequently happens, the periosteum be torn through, the means of ossific action are, in consequence of such fracture and laceration, necessarily destroyed in the head of the bone. Scarcely any change, therefore, takes place in the head or neck of the bone attached to it; no deposit of cartilage or bone, similar to that of the other fractured bones, is produced; but the deposit which does take place, as will be seen in the plates of fracture of the neck of the thigh-bone, consists of ligamentous matter, covering the surface of the cancellated structure with little patches like ivory on the head of the bone*.

* But if I attempt to prevent union in a fracture external to a joint, I find, by moving the bone from time to time, that in proportion to that motion is the quantity of callus produced; which is just the reverse in the accidents I am now describing.

Dissection of this fracture.

The appearances which are found on the dissection of these injuries are as follow:—The head of the bone remains in the acetabulum attached to the ligamentum teres. There are, upon parts of the head of the bone, very small white spots like ivory. The cervix is sometimes broken directly transversely, at others with obliquity. The cancellated structure of the broken surface of the head of the bone and of the cervix, is hollowed by the occasional pressure of the neck attached to the trochanter, and consequent absorption; and this surface is sometimes partially coated with a ligamento-cartilaginous deposit. The cancelli are rendered firm and smooth by friction, as we see in other bones which rub upon each other when their articular cartilages are absorbed. Portions of bone are formed or broken off, and these are found either attached by means of ligament, or floating loosely in the joint, covered by a ligamentous matter; but the pieces do not act as extraneous bodies, so as to excite inflammation, and thus produce their discharge, any more than those loosened portions of bone covered by cartilage, which are found so frequently in the knee, and sometimes in the hip and elbow-joints. With respect to the neck of the bone which remains attached to the trochanter major, the most remarkable circumstance is, that it soon becomes in a great degree absorbed, only a small portion of it remaining; its surface is yellow, and extremely smooth, if the bones have rubbed against each other. Some ossific deposition I have seen manifested around this small remaining part of the neck of the bone, and upon the trochanter major and thigh-bone below it, in several examples of this fracture. We do not, however, observe the same process of union as in other bones, but a ligamentous instead of an ossific union.

Ligament and synovial membrane.

The capsular ligament enclosing the head and neck of the bone becomes much thicker than natural, but the synovial membrane undergoes the greatest change from inflammation, being very much thickened, not only upon the capsular ligament, but also upon the reflected portion of that ligament upon the neck of the bone, as far as the edge of the fracture.

Within the articulation is found a large quantity of serous synovia; by which term I mean to express, that the synovia is less mucilaginous, and contains more serum than usual, mixed with a small quantity of blood; this fluid, by gradually extending the ligament, separates for a time one portion of bone from the other: it is produced by the inflammatory process, and becomes absorbed when the irritation in the part subsides. I do not know the exact period at which this change takes place, but I have seen it in the recent state of the injury. Into this fluid is poured a quantity of ligamentous matter, by the adhesive inflammation excited in the synovial membrane, and flakes of it are found proceeding from its internal surface, uniting it to the edge of the head of the bone. Thus the cavity of the joint becomes distended, in part by an increased secretion of synovia, and in part by the solid effusion which the adhesive inflammation produces; the membrane reflected on the cervix femoris is sometimes separated from the fractured portions, so as to form a band for the fractured edge of the cervix to that of the head of the bone: bands also of ligamentous matter pass from the cancellated structure of the cervix to the head of the bone, serving to unite, by this flexible material, the one broken portion of bone with the other.

Effusion into the joint.

New ligament.

Union by ligament.

The trochanter is drawn up, more or less, in different accidents; and in those cases in which it is very much elevated, I have known a considerable ossific deposit take place upon the body of the thigh-bone, between the trochanter major and the trochanter minor. When the bone has been macerated, its head is much lighter, and more spongy than in the healthy state, excepting on those parts most exposed to friction, where it is rendered smooth by the attrition, which gives it a polished surface.

Appearances on dissection.

These, then, are the usual appearances on dissection: there are, however, two preparations in the Royal College of Surgeons in London, which have been sent as specimens of union by bone of the cervix femoris; but as I may be thought prejudiced in favour of the opinion I have advanced, I shall give that of an excellent anatomist whose loss we have had lately to deplore. Mr. Wilson

Specimens in the college.

says, "*I have examined very attentively these two preparations, and cannot perceive one decisive proof in either, of the bones having been actually fractured.*"

Want of ossific union not peculiar to the femur.

This circumstance of want of ossific union, is not peculiar to the neck of the femur, as will be seen in our account of fracture of the condyles of the os humeri, of the coronoid process of the ulna, and of bones generally, when seated within the capsular ligament.

All nature's efforts at ossific union end in callus or ligament.

It appears then, as a general principle, from the account which I have given of the dissection of those whose bodies have been examined after having suffered from this fracture, that ossific union is not produced; that nature makes slight attempts for its production upon the neck of the bone, and upon the trochanter major, but scarcely any upon the head of the bone: and that if union be produced, it is by means of ligament.

Mr. Stanley, for whom, both as an anatomist and surgeon, I have great respect, has met with the appearance of fracture in the neck of each thigh-bone, in the same subject. I do not mean to deny the possibility of the necks of both thigh-bones in this subject having been fractured, because that point can only be determined by the history of the accident, and by a very careful and accurate examination of several sections of the bones; but I can shew that similar effects are produced by disease.

Structure of the bone.

The neck of the thigh-bone in adult persons of middle age, has a close cancellated structure, with considerable thickness of the shell which covers it; but in old subjects, the cancellated structure of the shaft of the bone, which is formed of a coarse net-work, loaded with adipose matter, is often extended into the neck of the bone, and the shell which covers it becomes so thin, that when a section is made through the middle of the head and cervix it is found diaphonous: of this I have several specimens. As the shell becomes thin, ossific matter is deposited on the upper side of the cervix, opposite the edge of the acetabulum, and often a similar portion at its lower part, and thus the strength of the bone is in some degree preserved: this state may be

frequently seen in very old persons. Mr. Steel, of Berkhampstead, an intelligent surgeon, and a most respectable man, gave me the thigh-bone of a person thus altered, whose age was ninety-three.

Absorption and deposition.

When the absorption of the neck proceeds faster than the deposit on its surface, the bone breaks from the slightest causes, and this deposit wears so much the appearance of an united fracture, that it might be easily mistaken for it. Before the bone thus alters, we sometimes meet with a remarkable buttress shooting up from the shaft of the bone into its head, giving it additional support to that which it receives from the deposit of bone upon its external surface. But another change is also produced from disease, of which the following is the history, and which directly applies to the subject before us.

Old bed-ridden and fat persons (generally females) are often brought into our dissecting-room with some of their bones broken (and more frequently the thigh-bone than any other) in being removed from the grave. If the cervix femoris of such persons be examined, it will be found that the head of the bone is sunk down upon its shaft, and that the neck of the thigh-bone is shortened, so that its head is in contact with the shaft of the bone, opposite to the trochanter minor; and at the part at which the ligament is inserted into the neck of the bone, the phosphate of lime is absorbed, and a ligamento-cartilaginous substance occupies its place; either extending entirely through the neck of the bone, or partially, so that one section exhibits signs of it, and in another it is wanting. The bone, in some cases, is so soft and fragile, both in its trochanter and head, that it will scarcely bear the slightest handling; and the motion of the thigh-bones in the acetabulum is almost entirely lost, so that the persons must have had little use in their lower extremities.

During the last winter we had two instances of this alteration in the neck of the bone, and it is an appearance which I have several times seen.

In examining the body of an old subject, very much loaded with

fat, in the dissecting-room of St. Thomas's Hospital, I found that the gentleman who had dissected one limb, had cut through the capsular ligament of the hip-joint, and tried to remove the head of the thigh-bone from the acetabulum; but the neck of the bone broke on the employment of a very slight force, and upon a further trial to remove it, the bone crumbled under his fingers. As the other limb was not yet dissected, I requested Mr. South, one of our demonstrators, to remove with care the upper part of the thigh-bone; but although he used great caution in doing it, he could not remove the bone without fracturing the upper part of its shaft; but he succeeded in removing the upper part of the bone, so that it might be preserved.

We have here, then, a case in which the neck of the bone was absorbed, so that the head was brought in contact with the trochanter; in which, most decidedly, there had not been a fracture, although it had in some parts the appearance of one; and in which the disease occurred in each hip-joint.

Another case of the same kind was examined by Mr. South, during the last winter, which, so far as it relates to the softened state of the upper part of the thigh-bone, was similar to the former; the heads were spongy, the necks were shortened, so that there was scarcely any remaining; each trochanter was light in weight, spongy, and very large; and there was little if any motion in either of the hip-joints; so that both limbs appeared, at first sight, as if dislocated upon the pubes.

But the best specimen of this state of the bone is the following, which I preserve with the most assiduous care, and value in the highest possible degree: I have had for twenty years in the collection of St. Thomas's Hospital, the thigh-bone of an old person, in which the head of the bone had sunken towards its shaft. I have been in the habit of shewing this bone twice a year as a specimen how bones sometimes become soft from age and disease, and from the absorption of their phosphate of lime; and I have frequently cut with a penknife both its head and its condyles to shew this softened state. On sawing through its cervix, the cartilage, deprived

of its phosphate of lime, had dried away in several parts, and the appearance was such that a person, ignorant of the change, would have declared it to be a fracture; only, that in some sections the cartilage had taken different directions, and in some the bone was not yet entirely absorbed. There is also in the Museum of St. Thomas's Hospital, a skeleton in which both the thigh-bones, and each os humeri, are, in a subject extremely altered by rickets, divided by similar portions of cartilage, in which no ossific matter exists.

I have been led to prosecute the inquiry by experiments upon animals. I found it difficult to succeed in breaking the bone in the direction I wished, and, after a great number of experiments, was successful only in the following instances; the preparations of these I have preserved, and they may be seen in the Museum at St. Thomas's Hospital.

Experiment I.

The neck of the thigh-bone was fractured in a rabbit, on October 28th, 1818; and on December 1st, 1818, as the wound had been some time healed, I dissected the animal.

Appearance on dissection.—The capsular ligament was much thickened; the head of the bone was entirely disunited from its neck, but adhered by a new ligamentous substance to the capsular ligament; the broken cervix, which was very much shortened, played on the head of the bone, and had smoothed it by attrition; the head of the thigh-bone had not undergone any ossific change.

Experiment II.

The neck of the thigh-bone was broken in a dog, November 8th, 1818, and the animal was killed on the 14th of December following.

Dissection.—The trochanter was much drawn up by the action of the muscles, so that the head and cervix femoris were not

in apposition. The capsular ligament was much thickened, and contained a large quantity of synovia.

The joint was lined with adhesive matter of a ligamentous appearance adhering to the head of the bone, which did not seem to be changed by any ossific process; but the thigh-bone around the capsular ligament, the trochanter major, and the bone a little below it were enlarged.

We find, therefore, by these dissections, that what appears in the human subject after this accident, takes place also in other animals; and that motion, want of apposition and pressure, with the little ossific action in the head of the bone, under these circumstances, produce a deficiency of bony union, as in man.

The two preparations which I have preserved, were the only examples in which the experiment was complete in relation to the transverse fracture; but I have two other interesting preparations derived from these experiments. I also made a great number of others, in which the fractures continued compound; in each of these the head of the bone either became absorbed, or was discharged by ulceration; and I never could succeed in uniting the head to the neck of the bone. I have since divided the neck of the thigh-bone in a dog, and the head of the bone was three-fourths absorbed. By way of contrast, I have also divided the bone externally to the capsule, in five instances, and have preserved the bones: the wounds united by adhesion, and every bone has been healed by ossific union: the natural inference is, that fractures within the capsule are not at all susceptible of union by bone, but that fractures external to it are so, readily. As to the notion that the bearing upon the limb, or its weight may have influence to prevent union in these animals, I have only to observe, that the muscles become contracted, the limb is drawn up, and the animal cannot bear upon it for several weeks.

My friend, Mr. Brodie, has furnished me with the following ac

count of an experiment which he made upon the same subject, which fully confirms my observations.

"Dear Sir:—The circumstances of the experiment which I mentioned, were briefly these,—The tibia of a guinea-pig was broken at the lower end. A month afterwards the animal was killed. On dissection, I found a fracture extending across the tibia, transversely, and so close to the ancle-joint, that it was situated at that part of the bone which is covered by the reflected layer of the synovial membrane. The synovial membrane itself, and the ligaments of the joint, appeared to have been very little injured, and the broken surfaces had remained in good apposition; nevertheless, there was not the smallest union of them, either by bone or ligament, and there had been no formation of callus round the fracture. The bone in the neighbourhood of the fracture had become compact and hard, in consequence of the ossification of the medullary membrane lining the cancelli."

Professor Burns, of Glasgow, has had the great kindness to send me the following observations.

"Permit me to offer my warmest thanks for the pleasure and edification I have received from the study of your late work. I was early led to attend to the process adopted by nature in forming a new articulation in injuries to the hip-joint, by the dissection of a dog which I had when a boy, and which had the hip fractured. Many years afterwards I examined the parts, and found the fragment of the cervix belonging to the head absorbed, the head itself filling the acetabulum; the shaft of the bone expanded; a new head formed for a new socket, and the whole enveloped in a dense capsule or covering.

"In a fracture of the os femoris external to the capsule, the gluteus medius and minimus seem to act as a cushion to stop the ascent of the end of the cervix, whilst the fragment attached to its head will, perhaps, afford some opposition; but in the fracture within the capsule, the end of the cervix is drawn more freely up under the gluteus medius, and lodged behind the inferior spinous process of the ilium.

"Is this the explanation of the greater shortening in the one fracture than in the other?

"Nothing can better explain the want of ossific union than the principle you have laid down."

Having by experiment verified the result I have mentioned I was next anxious to learn if the head and neck of the thigh-bone would unite under a longitudinal fracture, partly within and partly external to the capsular ligament, in which apposition, contact and pressure are maintained; and for this purpose I made the following experiment.

Experiment III.

Longitudinal fracture.

I divided the head, neck, and a portion of the trochanter major of the thigh-bone of a dog longitudinally, by placing a knife on the trochanter major, and striking it down towards the acetabulum through the head of the bone. The animal was killed twenty-nine days after, and the following appearances presented themselves.

A portion of the trochanter major had been broken off, and was only united by cartilage. The head and neck of the bone, which had been longitudinally broken, were united; the neck by a larger quantity of ossific deposit than that which joined the separated portions of the head of the bone, and so irregularly as to make a beautiful preparation, and shew the circumstance most clearly. This bone may be seen in the collection at St. Thomas's Hospital.

Whether the union began in the fracture externally to the ligament, and proceeded inwards, or whether on the whole surface at once, it is impossible to ascertain; but the coalescence was firm; although, as I have stated, I thought more so at the neck than at the head of the bone. The union in this case is readily explained. Apposition was supported; the vessels of the head of the bone and cervix remained whole; and, therefore, this experiment shews at once why the longitudinal unites, and the transverse, in general, does not unite.

Thus then, it appears, that in a longitudinal fracture of the head and neck of the bone *partly external to the ligament*, if the bones be applied to each other, pressed together, and in a state of rest, and the vessels remain, ossific union can be produced; although the ossific deposition is extremely slight when compared with that of other bones. Union of these bones.

The fracture of the neck of the thigh-bone may be confounded with the dislocation of the os femoris upon the dorsum ilii; with that into the ischiatic notch; and with that upon the pubes: as in all these luxations the limb is shorter. From the two former it may be distinguished by the eversion of the foot, and by the mobility of the limb in fracture; and from the latter, by the ball of the os femoris being felt in the groin in the dislocation on the pubes; otherwise the eversion of the foot in both cases might lead to their being confounded. Diagnosis.

With respect to the treatment of fractures of the neck of the thigh-bone within the capsular ligament, various are the means to which I have had recourse, and which I have known resorted to by others, for the purpose of producing union in this accident, but all without avail. Treatment.

One mode consisted in placing the fractured limb over a double inclined plane, thus maintaining a regular and constant extension, which, by raising the planes at the knee, may be increased to any degree that the surgeon may require, or the patient can bear; at the same time, a bandage is applied around the pelvis and upper part of the thigh, to bring the neck of the bone, as much as possible, in approximation with the head from which it has been separated: and this extension, with pressure, has been steadily preserved for three months. With respect to the patient's body, it has been placed at an angle of forty-five degrees.

A second method consisted in placing a board at the foot of the bed, upon which the foot of the sound limb rested, so as to prevent the descent of the body in the bed; the other limb was

then extended as much as possible, and a weight, appended to the foot, was suffered to hang through a hole in the board over the end of the bed, in order to support the extension with regularity and steadiness for several weeks.

In a third method, the patient has been placed in bed with both limbs extended to the utmost possible degree, and then the two feet have been bound together by a roller passed from the foot on the injured side under the sound foot, so as to make one limb steadily preserve the extension of the other. This may also be effected by an iron plate affixed to the shoe on the sound foot, with a screw passed through a hole in the plate, and having a band fixed to the other foot, which may be tightened by turning the screw; and the foot, by this means, be kept constantly extended.

A fourth mode employed for this purpose has been the application of Boyer's splint, with the intention of extending the limb from the pelvis; but this splint, though it answers well for fractures of the thigh under ordinary circumstances, has a tendency to prevent union in those fractures which occur at the upper part of the bone, by the pressure of its band upon the inner and upper portion of the thigh.

Mr. Hagedorn's machine.

Mr. Hagedorn has recommended a machine for fractures of the neck of the thigh-bone, which is very ingenious in its construction. It consists of a long splint to extend from the hip to the foot, and to be firmly applied, by means of proper straps, to the sound limb; at the bottom of this is fixed a broad foot-board, perforated with a sufficient number of openings to receive the bands, by means of which both feet are to be securely fixed to it; these bandages are attached to a kind of leathern gaiter, made to lace tight round the ancle, and the upper part of the splint is kept close to the hip by means of a broad bandage carried round the pelvis. By this machine the extension of the limb is tolerably well effected, so long as the patient can be kept still; but a displacement of the bones will invariably be the consequence of every motion which

the evacuation of the fæces will necessarily require. I am never so wedded to any opinion as to be prevented from trying, or from wishing others to employ, every means which appear plausible or ingenious; and, therefore, I think that this instrument ought to have a fair trial.

Mr. Earle's fracture bed.

Mr. Earle is of opinion, that these cases may be cured by long continued attention in keeping the parts at perfect rest. I think a trial should be made of the bed recommended by Mr. Earle, and heartily wish him success in his laudable attempt to prevent the lameness and shortening of the limb in cases of fracture within the capsule; which has invariably been the result in those cases which I have had an opportunity of observing.

All means unavailing.

But all the means which I have seen used have been found unavailing. I have been baffled at every attempt to cure, and have not yet witnessed one single example of union in this fracture. I know that some persons still believe in the possibility of this union, by surgical treatment, and that instances of success have been published; but I cannot give credence to such cases, until I see that the authors were aware of the distinction between fractures within and fractures external to the articulation.

Exceptions.

The cases in which union might be produced are two: one, in which the periosteum covering the neck of the thigh-bone is not torn through, a circumstance which now and then happens; the other in which the head of the bone is broken, so that the cervix still remains in the acetabulum: but in neither of these cases will the limb exhibit the shortened state which the fracture of the neck of the bone usually produces, and therefore, the common characters of the accident will be wanting. Even in such cases, I would, in consideration of the confinement and danger of bony union, prefer a ligamentous union, as well from regard to the health and life of the person, as, I believe, to the subsequent use of the joint.

Hypothetical case.

The various attempts at curing these cases having failed, and

the patient's health having invariably suffered under the trials made to effect union, I should, if I sustained this accident in my own person, direct that a pillow should be placed under the limb throughout its length ; that another should be rolled up under the knee, and that the limb should be thus extended for ten days or a fortnight, until the inflammation and pain had subsided. I should then daily rise and sit in a high chair, in order to prevent a degree of flexion, which would be painful; and walking with crutches, bear gently on the foot at first; then, gradually more and more, until the ligament became thickened, and the muscles increased in their power. A high-heeled shoe should be next employed, by which the halt would be much diminished. Our hospital patients treated after this manner, are allowed in a few days to walk with crutches; after a time a stick is substituted for the crutches, and in a few months they are able to use the limb without any adventitious support.

The degree of recovery in these cases is as follows:—if the patient be very corpulent, the aid of crutches will be for a long time required; if less bulky a stick only will be sufficient; and where the weight of the body is inconsiderable, the person will be able to walk without either of these aids, but will drop a little at each step on that side, unless a shoe be worn having a sole of equal thickness to the diminished length of the limb. In every case, however, in which there is the smallest doubt whether it be a fracture within, or external to the ligament, it will be proper to treat the case as if it were the fracture which I shall hereafter describe, and which admits of ossific union.

It is gratifying to find opinions which have been for thirty years delivered in my lectures, confirmed by the observations of intelligent and observing persons; and, therefore, it is with pleasure that I read in the Dublin Hospital Reports, the account of the dissection of several cases of fracture of the cervix femoris, by my friend Mr. Colles, of Dublin, (a man excellently informed in his profession,) who found in them similar want of ossific union, in the

fracture within the ligament, to that which I have described. A few contributions of a similar kind, from the ardent cultivators of morbid anatomy, would soon prevent persons from being tortured with trials, which have been frequently repeated, and found to be uniformly unavailing.

FRACTURES OF THE CERVIX FEMORIS EXTERNAL TO THE CAPSULAR LIGAMENT, AND INTO THE CANCELLI OF THE TROCHANTER MAJOR.

The symptoms of this accident in some respects resemble those of the fracture within the ligament, and they require much attention to distinguish them accurately; but the result is entirely different; so that a favourable opinion may be given as to the restoration of the bone by an ossific union.

Symptoms.

In this accident, the injured leg is shorter than the other by one half to three quarters of an inch; the foot and toe on that side are everted, from the loss of support which the body of the thigh-bone sustains in consequence of the fracture; much pain is felt at the hip, and on the inner and upper part of the thigh; and the joint loses its usual roundness.

Diagnostic marks.

The distinguishing signs of this accident are,—First:—It sometimes occurs at the earlier periods of life; for it happens in the young, and in the adult *under fifty years of age*, although I have known it at a later period, when it often proves fatal; but if the above symptoms are seen at any age under fifty years, there will be generally found a fracture external to the capsular ligament, and capable of ossific union. Several cases of these which have fallen under my notice have occurred under that period; and, therefore, a surgeon called to the bed-side of a patient who has an injury to the upper part of the thigh-bone, if he finds the age of the patient to be under fifty years, will, with very few exceptions, be warranted in pronouncing it either a fracture just external to the ligament, or one through the trochanter major. But I also mention that *both fractures occur in age*, and therefore no discrimination can be drawn between the two, in advanced age, but by the most careful examination.

Union of the bone.

From severe injuries.

Secondly:—These cases may be in some measure distinguished by the severity of the accident which produces them; for whilst the internal fracture happens from very slight causes, this on the contrary, is produced either by severe blows, or falls upon the edge of some projecting body, as against the edge of a curb-stone, or from the pressure of laden carriages passing over the pelvis. My experience has taught me, that a very slight accident generally occasions the fracture within the capsule, and a violent blow or fall, the other; the first is an accident upon which the fall often succeeds, the other is generally the consequence of that fall. Many of those within the capsule which I have witnessed, were produced by the persons slipping from the curb-stone to the road-way*: not that I mean to deny, that a fall will, and does occasionally, produce a fracture within the capsule, or that in a very old person, a fracture may occasionally happen in any part of a bone, from a slight cause compared with that which produces it in the young.

Crepitus.

Thirdly:—It may be generally known by the crepitus which attends it upon slight motion; and so small is the retraction, that it is unnecessary to draw down the limb to distinguish the grating of one bone upon the other.

Fourthly:—Great ecchymosis often attends it.

Swelling.

Fifthly:—Swelling and tenderness to the touch quickly succeed upon the upper part of the thigh, from the inflammation which this injury produces.

Severe pain.

Sixthly:—This accident is generally marked by much greater severity of suffering than the fracture within the ligament, slight motion producing excruciating pain, which does not happen in an equal degree in the fracture within the ligament.

Dissection.

Seventhly:—There is a high degree of irritative fever, and many months elapse before the patient recovers any use of his limb.

Upon dissection of these cases, the seat of the fracture is found

* Slipping from the curb-stone to the road-way produces a violence in the perpendicular direction; falling against the edge of the curb-stone often produces the fracture external to the capsule.

to vary very much in different examples, being more or less complicated, but it is external to the capsular ligament; and the fracture is placed at the neck of the root of the thigh-bone, the trochanter is split, and the neck of the bone is received into its cleft. The trochanter major is often broken into several portions.

We have few opportunities of dissecting these cases in the young, because they recover from the accident; and, therefore, the examination of them has been most frequently made in aged persons, to whom they always prove fatal.

Roux sends a specimen from Paris.

My friend, Mr. Roux, sent me from Paris a fractured thigh-bone, in which the neck of the bone had been broken at the same part as in Mr. Powell's case, and had been united in a similar manner. But it frequently happens in this injury, that the fracture of the neck of the thigh-bone is complicated with an injury of the trochanter major and trochanter minor.

Since the publication of a former edition of this work *, I have inspected, with Mr. Key, a fracture of the neck of the thigh-bone. The moment I had examined the patient, I pronounced the case to be a fracture external to the capsule, and was led to believe so from some little diminution in the length of the limb; from the ecchymosis which attended it; from its distinct crepitus without any rotation; from the diminished motion of the upper part of the thigh; from the sunken state of the trochanter; and from excitement of great pain by the smallest motion. This man died in a fortnight after the accident.

When the body was placed upon the table for examination, post mortem, all the limbs were rigid from the fixed contraction of the muscles, and consequently, the thigh was drawn up to its greatest possible extent; yet the limb was found to be not quite three quarters of an inch shorter than the other. The posterior part of the sheath of the vessels, and some branches of blood-vessels were torn by the bone, which accounted for the ecchymosis. The neck of the bone was forced into the cancelli of the trochanter major.

Before writing this statement, I again enquired of Mr. Key, the

* Sir Astley alludes here to his large work on Dislocations, &c.

degree of diminution in the length of the limb, and his answer was, "If you mention three quarters of an inch, you will state rather more than its degree of retraction, even when all the muscles were contracted to their utmost rigidity." I shall be happy to shew the parts which I removed from the case, with all the surrounding muscles, to any person who wishes to see them, as they at once explain the nature of the accident, and the reason why the limb is so little shortened.

Although, then, this accident has some of the marks of fracture of the neck of the bone within the ligament, yet it unites by bone, and it will be seen that the union is similar to that of other bones external to the joints; cartilage is first deposited, and then the matter of bone, because in this case the parts can be brought into apposition, and the ends of the bones are confined together by the surrounding muscles; one portion is pressed against the other and the neck of the bone sinks deeply into the cancellated structure of the trochanter; thus direct approximation and pressure are preserved when the fracture is at the junction of the cervix with the trochanter, and the nutrition of each extremity of the bone is well supported by the vessels which proceed to it from the surrounding parts.

Difference of opinion reconciled.

We now see the reason of the difference of opinion respecting the union of fracture of the neck of the thigh-bone. In the internal fracture the bones are not applied to each other, and the nutrition of the head of the bone being imperfect, in general no ossific change is produced; but in the external fracture the bones are held together by the surrounding parts, easily kept in apposition by external pressure, and there is not only ossific union, but very exuberant callus. Much time is required in these accidents to produce a complete ossific union; and the neck of the bone, received into the cancelli, moves for a long period in its new situation; although it is so far locked in as to prevent its separation.

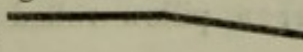
Treatment.

In the treatment of this injury, the principle is, to keep the bones in approximation by pressing the trochanter towards the acetabulum; and the length of the limb is preserved by applying a

roller around the foot of the injured leg, and by binding the feet and ancles firmly together, so as to prevent their retraction, and thus cause the uninjured side to serve as the splint to that which is fractured, giving it a continued support. A broad leathern strap should also be buckled around the pelvis, including the trochanter major, to press the fractured portions of the bone firmly together; and the best position for the limb is, to keep it in a straight line with the body.

The following plan I have also known successful:—The patient being placed on a mattress on his back, the thigh is to be brought over a double inclined plane composed of three boards, one below, which is to reach from the tuberosity of the ischium to the patient's heel, and the two others having a joint in the middle by which the knee may be raised or depressed; a few holes should be made in the board, admitting a peg, which prevents any change in the elevation of the limb but that which the surgeon directs; over these a pillow must be thrown, to place the patient in as easy a position as possible*.

When the limb has been thus extended, a long splint is placed upon the outer side of the thigh to reach above the trochanter major, and the upper part of this is fixed to a strong leathern strap, which buckles around the pelvis, so as to press one portion of bone upon the other; and the lower part of the splint is fixed with a strap around the knee, to prevent its position from being altered; the limb must be kept as steady as possible for many weeks, and the patient may be permitted to rise from his bed when the attempt does not give him much pain: he is still to retain the strap which I have mentioned round the pelvis; and by this treatment he will ultimately recover, with a useful, though shortened limb. Recovery.

* The construction of this inclined plane is so little complicated, that it may be made at the instant, of two common boards, one of which is to be sawn through nearly at the middle, and if hinges cannot be immediately procured, the boards may be nailed together thus  .

FRACTURES THROUGH THE TROCHANTER MAJOR.

Oblique fractures sometimes happen through the trochanter major, and the cervix ossis femoris does not participate in the injury. This accident occurs at every period of life, and its symptoms are as follow:—The leg is very little, and sometimes not at all, shorter than the other, and the foot is benumbed; in some cases the patient is unable to turn in bed without assistance, and the attempt gives him great pain. The broken portion of the trochanter major is, in some cases, drawn forward towards the ilium; in others, it falls towards the tuberosity of the ischium; but is, in general, widely separated from that portion which remains connected with the neck of the bone. The foot is greatly everted; the patient cannot sit, and any attempt to do so produces excessive pain. Crepitus is with difficulty discovered if the trochanter is either much fallen, or much drawn forwards.

Diagnostic marks.

The distinguishing marks of this accident are, a fixed state of the upper part of the trochanter, whilst its lower part obeys the motion of the thigh-bone; eversion of the foot, and the very perceptible altered position of the trochanter major; attended with crepitus under very extended motion of the upper part of the limb, and with little diminution of its length.

But when the fracture happens below the insertion of the principal rotatory muscles, the lower portion of bone is much raised by the action of the gluteus maximus, and the limb becomes very much shortened and deformed at the place of union by exuberant callus.

This fracture unites very firmly, and more quickly than when the cervix is broken at the root of the trochanter, and the patient recovers with a very good use of the limb.

Case.

The first case of this kind I ever saw was in St. Thomas's Hospital, about the year 1786. It was supposed to be a fracture of the neck of the thigh-bone within the capsule, and the limb was extended over a pillow rolled under the knee, with splints on

each side of the limb, by Mr. Cline's direction. An ossific union succeeded, with scarcely any deformity, excepting that the foot was somewhat everted, and the man walked extremely well. When he was to be discharged from the hospital a fever attacked him, of which he died; and upon dissection, the fracture was found through the trochanter major, and the bone was united with very little deformity, so that his limb would have been equally useful as before.

In conclusion, I have to observe, that as the diminution of the length of the limb, and its eversion of the knee and foot, are signs common to fractures of the thigh-bone generally, it may be proper to bring into one view the means of distinguishing the three species of fracture which I have described.

Fracture within the capsule.

The fracture of the cervix within the capsule is known, with very rare exceptions, by the very advanced age of the patient,—by its greater frequency in female than in male subjects,—by the absence of swelling and ecchymosis,—by the elevation and advance of the trochanter,—by the greater mobility of the joint, allowing flexion and extension, although with some pain, and resistance from muscles,—by a crepitus perceptible only on drawing down the limb to the same length with the other, and then rotating it,—by the pain felt at the trochanter minor,—by the small degree of constitutional irritation attending the accident,—by the slight causes which produce it,—and by the little local swelling or change of appearances which ensues.

Fractures of the cervix into the cancelli.

Fractures of the cervix into the cancelli of the trochanter are known by the effusion of blood amidst the muscles,—by great swelling produced, and by ecchymosis, which appears soon after the accident,—by an unnaturally fixed state of the joint, so that flexion and extension cannot be performed,—by excessive pain on the least motion of the hip-joint, and upper part of the thigh-bone,—by a crepitus attending the least motion of the thigh-bone without drawing it down to the length of the other,—and by the inflammation, swelling, and constitutional irritation produced, which are frequently fatal.

The fracture of the trochanter major may be easily known by the separation of the bone at the part, so that the finger may be placed between the fractured portions,—by the distinct crepitus felt in putting the fingers on the trochanter when the knee is advanced,—by inability of the upper portion of the trochanter to obey the motions of the lower, and of the shaft of the bone,—and when at the lower part of the trochanter, by great overlapping, distension, and exuberant callus.

Concluding observation.

I have thus stated what dissection and observation have taught me of the three fractures of the upper part of the thigh-bone, and shewn it to be a general principle, that fractures within the capsule do not unite by bone. I ought to add, that, in the Museum of Mr. Langstaff, there is a preparation of fractures within, and of one external to the ligament; the latter firmly united by bone, whilst the former has scarcely undergone any ossific change. I can have no wish but that these fractures within the capsule should unite by bone, if that result be desirable. I only state what dissection has taught me; and with respect to the contrivances to produce their union, I cannot extol them until there be some evidence of their value.

FRACTURE OF THE EPIPHYSIS OF THE TROCHANTER MAJOR.

Mr. Key, surgeon to Guy's Hospital, had the kindness to send me the following account of a peculiar fracture of the trochanter major, in which this process was broken from the thigh-bone at the part at which it is naturally united by cartilage as an epiphysis in youth.

The subject of this accident was a young girl about the age of sixteen, who tripped in crossing the street, and in falling, struck her trochanter violently against the curb-stone. She immediately rose, and without much pain or difficulty walked home. The accident occurred on Saturday, March 15th, 1822; and, in consequence of the increase of pain she experienced on the inner side of the thigh, she presented herself at Guy's for admission on the Thursday following. Her constitutional symptoms being evidently

more violent than those which usually arise from fractured femur, she was placed under the care of the physician, Dr. Bright, at whose request I examined the limb. Her right leg, which was the one injured, was considerably everted, and appeared to be about half an inch longer than the sound limb. It admitted of passive motion in all directions, but in abduction gave her considerable pain. She had perfect command over all the muscles except the rotators inwards. The fact that she had walked both before and since her admission into the hospital, gave rise to some doubts as to the existence of a fracture, and the closest examination of the trochanter and body of the femur, could not detect the slighest crepitus, or displacement of bone. I repeated the examination of the limb on the following day, but the result was equally unsatisfactory.

The fever under which she was labouring, together with general abdominal uneasiness, threatening her life, the limb underwent no further examination. She died on Monday, nine days after the accident.

Examination after death.

Wishing to ascertain (for I suspected some obscure fracture of the os femoris) the exact nature of the injury, previously to removing the soft parts I moved the limb in every direction, fixing the trochanter and head of the bone; but I could perceive no deviation from the usual state of parts, nor could I distinguish the slightest crepitus under all the variety of movements. I should observe, that there was no tumefaction of the thigh, and therefore the trochanter and head of the os femoris were as readily distinguished and exposed to examination as in the most healthy limb.

The capsule of the joint being laid bare, a cavity was discovered by the side of the pectineus, leading backwards and downwards, towards the trochanter minor, and containing some pus: it allowed the fingers to pass behind the bone to the greater trochanter. The head of the bone was then dislocated by cutting through the ligaments, and not till then was a fracture discovered at the root of

the trochanter major. The upper half of the femur being removed from the body, I discovered the reason why the fracture had eluded our search.

The fracture had detached the trochanter from the body and neck of the bone, but without tearing through the tendons attached to the outer side of the process. The tendons are those of the two smaller glutei, and the commencement of that of the vastus externus; had they been torn, the broken portion of bone would have been drawn upwards by the action of the two former muscles, and in that case, the injury would readily have been recognized; but they so effectually prevented all movement of the fractured portion, that, when dissected from the body, not the least motion could be produced except in one direction. It was found that this motion resembled that which would be produced by a hinge; the tendons acting the part of a broad hinge, and allowing the portion to be moved only upwards and downwards. It is evident that such motion could not have been produced by any direction given to the limb; hence it is also manifest, that the fracture could not have been detected during the life of the patient.

FRACTURES BELOW THE TROCHANTER.

The thigh-bone is sometimes broken just below the trochanter major and minor; it is a difficult accident to manage, and miserable distortion is the consequence if it be ill-treated. The end of the broken bone is drawn forwards and upwards, so as to form nearly a right angle with the body, and the cause of this position is evidently the contraction of the iliacus internus and psoas muscles, assisted by the pectinalis, and perhaps by the first head of the triceps. A better idea of the effect of this accident may be obtained by a view of the Plate in my larger work, where the bone will be observed to be united, not only with extreme shortening, but with a hideous projection forwards. If pressure be made upon the projecting bone in the treatment of this case, it only adds to the patient's sufferings, and to the degree of irritation of the limb, without preserving the bone in its proper situation. It will be seen that this

PLATE XIII.

Fig. 1.

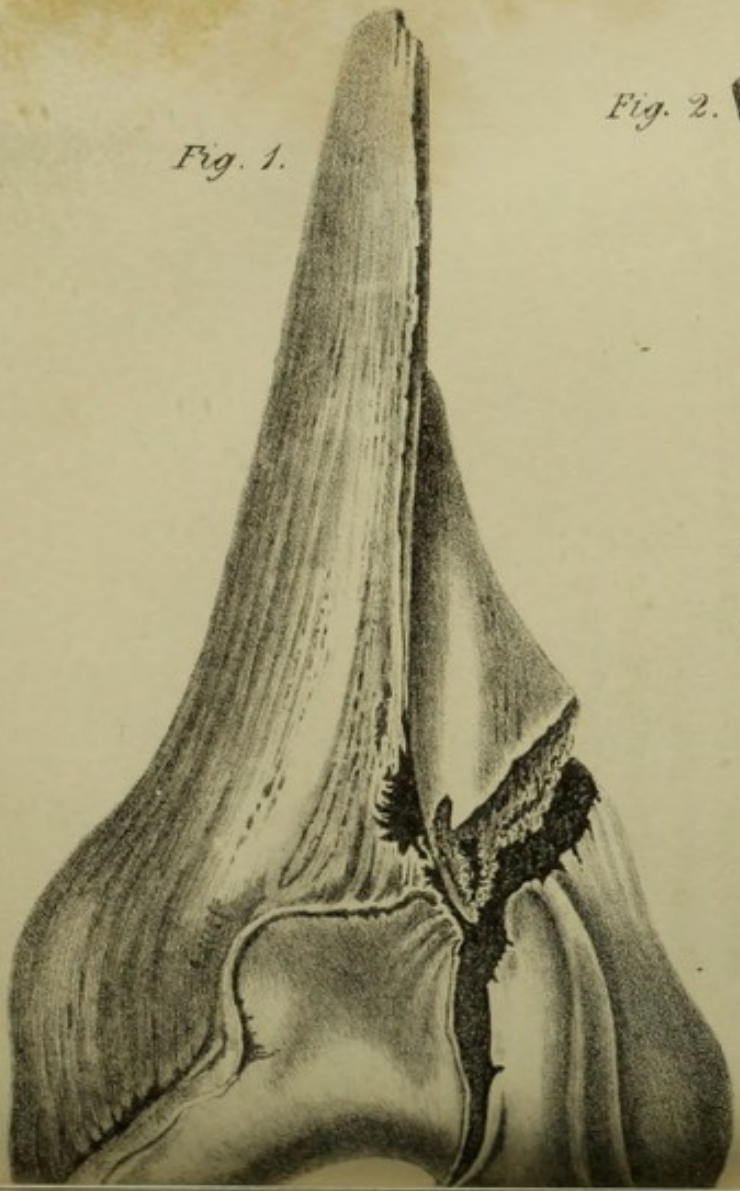


Fig. 2.

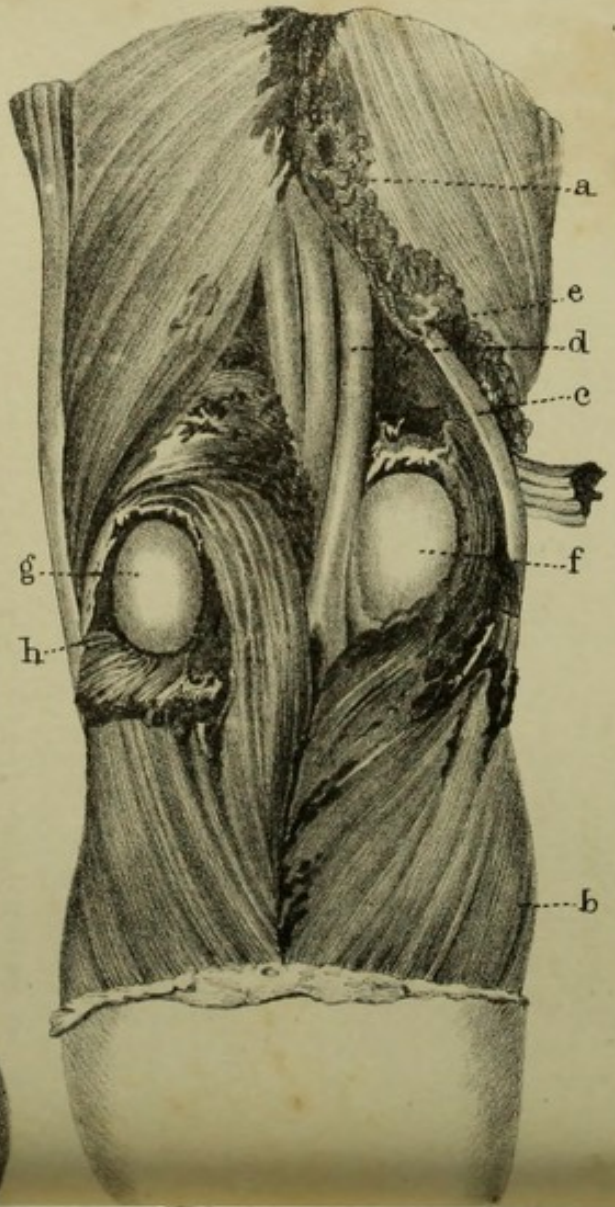


Fig. 3.

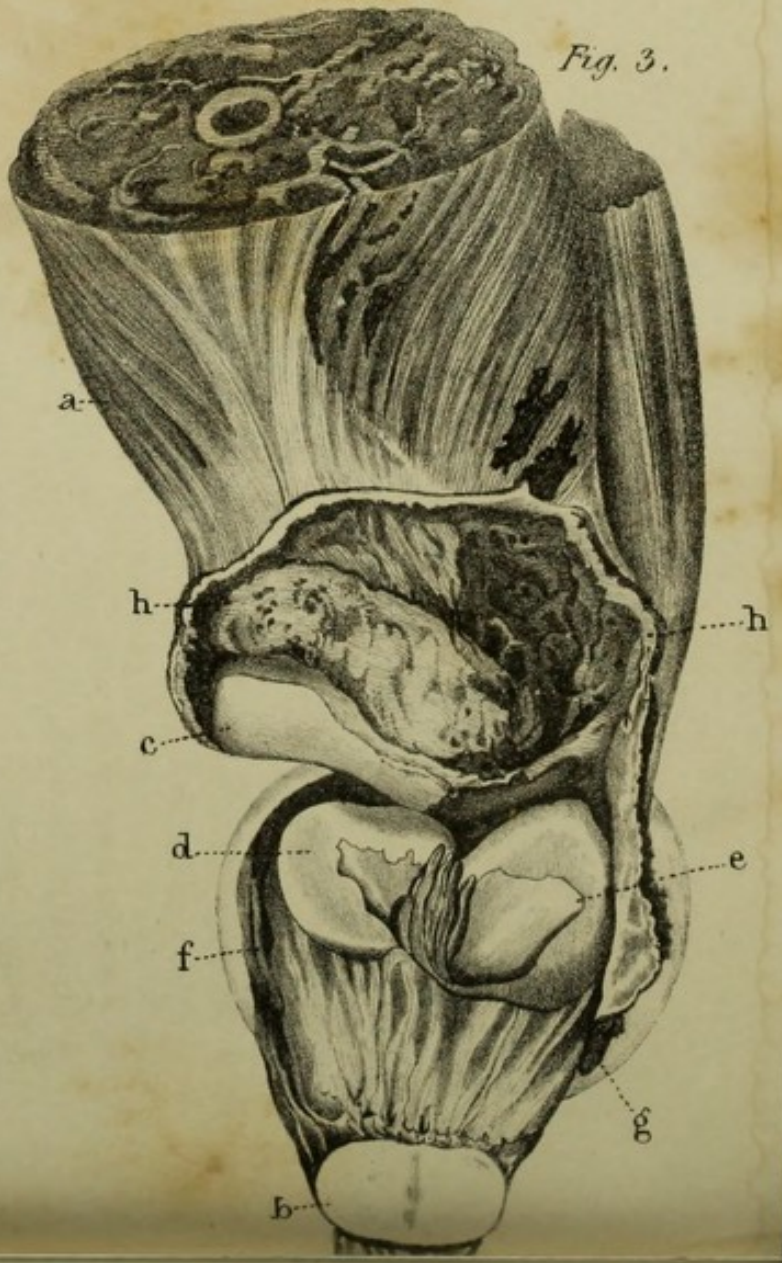


PLATE XIII.

Fig. 1. Shews the thigh-bone in a compound fracture at its condyles into the knee-joint.

Fig. 2. Posterior view of the same knee.

a, Muscles of the thigh.

b, Gastrocnemius.

c, Sciatic nerve.

d, Popliteal vein.

e, Popliteal artery.

f, External condyle, which had torn the capsular ligament and muscles posteriorly.

g, Internal condyle, which had also torn the ligament and muscles.

h, Torn ligaments.

Fig. 3. Shews an anterior view of a dislocation of the thigh at the knee-joint outwards.

a, Muscles of the thigh.

b, Patella.

c, External condyle of the os femoris, which had passed through the ligaments and skin.

d, One semilunar cartilage.

e, The other semilunar cartilage.

f, Head of the tibia.

g, Leg.

h h, Capsular ligament.

nion exceedingly overlaps, and that it is very feeble; shewing hat I have already mentioned, that a fracture thus circumstanced as the ossific deposition only on that side where the inflammation vas preserved by the pressure of one bone on the other. This reparation may be seen in the Anatomical Museum, St. Thomas's Hospital.

To prevent this horrid distortion and imperfect union, two circumstances are to be strictly observed: the one is, to elevate the nee very much over the double inclined plane; and, the other, to lace the patient in a sitting position, supporting him by pillows luring the process of the union. The degree of elevation of the ody which is required, will be about forty-five degrees, but it may e readily ascertained by observing the approximation of the fractured extremities of the bones; and this position is requisite for elaxing the psoas and iliacus muscles, and thus preventing the levation of the upper part of the bone. In no other manner can he great deformity I have described, be prevented. When, by his posture, the extremities of the bones are brought into proper pposition, and all projections of the upper portion are removed, ither the splints may be applied which are commonly used in racture of the thigh-bone; or, what is better, a strong leathern elt, lined with some soft material, should, by means of several traps, be buckled around the limb, and be confined by means of a trap around the pelvis.

DISLOCATIONS OF THE KNEE.

The broad surfaces of bone by which the os femoris rests upon he tibia tends to prevent the ready dislocation of this joint, which would be otherwise very liable to happen from the superficial nature of the articulating cavities on the head of the tibia, and also rom the great violence to which the knee is often exposed.

Structure of the knee.

The depressions upon the head of the tibia are increased by the addition of the semilunar cartilages which rest upon the bone; hey receive the condyles of the os femoris, and are attached by ligaments to the edge of the tibia. The fore part of the joint is

Bone.

defended by the patella, which has two unequal articular surfaces to play upon the condyles of the os femoris. The head of the fibula forms no part of the knee-joint, but is attached to the tibia from one half to three-fourths of an inch below its head.

Ligaments.

The junction of the os femoris, tibia, and patella, is produced by means of a capsular ligament, which proceeds from the os femoris to the head of the tibia, and is attached to the edge of the patella, where it divides into two portions, forms wings to that bone, and takes the name of the alar ligament. On its outer side the capsular ligament is covered, and greatly strengthened, by tendinous expansions, which are derived from the vasti muscles, and which proceed to the head of the tibia. Internally the ligament has a secreting synovial surface, which is folded within the cavities at the extremities of the bones, is reflected to the edge of the articular cartilages, and it is believed, forms a covering to those cartilages. Besides the capsular, there are several peculiar ligaments. First: The ligamentum patellæ, which are extended from the lower point of the patella to the tubercle of the tibia. Secondly: The external lateral or femoro-fibular ligament, which passes from the os femoris to the head of the fibula, and which divides into two external lateral ligaments. Thirdly: The internal lateral or femoro-tibial ligament, attached to the os femoris and to the head of the tibia. Fourthly: The oblique or popliteal ligament, which proceeds from the external condyle of the os femoris obliquely, to be inserted into the head of the tibia. Fifthly: The crucial ligaments, which pass from the depression between the condyles of the os femoris behind; the one to a projection between the articular surfaces of the head of the tibia, and the other to a depression behind that projection, so that these ligaments cross each other from before backwards. The patella has a muscular connection with the os femoris by the insertion of the rectus, vasti, and cruralis. By the ligamentum patellæ it is united with the tibia, and laterally it is joined to the capsular and alar ligaments. This ligamentous junction of the three bones is very firm, but it allows of free flexion and extension, with some degree of rotatory motion when the knee

is bent; but although great strength is evident in the construction of this joint, still excessive violence and extreme relaxation will occasionally produce its dislocation.

DISLOCATION OF THE PATELLA.

The patella is liable to be dislocated in three directions: namely outwards, inwards, and upwards. In its lateral dislocation, the bone is most frequently thrown on the external condyle of the os femoris, where it produces a great projection; and this circumstance, with an incapacity of bending the knee, is the strong evidence of the nature of the injury. The most frequent cause of the accident is, that a person in walking or running, falls with his knee turned inwards, and the foot outwards; and thus by the action of the muscles to prevent the fall, the patella is drawn over the external condyle of the os femoris; and when the person attempts to rise he finds himself unable to bend his leg, and the muscles and ligaments of the patella are all forcibly on the stretch. This accident generally occurs in those who have some inclination of the knee inwards, which, under the action of the extensor muscles, gives a direction to the patella outwards.

Three directions.

Symptoms.

Cause.

External.

The internal dislocation is much less frequent, and it happens from falls upon a projecting body, by which the patella is struck upon its outer side, or by the foot being, at the time of the fall, turned inwards. In either of these cases the ligament will be torn, unless there be some previous disease.

Internal.

Mr. Harris, getting into a chaise, caught his foot in the carpet at the bottom of it, by which accident the knee was turned in and the leg outwards; the patella slipped upon the external condyle of the os femoris, but it returned very soon, by the effort of the muscles, into its natural situation. On examination, I found the internal portion of the capsular ligament torn, and a great accumulation of synovia in the joint.

The mode of reduction in either case, consists in pursuing the following plan:—The patient is placed in the recumbent posture and an assistant raises the leg by lifting it at the heel; the advan-

Mode of reduction.

tage of which is, that it relaxes the extensor muscles on the thigh in the greatest possible degree; the surgeon then presses down that edge of the patella which is most remote from the joint, be it one luxation or the other; and this pressure raises the inner edge of the bone over the condyle of the os femoris, and it is immediately drawn, by the action of the muscles, into its natural situation.

Case. My friend, Mr. George Young, informed me, that he was called to a case of dislocation of the patella outwards, in which the reduction was very difficult. The patient was a female, who, by a fall in walking, had the patella drawn over the external condyle of the os femoris, where it remained. He employed pressure upon the edge of the patella, most perseveringly, without being able to succeed, but at last reduced it in the following manner:—He placed the patient's ancle upon his shoulder, and thus most completely extended the limb and obtained a fixed point of resistance at the knee; then grasping the patella with the fingers of his right hand, he pressed the outer edge of the patella with the ball of his left thumb, and pushed it into its place.

Refrigerant lotion. When the reduction of this bone has been effected, an evaporating lotion of spirits of wine and water is to be applied; in two or three days the limb may be bandaged, and it is soon restored to its natural uses, although somewhat weaker than before.

I was informed, by Mr. Welling, formerly surgeon at Hastings, that he was called to a case in which the patella was dislocated upon its edge. The nature of the accident was very obvious, as the edge of the bone forced up the integuments to a considerable height between the condyles on the fore part of the joint. Mr. Welling reduced the dislocation, but with considerable difficulty, by pressing the edges of the bone in opposite directions.

When the bone is dislocated from relaxation, the patella is drawn upon the external condyle of the os femoris by very slight accidents, or sudden action of the muscles. My neighbour, Mr. Hutchinson, a very intelligent surgeon, informs me he has very frequently seen this accident, and that the tendency to it has arisen, in a large

roportion of cases, from the relaxation produced by excessive in-
ılgence in onanism.

The reduction, in these cases, is effected in the manner which
ıs been before described; and after the reduction, to prevent any
currence of the accident, and to support the weakened ligament,
laced knee-cap, with a strap and buckle over and below the pa-
lla, is to be worn.

I once saw the patella drawn over the external condyle of the os
moris from loss of action of the vastus internus, owing to a dis-
se in the thigh-bone.

DISLOCATION OF THE PATELLA UPWARDS.

Ligament lacerated.

In this dislocation, the ligament of the patella is torn through
the action of the rectus femoris muscle, and the immediate effect
the injury, is to draw the patella upwards upon the fore part of
e thigh-bone. The appearances which this accident presents
e very decisive of its nature; for in addition to the elevation of
e patella, and its easy motion from side to side, a deep depres-
ın is felt above the tubercle of the tibia from the absence of the
ament; the patient immediately loses the power of bearing upon
ıt limb, as the knee bends under each attempt, and he would
l if he persisted in throwing the weight of his body upon it. A
nsiderable degree of inflammation is the consequence.

Symptoms.

Treatment.

In the treatment of this injury, local depletion and evaporating
ions are to be used during four or seven days from its occur-
nce, and then a roller is to be applied around the foot and upon
e leg, to prevent its swelling; the leg is to be kept extended by
plint behind the knee, and a bandage, composed of a leathern
ap, is to be buckled around the lower part of the thigh: to this
to be attached another, which is to be carried on each side of
e leg, and under the foot, and is to be buckled to the circular
ap; thus the bone is gradually drawn down, so as to allow of a
ion of the ligament. In a month the knee may be slightly bent,
d as much passive motion daily given as the patient is able to
ar; by these means the ruptured ligament becomes united, and

the patella retains its motion. During the time the bandage is worn, the patient is to preserve the sitting posture, in order to relax the rectus muscle and to prevent its action upon the patella. With very great attention the union becomes perfect; for so it happened in a case which I saw with Mr. Burrowes, in Bishopsgate-street, who paid great attention to the case, that the patient recovered without any diminution of the natural powers of the part; the patella being gradually forced down until the ends of the ligament had approximated and coalesced.

Dislocation downwards.

With respect to dislocations of the patella *downwards*, at which some surgeons have hinted, I have seen no injury which deserved such a title, if I except a rupture of the tendon of the rectus, which I have twice witnessed, and which destroyed the attachment of that muscle to the patella. The appearance of this injury was a soft swelling above the patella, upon which, when the hand was placed, it sunk into the joint; the patella fell loose between the condyles of the os femoris and the head of the tibia, but it still retained very much its usual situation, and could not be said to be luxated, as it was not displaced from the joint. The treatment which this accident requires, is that the patient be obliged to preserve the sitting posture during the cure: and that a cushion be applied upon the ligamentum patellæ, which is to be confined by a roller passed around the head of the tibia.

DISLOCATION OF THE TIBIA AT THE KNEE-JOINT.

In four directions.

These dislocations occur in four different directions; but two of them are incomplete, and lateral, while the others are perfect luxations, the tibia being thrown either backwards or forwards.

Internal.

The lateral dislocations are but rare. In the dislocation inward the tibia is thrown from its situation, so that the condyle of the os femoris rests upon external semilunar cartilage, and the tibia projects on the inner side of the joint, so as at once to disclose the nature of the injury. The first case of this kind which I ever witnessed was brought to St. Thomas's Hospital whilst I was a apprentice there, and I remember being struck with three circum

stances in it; the first was, the great deformity of the knee from the projection of the tibia; the second, the ease with which the bone was reduced by direct extension; and the third, the little inflammation which followed upon what appeared to be so serious an injury; for the man was discharged from the hospital after a few weeks, having suffered little local or no constitutional irritation.

External.

The tibia is sometimes thrown upon the outer side of the knee-joint, the condyle of the os femoris being placed in the situation of the inner semilunar cartilage, or rather behind it, when the same deformity is produced as in the external dislocation. The reduction of the limb is equally easy with the former, and the patient recovers with little diminution of the powers of the part. It seems to me, that in both these dislocations the tibia is rather twisted upon the os femoris, so that the condyle of the os femoris, with respect to the tibia, is thrown somewhat backwards, as well as outwards or inwards.

Case of dislocation outwards.

One of the aldermen of the city of London, riding down Highgate-hill during the night, and not being aware of a rail that was placed across a part of the road, which was undergoing repair, the horse ran against the rail, and turning quickly, threw his rider over it, while his leg was confined between the rail and the horse, so that his body was on one side the rail and his leg on the other: the result of this accident was, that he partially dislocated his tibia outwards, throwing the condyle of the os femoris inwards. Being immediately taken to a public-house, the tibia was easily replaced; and on his removal home, some hours afterwards, means were used to reduce the swelling and inflammation, which became considerable. When he attempted to bear upon the limb he found the capsular ligament very feeble, and he was obliged to have a knee-cap made of very strong leather, to support and connect the bones; by the aid of this bandage he gradually recovered, and was enabled to walk well, and to do duty on horseback as a light-horse volunteer, before twelve months had expired.

I was consulted by Mr. Richards respecting Mr. Bovill, a gen-

tleman from Barbadoes, who had dislocated his knee. I made a few notes on the case at the moment, which were as follow.

Case of dislocation inwards.

The gentleman was thrown from a gig; the tibia was dislocated, and the fibula broken a little below its head. The head of the tibia projected much on the inner side of the condyle of the os femoris. My friends, Mr. Caddell and Mr. Richards, surgeons at Barbadoes, saw him a quarter of an hour after the accident; the leg was extended from the thigh-bone in a bent position of the limb; the extension was a long time continued, and force was employed by several persons for half an hour before the luxation was reduced. The limb became excessively swollen, and remained so for many weeks, the climate probably being unfavourable to his recovery; but, at length, the inflammation and its consequence were subdued by local depletion. When I saw him, eighteen months had elapsed from the accident, and he could not then bend the joint at right angles with the thigh; there was also an unnatural lateral motion of the joint, from the injury which the ligaments had sustained. The fracture of the fibula had injured the peroneal nerve, as was evident from the numbness of which he complained in the outer part of the leg and foot.

Dislocation forwards.

The tibia is now and then dislocated in a direction forwards. In this accident, when the person is recumbent, the external marks of the injury are these: the tibia is elevated; the thigh-bone is depressed, and is thrown somewhat to the side as well as backwards; the os femoris makes such pressure on the popliteal artery, as to prevent the pulsation of the anterior tibial artery on the foot; the patella and tibia are drawn by the rectus muscle forwards. Such were the appearances in a man of the name of Briggs, brought into Guy's Hospital in the year 1802, not only with this accident, but with a compound fracture of the tibia of the other leg, with dislocation of the head of the fibula. Mr. Lucas was obliged to amputate the compound fracture, and the man is now living at Walworth. The limb in this case was easily reduced by extending the thigh from above the knee, and by drawing the leg from the thigh, and inclining the tibia a little downwards. As

soon as it was reduced, the popliteal artery ceased to be compressed, and the pulsation in the anterior tibial artery was restored.

The head of the tibia is sometimes dislocated backwards, behind the condyles of the os femoris, producing the following appearances; the limb shortened, the condyles of the os femoris projecting, the ligament of the patella depressed, and the leg bent forwards. Dislocation backwards.

PARTIAL LUXATION OF THE THIGH-BONE FROM THE SEMILUNAR CARTILAGES.

Under extreme degrees of relaxation, or in cases in which there has been increased secretion into a joint, the ligaments become so much lengthened, as to allow the cartilages to glide upon the surface of the tibia, and particularly when pressure is made by the thigh-bone on the edge of the cartilage. That excellent practical surgeon, the late Mr. Hey, of Leeds, was the first who clearly described the symptoms and cause of these accidents, and suggested a mode of treatment which is ingenious, scientific, and generally successful. The injury most frequently occurs when a person in walking strikes his toe, with the foot everted, against any projection, (as the fold of a carpet,) after which he immediately feels pain in the knee, which cannot be completely extended. I have seen this accident also happen from a person having suddenly turned in his bed, when the clothes not suffering the foot readily to turn with the body, the thigh-bone has slipped from its semilunar cartilage. I have also known it occur from a sudden twist of the knee inwards when the foot was turned out. From relaxation. Mr. Hey's ideas.

The explanation of this accident is as follows: the semilunar cartilages, which receive the condyles of the os femoris, are united to the tibia by ligaments, and when these ligaments become extremely relaxed and elongated, the cartilages are easily pushed from their situations by the condyles of the os femoris, which are then brought into contact with the head of the tibia; and when Explanation of the accident.

the limb is attempted to be extended, the edges of the semilunar cartilages prevent it. How then is the bone to be again brought upon the cartilages? Why, as Mr. Hey has advised, by bending the limb back as far as is possible, which enables the cartilage to slip into its natural situation; the pressure of the thigh-bone is removed in the bent position, and the leg being brought forwards, it can be completely extended, because the condyles of the os femoris are again received on the semilunar cartilages. This plan is not, however, invariably successful, as the following case will shew. A lieutenant in the army suffered this accident repeatedly, and the limb was as often reduced by the above means; but at length, turning in bed, from the pressure of the bed clothes on his foot, the accident recurred. He came to town; but bending the limb had now no effect in enabling him to extend the joint, I therefore advised him to visit Mr. Hey, at Leeds; but I learned that in this case the dislocation was never reduced.

Mode of reduction.

I made the following notes of the case of a gentleman who came to my house. Mr. Henry Dobley, aged thirty-seven, has often dislocated his knee, turning the foot inwards and the thigh-bone outwards, by accidentally slipping on uneven ground, or by sudden exertions of the limb; considerable pain was immediately produced, accompanied with a great deal of swelling. His mode of reducing it is as follows: he sits upon the ground, and then bending the thigh inwards, and pulling the foot outwards, the subluxation of the os femoris being external, the natural position of the limb becomes restored. A knee-cap laced tightly around the knee, is the usual preventive of the return of this accident; but it is not sufficient in Mr. Dobley without the addition of straps, and more especially of a very strong one of leather, just below the patella.

Different mode of reduction.

A young lady was brought to my house who was frequently the subject of this accident, but in her the cartilages had been several times easily replaced, and the return of the accident prevented by a bandage composed of a piece of linen with four rollers at-

Particular bandage required.

ached to it, which were tightly bound above and below the patella; his, she said, answered its intended purpose better than any other ontrivance.

In some of these cases great alteration takes place in the form nd size of the knees, from a chronic rheumatism occasionally at-ending them.

In the dissection of these cases, the ligament is found extremely hickened; little pendulous ligamentous and cartilaginous bodies re seen suspended from it; a thick edge of cartilage projects rom the articular cartilage, and a part of the latter is absorbed. When the bone is macerated, a great addition of ossific matter is ound to have been made to the edges of the condyles of the os emoris.

DISLOCATION OF THE KNEE-JOINT.

Cases of dislocation of the knee-joint are so rare, that every nstance of this accident is worthy of recital; and I feel greatly ndebted to my friend, Mr. Toogood, surgeon at Bridgewater, for he following detail of a case of this description which occurred nder his care.

December 5th, 1806.

Francis Newton, a strong athletic man, thirty years old, fell rom the fore part of a waggon, and his foot being entangled in he frame-work of the shaft, he was dragged a very great distance efore he was released. I saw him two hours after the accident. The left knee was very much swollen; the tibia, fibula, and patella were driven up in front of the thigh; and the os femoris occupied he upper part of the calf of the leg, the internal condyle being nearly through the skin. It was a complete dislocation, and the ppearance of the limb so dreadful, that I despaired of being able o reduce it; but, to my surprise, it was more easily effected than imagined. By placing two men to the thigh whilst I extended he leg, the man became directly relieved. The whole limb was laced in splints, and the strictest antiphlogistic treatment ob-erved, with the most perfect quiet. The symptoms were very

Case.

mild; and, by carefully watching him, he suffered very little inflammation or pain. At the expiration of a month I allowed him to get up, and on the 29th of January, he came into this town, a distance of four miles, in a cart, and walked from an inn to my house, with his leg but little swollen, and having some motion of the joint. He eventually recovered a very good use of his limb, and walks with so little inconvenience, that he has followed his business as a waggoner ever since; and this day, November 30th, 1822, I have seen him walking by the side of his team with very little lameness.

COMPOUND DISLOCATION OF THE KNEE-JOINT.

Having seen only one instance of this dislocation, I conclude it to be a rare occurrence; and there are scarcely any injuries incident to the body, which more imperiously demand immediate amputation than these.

Case. On Monday, August 26th, 1819, at eleven p. m., I was sent for by Mr. Oliver, of Brentford, to visit Mr. Pritt, who had fallen from the box of a mail-coach, and most severely injured his knee. I met, at the house to which he was carried, Mr. Oliver, and Mr. Hunter, of Richmond, surgeons, and immediately proceeded to examine the knee. A large opening was found in the integuments, through which the external condyle of the os femoris projected, so as to be on a level with the edges of the skin. The os femoris was thrown behind the tibia on the outer side of the head of the latter, and the external condyle of the thigh-bone was dislocated backwards and outwards; the thigh-bone was twisted outwards, and the internal condyle advanced upon the head of the tibia. I made attempts to reduce the condyle, but it could only be effected with extreme difficulty; and the bone, directly when the extension was removed, slipped into its former situation. The joint being freely opened by the accident, the bone dislocated, and when reduced easily slipping from its place, and the patient having an extremely irritable constitution, I determined at once to propose the amputation of the limb, which being acceded to, was immediately

performed. The symptoms of constitutional irritation which followed the operation became extremely severe, and being delirious on the 31st, Mr. Oliver applied leeches to his temples, a blister under the occiput, and gave the saline medicine with the camphor, and the pulv. ipec. comp. On the following day I was sent for, but being absent from London, my valued friend, Mr. Cline, visited him, and ordered him tinc. opii. gtt. v.—Pulv. castor. gr. x.—Mist. camphor. ℥iss. m.—Ft. haustus 4ta quaque hora sumendus. Soon after the second draught was administered he fell asleep, and after several hours' repose awoke perfectly sensible. He gradually recovered, and left Brentford on the 25th of October, with a small wound still remaining on the stump.

I brought home the limb, and carefully dissected it. Under the skin there was great extravasation of blood in the cellular membrane surrounding the knee; the vastus internus muscle had a large aperture torn in it just above its insertion into the patella; the tibia projected forwards; and the patella was drawn to the outer side of the knee, being no longer in a line with the tubercle of the tibia. Looking at the joint posteriorly, both heads of the gastrocnemius externus muscle were lacerated; the capsular ligament was so completely torn, posteriorly, that both the condyles of the os femoris were seen projecting through the laceration in the gastrocnemius; neither the sciatic nerve, the popliteal artery and vein, the lateral, nor the crucial ligaments, were ruptured. Dislocation.

It is probable that all compound dislocations of the knee-joint will require a similar practice, unless the wound be so extremely small as to admit readily of its immediate closure and adhesion.

DISLOCATION OF THE KNEE FROM ULCERATION.

In the progress of chronic diseases of the joints, inflammation beginning in the synovial membrane, and proceeding to ulcerate the articular cartilages and bone, at length affect the capsular ligament, and sometimes even the peculiar ligaments of the joints; the bones thus becoming unconnected, the muscles irritated by Ligament ulcerated.

participating in the inflammation, draw the limb into distorted positions, and thus one bone becomes gradually displaced from the other. This state is most frequently seen in the hip-joint, from the oblique bearing of the thigh-bone on the pelvis. In the knee it is also not unusual that the thigh-bone shall be placed out of its natural line with the tibia, projecting either on the one side or the other.

Excessive distortion.

Now and then most remarkable distortions are produced by the irritative and spasmodic action of the muscles succeeding the ulcerative process of the ligaments. Mr. Cline removed the limb in St. Thomas's Hospital. It had been the consequence of what is vulgarly called the white swelling of the knee-joint; the leg was placed forwards at right angles with the thigh, so that when walking on his crutches he had the most grotesque appearance, as the bottom of his foot first met the eye when he was advancing. Upon inspection of the patella it was found anchylosed to the os femoris, and the tibia was also joined by ossific union to the fore part of the condyles of the thigh-bone.

How prevented.

This state of parts may be prevented by opposing the action of the muscles when their irritability first begins to produce distortion; by the application of splints; and by the exhibition of the pulvis ipecacuanhæ compositus, to diminish the irritability of the system. Thus I have seen, in cases of ulceration of the hip-joint, the irritative action of the flexor muscles diminished, and future distortion prevented, by drawing down the limb and keeping it in the extended position; but as this extension is most painful to the patient, however desirable it may be, it should be accomplished very gradually.

FRACTURES OF THE KNEE-JOINT.

I shall now, pursuing my former plan, describe the fractures to which the bones entering into the composition of this part are liable; and first, the

FRACTURES OF THE PATELLA.

This bone is generally broken transversely, sometimes, though rarely, longitudinally; it is liable also to simple and compound fracture; but, fortunately, the latter is but of rare occurrence. Transverse or longitudinal.

When the patella is transversely broken, the upper part of the bone is drawn from the lower, its superior portion being elevated by the action of the rectus, vasti, and cruralis muscles, which are inserted into its upper part; whilst the lower portion is still retained in its natural situation by the ligament which passes from it to the tubercle of the tibia. Symptoms.

The degree of separation thus produced, depends on the extent of laceration of the ligament; for when the ligament is but little torn, the separation will be half an inch, but under great extent of injury, the bone is drawn five inches upwards, the capsular ligament and tendinous aponeurosis covering it being then greatly lacerated; and this, with one exception, is the greatest extent of separation which I have seen. The accident may be at once known by the depression between the two portions of bone; by the fingers passing readily down to the condyles of the os femoris into the joint as far as the integuments will permit; and by the elevated portion of bone moving readily on the lower and fore part of the thigh. The power of extending the limb is lost immediately after the accident, and likewise that of supporting the weight of the body on that leg, if the person be standing; for the knee bends forwards from the loss of action in the extensor muscles. The pain in this accident is not very severe; and a simple fracture is not dangerous, for the constitution feels it but little. In a few hours after the accident, a considerable degree of extravasation of blood takes place upon the fore part of the joint, so that the appearance is livid from ecchymosis; but this is removed by absorption in a few days. Considerable inflammation and fever succeed, and there is a great degree of swelling in the fore part of the joint, both from the free secretion of synovia, and the effusion arising from inflammation. No crepitus Degree of separation.

is felt in this fracture, for the bones cannot be brought sufficiently near each other to give this general discriminating mark of other fractures.

The separation of the bones is much increased by bending the knee, as it removes the lower from the upper portion of bone, pulling down the tibia, ligamentum patellæ, and the lower part of the bone from the upper.

Causes.

Blows or actions of the muscles.

This accident arises from two causes: first, from blows upon the bone produced by falls upon the knee, or received upon the patella in the erect position of the body; and secondly, from the action of the extensor muscles upon the bone.

Case.

A gentleman walking in the country, and not used to jumping, leaped a ditch of considerable breadth; and when he reached the opposite bank he was in danger of falling, and ran forward several steps, and with difficulty recovered himself. In this attempt to save himself from a fall, he felt the patella snap; and I was sent for to him, and found his patella broken, and the portions of bone considerably separated.

Case.

A lady descending some stairs, placed her heel near the edge of one of the stairs, and was in danger of falling forwards, when throwing her body somewhat backwards, to prevent the fall and to straighten the knee, the patella became broken.

Explanation of it.

That a bone should thus break by the action of muscles, appears at first sight incomprehensible; but the solution of this circumstance is easily given. When the knee is bent, the patella is drawn down on the end of the condyles of the os femoris, so as to bring the upper edge of the bone forwards; and at that moment it is that the patella is broken, by the rectus muscle not acting in a line with the bone, but at right angles with it, or nearly so, and upon its upper edge more particularly.

Mode of union.

With respect to the mode of union of this bone, whether the separation be great or inconsiderable, it is generally effected by an intervening ligamentous substance. The bone itself undergoes but little alteration; the lower portion, joined by ligament to the patella, has its broken cancellated structure still apparent, al-

though a little smoothed. The upper portion of bone has its broken cancelli covered by a slight ossific deposit, so that there is more ossific action in the upper than in the lower portion of the bone, and certainly much less than in bones which do not form a part of the joints. The internal articular surface of the bone preserves its natural smoothness. Blood is immediately deposited in the place of the injured ligament; but this in a few days is absorbed. Inflammation arises and pours out adhesive matter, which extends from one edge of the lacerated ligament to the other, and even between the bones, to each of which it is firmly united. Vessels shoot from the edges of the ligament and render the new substance organized, and produce a ligamentous structure similar to that from which the vessels shoot; this substance is not, however, always perfect, for I have seen apertures in it; but this will greatly depend upon the extent of the laceration of the ligament, and the too early use of the limb. In the dog and in the rabbit, or almost any other quadruped, it is possible by experiment to trace the mode of union of this bone.

Experiment I.

I drew the integuments much aside in a rabbit, and dividing them, placed a knife upon the patella and struck it lightly with a mallet; the bone was broken and directly drawn up by the action of the muscles. I let the integuments go, and the wound was not opposite the fracture. In forty-eight hours I killed the animal and examined the part. The bones were separated three quarters of an inch, and the intervening part filled with coagulated blood.

Experiment II.

I repeated the former experiment, and killed the animal on the eighth day, and found most of the blood absorbed, and adhesive matter occupying the space between the bones.

Experiment III.

The former experiment repeated; the animal examined on the

fifteenth day. The adhesive matter had acquired a smooth and somewhat ligamentous character.

Experiment IV.

The same division of the bone being made, it was examined on the twenty-second day, when the new ligament was complete.

Experiment V.

The same repeated in five weeks. The part was injected, and vessels were found proceeding from the edge of the ligament into the adhesive matter now become ligamentous. So that at the end of five weeks the vascularity is complete, and some vessels proceed into the new ligament from the bone, but chiefly from the lacerated ligament. Upon the dog, these processes may be equally well observed; but they are not quite so rapidly produced in a large dog as in the rabbit.

The parts were dissected and preserved after these experiments, both in the dog and rabbit, and they are deposited in the collection of St. Thomas's Hospital, where they may be always seen.

Experiment VI.

In the rabbit, having divided the bone, I sewed the two portions by conveying a needle and thread through the tendinous covering of the bone; but the ligatures separated, and the bones still united by ligament.

Experiment VII.

I divided the bone, and cut the rectus muscle across above it, yet the patella united by ligament.

I could not, either in the dog or the rabbit, succeed in producing a bony union in the transverse fracture.

Yet I once saw a patient of my kind friend, M. Chopart, at Paris,—a case which appeared to me to be united by bone; and Mr. Fielding, of Hull, has lately published a similar case.

A ligamentous union of the transverse fracture of the patella is that which generally occurs; and if there be an exception, it is

very rare. But still the principle which is to guide the surgeon's conduct is, to make that ligament as short as possible. If the ligament be of great length, there is a proportionate weakness; for as soon as the accident has happened, the rectus muscle retracts and draws up the superior portion of the patella; and in proportion to the retraction suffered to remain, is the degree of shortening of the muscle, and, consequently, the diminution of its power. Those, therefore, who have had the bones unite when widely separated, if they walk quickly, do it with a halt; and are very liable to fall, and to break the other patella. Let then the muscle be brought as nearly as it can be into its natural length; and although complete apposition of the bone is very rarely effected, yet the ligamentous union is rendered as short as circumstances will permit, and the patient will recover the power of the limb.

Ligamentous union as short as possible.

The idea which was formerly entertained of the danger of squeezing the callus into a projection in the inner side of the bone, so as to destroy the smoothness of its internal surface, is not at all tenable

When called to this accident, the surgeon places the patient in bed upon a mattress, extends the limb upon a well padded splint placed behind the thigh and leg, to which it is tied, and which splint should be hollowed. The patient's body should be raised as much as he can bear to the sitting posture, to relax the rectus muscle. An evaporating lotion is to be then applied upon the knee consisting of liq. plumbi s. acetat. dilut. ℥ v. with spir. vini. ℥ i.; and no bandage should be at first employed. The body should be slightly raised in bed to relax the rectus muscle, and the heel should be raised to bring up the lower portion of the patella. If, on the succeeding day or two, there be much tension or ecchymosis, leeches should be applied, and the lotion be continued; when, after a few days, the tension has subsided, then, and not till then, should bandages be employed. I have seen the greatest suffering and swelling produced by the early application of bandages in these cases, even so as to threaten slough-

Treatment.

ing of the skin, when there had been much contusion. The means which are most frequently employed in the treatment of this case are as follow:—A roller is applied from the foot to the knee, to prevent the swelling of the leg: and the upper portion of the bone is pressed downwards, as far as it can be without violence, towards the lower, so as to lessen the retraction of the muscles, and produce the approximation of the portions of bone. Then rollers are applied above and below the joint, confining a piece of broad tape next the skin on each side, which crosses the rollers at right angles; these portions of tape are bent down and tied over the rollers so as to bring them near to each other, and thus keep down the upper portion of bone. Sometimes, instead of the tape on each side, a broad piece of linen is bent over the rollers on the fore part of the joint, and is there confined so as to approximate the pieces of bone, and to bind down the upper portion of the patella that its lower broken edge may not turn forwards.

But the mode I prefer is as follows:—A leathern strap should be buckled around the thigh, above the broken and elevated portion of bone; and from this circular piece of leather, another strap is passed under the middle of the foot, the leg being extended, and the foot raised as much as possible. This strap is brought upon each side of the tibia and patella, and buckled to that which is fixed around the lower part of the thigh. The strap may be confined to the foot by a tape tied to it, and to the leg at any part in the same manner; and this is the most convenient bandage for the fractured patella, and for the patella dislocated upwards by the laceration of its ligament; a roller is to be applied upon the leg.

In this position, and thus confined, the limb is to be kept for five weeks in the adult, and for six weeks at a more advanced age.

Then a slight passive motion is to be begun, and this must be done gently and with so much circumspection, that the ligament if not firmly united, shall not give way, nor the bones recede. If

the union be found sufficiently firm to bear it, the passive motion is to be employed from day to day, until the flexion of the limb be complete.

If passive motion be not used, it appears that the action of the extensor muscles would never return; for those who are kept in bed with the joint at rest, do not in many months acquire any power of bending or extending the limb: but when passive motion is to be used, the patient is placed on a high seat and directed to swing the leg, by which motion is given to the rectus; and if the mind be then directed to the contraction of that muscle, its powers will be gradually renewed. When the rectus muscle has been shortened, and the upper portion of bone is drawn from the lower, all the disposition to action in that muscle ceases; and it does not seem disposed to recover its voluntary action until it becomes again elongated, which is effected after the union of the ligament, by bending the knee: and from this point of elongation the muscle begins to contract.

State of the muscle.

A young woman was brought into my house in her father's arms; and he said, "I am obliged to carry her, for she has lost the use of her legs, having broken both her knee-pans eight months ago, and she has never been able to use her limbs since." Passive motion was directed, and she was ordered to try to extend her legs after they had been bent by the surgeon. At first she could effect but little; however, by repeated trials, she gradually recovered the use of her limbs. Mr. John Hunter, who raised surgery into a science, and who seems to have been the first who attended to the principles on which the practice of surgery ought to be regulated, always dwelt most ably upon this subject in his lectures. Patients, from the pain which passive motion produces, and the slow return of action in the muscles, are indisposed to suffer the one, or to make trial of the other; but, without them, there can be no recovery.

The degree of approximation of the bone is, as I have stated, a matter of great consequence. The bone is rarely brought into

Degree of approximation.

contact, so as to be united in the transverse fracture by ossific union; but the less the distance between the bones, the greater is the power which the muscle re-acquires; for, in proportion as the muscle is shortened, it is weakened: and in ascending, there is difficulty in raising the limb; in descending, in keeping it extended; and the uniting ligament is liable to be torn, and the other patella to be broken by falls; therefore, the surgeon should bring the bones as near together as he can, to render the ligamentous union as short as possible, and consequently to leave the muscle with as much of its original power as the nature of the accident will permit.

PERPENDICULAR FRACTURE OF THE PATELLA.

There is in the collection at St. Thomas's Hospital a patella, one fourth of which has been broken off; the edge is smooth, and no attempt at ossific union appears to have been made.

Ligamentous union.

A gentleman consulted me who had about one third of the patella separated from the other part of the bone; it had united by ligament, for there was free motion between the fractured piece of bone and that from which it had been removed. He recovered quickly from this injury, and it affected his power of walking very little.

During the winter of 1822, a body was dissected at St. Thomas's Hospital, in which both the patellæ had been broken longitudinally; and although they were in contact, they were both united by ligament.

These circumstances surprised me, because I saw no reason why the patella should not be united by bone when broken perpendicularly, as I thought the muscles would have a tendency to bring the parts together. I made it therefore a subject of experiment.

Experiment I.

July 31st, 1818, I broke the patella of a dog by placing a knife

upon it in the longitudinal direction, having first drawn the integuments aside; and on the 12th of September following, I examined the part, when I found the two portions of bone considerably separated from each other, and united by ligament. The cause was as follows:—when I had divided the bone, the knee became bent, the condyles of the os femoris pressed against the inner side of the patella, and thrust the parts asunder, and only a ligamentous union took place.

Union by ligament in experiments.

Experiment II.

August 2d, 1818, I broke in the same manner the patella of a rabbit and examined the parts on September 3d, when I found the two portions of bone widely separated, and united only by ligamentous matter. I now began to think it impossible for the patella to unite by bone, but determined to make another experiment to determine this point.

Experiment III.

I divided the patella longitudinally in a dog, but took care that the division should not extend into the tendon above or to the ligament below it, so that there should be no separation of the two portions. I examined it three weeks after, and found it united; no separation existing between the two portions*.

Union by bone.

Experiment IV.

October, 1819. I divided the patella by a crucial fracture into four portions; the two upper portions neither united with each other, nor with the bones below; but the two lower portions became united by bone.

It appears then, that under longitudinal and transverse fracture, a ligamentous union is generally produced, and that it arises

* The bone was, under maceration, found united in part by bone, and in part by cartilage, not completely ossified. It is preserved, and may be seen at any time by those who are curious to examine it.

from the separation produced in the bone; but if that cannot separate, and its parts remain in contact, ossific union may be produced.

Case.

In the summer of 1819, Mr. Marryat was thrown from his gig as he was passing along the Strand; by the fall he fractured his patella transversely and the lower portion of the bone was also broken perpendicularly, so that it was divided into three pieces. The transverse fracture united, as usual, by ligament; but the perpendicular by bone.

Mr. Parrott of Tooting, who also attended the case, writes in these words:

"Dear Sir,—I have great pleasure in replying to your letter. The longitudinal fracture of the patella of Mr. M. has become very firmly consolidated; but there is a line or ridge to be traced upon the surface of the bone, which marks distinctly the place where it had been separated."

Treatment.

In the longitudinal or perpendicular fracture of the patella, the best treatment consists in extending the leg, and in using local depletion and evaporating lotions: in a few days a roller should be applied around the limb, and then a laced knee-cap, with a strap to buckle around the knee above and below the patella, and a pad on each side to bring its parts as nearly as possible into contact.

COMPOUND FRACTURE OF THE PATELLA.

From violence or ulceration.

These fractures occur from injury, or from an ulcerative process under peculiar circumstances.

If the laceration be extensive, or the contusion very considerable in these cases, amputation will be required; but if the wound be small, and the patient be not irritable, and no sloughing of the integuments or ligament be likely to occur from the nature of the accident, it will be best to try to save the limb. The principal object is, to produce adhesion immediately; and every means in our power must be used for that purpose. I know well that

sutures are generally objectionable, and I never employ them if I can possibly succeed without them; but in moveable parts, in those which are unsupported, and in those through which a secretion is liable to force its way, they are not only justifiable, but highly necessary. Fomentation and poultices must not be employed in these cases, as they prevent the adhesive process.

A compound fracture of the patella will be sometimes produced by an ulcer, as in the following case.

Case. A woman was admitted into Guy's Hospital, in 1816, with a simple and transverse fracture of the patella, which had long been united by a ligament of about three inches in extent. Ulcers were Ulceration. formed upon different parts of the body: and, unfortunately, one of these upon the integuments over the ligamental union of the patella. It became sloughy, and extended through the new ligament to the joint, which it had laid open: violent constitutional irritation succeeded; a copious suppuration was produced; and no opportunity was given of amputating the limb, for the inflamed and swollen state of the thigh forbade it. This woman died.

OBLIQUE FRACTURES OF THE CONDYLES OF THE OS FEMORIS INTO THE JOINT.

These cases are of rare occurrence; but when they happen it is difficult to prevent deformity, and to restore to the patient a sound and useful limb. They are known by the great swelling of the joint which ensues, by the crepitus which is felt in moving the joint, and by the deformity consequent upon them. The fracture Of either condyle. is sometimes of the inner, and sometimes of the outer condyle, and the bone is split down into the joint.

Treatment. Whether the external or internal condyle be broken, the same treatment is required. The limb is to be placed upon a pillow in the straight position, and evaporating lotions and leeches are to be used to subdue the swelling and inflammation. When this object has been effected, a roller is to be applied around the knee, and a piece of stiff pasteboard, about sixteen inches long and sufficiently wide to extend entirely under the joint, and to pass on each side of it, so

as to reach to the edge of the patella, is to be dipped in warm water, applied under the knee, and confined by a roller. When this is dry, it will have exactly adapted itself to the form of the joint, and this form it will afterwards retain, so as best to confine the bones. Splints of wood or tin may be used on each side of the joint, but they are apt to cause uneasy pressure. In five weeks passive motion of the limb may be gently begun, to prevent anchylosis. I prefer the straight position in these cases, because the tibia presses the extremity of the broken condyle into a line with that which is not injured.

Examples of compound fractures of the condyles are very unfrequent. To aged persons these accidents sometimes prove fatal; and indeed I have known a simple fracture of the condyles terminate fatally.

OBLIQUE FRACTURES OF THE OS FEMORIS JUST ABOVE ITS CONDYLES.

Oblique fractures of the condyles.

This is a most formidable injury from its consequence on the future form and use of the limb; for it is liable to terminate most unfortunately, by producing deformity, and by preventing the flexion of the knee-joint.

It is only of late years that I have had an opportunity of investigating this case by dissection; and, consequently, of obtaining substantial knowledge of the exact nature of the injury. The appearances produced by it are, that the lower and broken extremity of the shaft of the bone projects, and forms a sharp point just above the patella, which pierces the rectus muscle, threatens to tear the skin, and sometimes does tear it: whilst the patella, tibia, and condyles of the os femoris sink into the ham, and are drawn upwards behind the broken extremity of the shaft of the os femoris.

The accident happens when the person falls from a considerable height upon his feet, or is thrown upon the condyles of the os femoris with the knee bent. In all the cases the fracture was very

oblique through the shaft of the bone; and hence the pointed appearance of the extremity of the fracture, and the difficulty of keeping the bones in apposition.

A body was brought into the dissecting-room at St. Thomas's Hospital, which fell to the lot of Mr. Patey, surgeon, of Dorset-street, Portman-square, to dissect; and he kindly permitted me to make a drawing of the limb. It appeared, upon view of the thigh, that the limb had been broken just above the knee-joint, and that the shaft of the bone projected as far as the skin, just above the patella; the union was firm, but the magnitude of the bone was exceedingly increased. When the integuments were removed, the end of the superior portion of the shaft of the bone was found to have pierced the rectus muscle, through which it still continued to project; and behind this projecting portion of bone the rectus muscle was situated, which passed to the patella. This portion of the rectus muscle attached to the patella, was stopped in its action by the projection of the fracture, so that its movement upwards was exceedingly limited. The condyles of the os femoris, and the lower portion of the bone, had been drawn by the action of the muscles behind the end of the fracture of the upper portion, and had united by a very firm callus to the body of the bone. Case.

This union had necessarily produced a great diminution in the power of extending the limb; for the rectus muscle was really hooked down by the fractured extremity of the bone; but even if the bone had not pierced the muscle, still the elevation of the patella would have been prevented, by that bone being drawn against the fractured end of the thigh-bone in the contraction of the muscle. It appears, then, that in the treatment of this case a most firm and continued extension must be supported to prevent the retraction which would otherwise ensue; the cases which I have seen justify me in saying that this defective union is with great difficulty prevented; as the ordinary extent of flexion in the joint is not to be expected.

FRACTURE OF THE HEAD OF THE TIBIA.

Oblique fractures of the tibia into the joint.

The head of the tibia is sometimes obliquely broken; and if it be fractured into the knee-joint, the treatment which it requires is similar to that which is necessary in the oblique fracture of the condyle of the os femoris; that is, first, to maintain the straight position of the limb, because the femur preserves the proper adaptation of the fractured tibia by serving as a splint to its upper portion, and keeping the articular surfaces in apposition. Secondly, a roller to press one part of the broken surface against the other. Thirdly, a splint of pasteboard to assist in the preservation of that pressure. And fourthly, early passive motion to prevent anchylosis.

Fractures just below the joint.

But if the fracture of the tibia be oblique, yet not into the joint, then it is best to place the limb upon the double inclined plane: for the cause of deformity being the elevation of the lower portion of the tibia, which is drawn up on the side of the knee-joint as the fracture is in the inner or outer side of the tibia, the weight of the leg keeps the limb constantly extended as it hangs over the angle of the inclined plane; and thus the bone is brought into as accurate apposition as the nature of the fracture permits.

DISLOCATION OF THE HEAD OF THE FIBULA.

The fibula joins the tibia three quarters of an inch below the articulation of the knee. Its head is inclosed in a capsular ligament, which unites it to the tibia, to which it is also joined through the greater part of its length by the interrosseous ligament.

Union with the tibia.

Produced by violence or relaxation.

This bone is liable to dislocation, both from violence and from relaxation. I have only seen one case of it from violence; and in that instance it was connected with the compound fracture of the tibia.

——— Briggs, of whose dislocation of the tibia I have given an account, had, at the upper part of the other leg, a compound fracture of the tibia, and dislocation of the head of the fibula. An

PLATE XIV.

Fig. 1. Shews the dislocation of the tibia inwards at the ancle-joint.

a, Malleolus internus of the tibia thrown on the inner side of the astragalus.

b, A portion of the tibia split off.

c, Fibula broken.

d, Broken portion of the tibia adhering by ligament to the fibula.

e, Malleolus externus of the fibula, with the broken portion of the tibia adhering to it.

f, Astragalus thrown outwards.

Fig. 2. Fracture of the patella, with ligamentous union and great separation of the bone.

The extent of separation depends upon the degree of laceration of the capsular ligament, and of the tendons of the vasti externi muscles which are spread over it.

a, Upper portion of the patella drawn up by the action of the rectus and vasti.

b, The lower portion of bone.

c to *a*, Original ligament.

c to *b*, New ligament, which from its length excessively diminished the power of the extensor muscles.

Fig. 3. Shews a fracture of the tibia and fibula at the ancle-joint, sent to me by my friend, Mr. Hammick, Surgeon of the Plymouth Naval Hospital.

a, Tibia fractured.

b, Fracture of the fibula.

c, Astragalus.

e, Shell of the bone surrounding a fragment of bone, and so completely enclosing it that it could not be removed, and amputation became necessary.

Fig. 1.

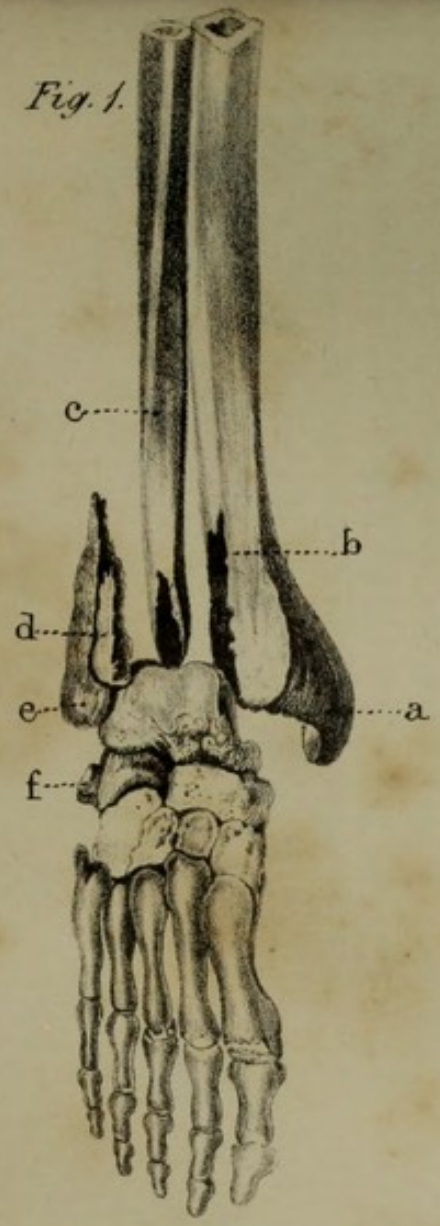
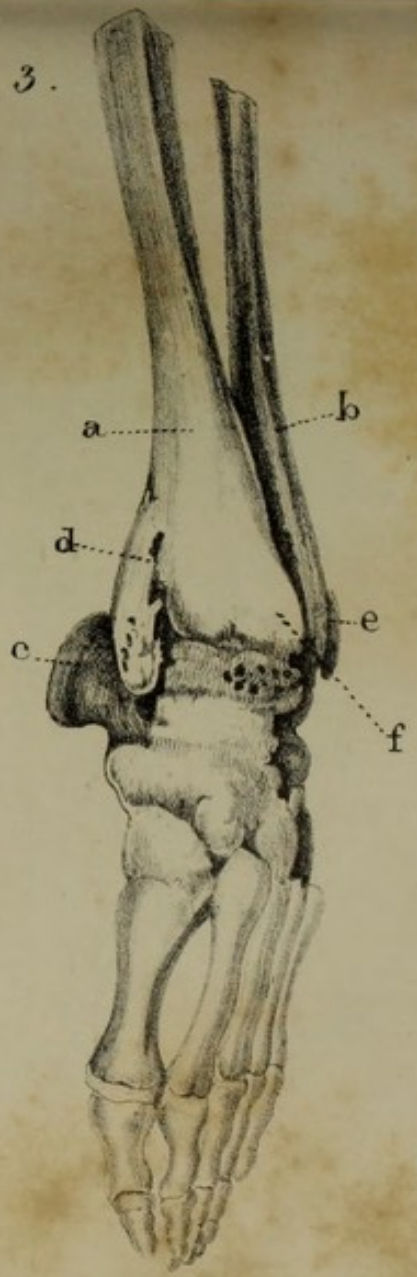


Fig. 2.

Fig. 3.



attempt was made to save the limb, but the constitutional irritation ran so high, that amputation was obliged to be performed; which was done by my colleague, Mr. Lucas, and the man was restored to health.

Dislocations of the head of the fibula from relaxation, are more frequent than those which occur from violence; the head of the bone, in these cases, is thrown backwards, and is easily brought into its natural connection with the tibia, but it directly again slips from its position. This state produces a considerable degree of weakness, and fatigue in walking; and the person suffers much from exercise. As in these cases there is a superabundant secretion of synovia, and a distension of ligament, repeated blistering is required to promote absorption; and afterwards a strap is to be buckled around the upper part of the leg, to bind the bone firmly in its natural situation: a cushion may be added behind the head of the bone to give it support, and at least to prevent the increase of the malady.

DISLOCATIONS OF THE ANCLE-JOINT.

Structure of the joint.

The bones which enter into the composition of the ancle-joint are the tibia, fibula, and astragalus. The tibia forms an articulating surface at its lower part, which rests upon the astragalus; there is a projection on the inner side of the lower portion of this bone, which forms the malleolus internus, and this part is articulated with the side of the astragalus. The fibula projects beyond the tibia at the outer ancle, and forms there the malleolus externus, which has also an articulating surface for the astragalus. The astragalus, which is the superior tarsal bone, rises between the malleoli and the lower part of the tibia, and moves upon it principally in flexion and extension of the foot.

Bone.

Thus nature has strongly protected this part of the body, by the deep socket formed by the two bones of the leg, and by the ball of the astragalus which is received between them.

Capsular ligament.

A capsular ligament, secreting synovia on its internal surface, joins the tibia and fibula to the astragalus. A strong ligament

unites the tibia to the fibula, but without any intervening articular cavity, as the ligament proceeds directly from one surface of bone and is received into the other.

Peculiar ligaments.

The peculiar ligaments joining the tibia and fibula to the tarsus, consist of a deltoid ligament, which proceeds from the tibia to the astragalus, os calcis, and os naviculare. The fibula is united at its lower end by three excessively strong ligaments; one anteriorly from the malleolus externus to the astragalus, one inferiorly to the os calcis, and a third to the astragalus posteriorly: and it is the strong union of this bone which leads to its being more frequently fractured than dislocated. And even when the tibia is luxated, the fibula is fractured in two of the species of dislocation of the ancle, and generally in all; but when the tibia is thrown outwards, I have known the fibula escape a fracture.

Directions of dislocations.

I have seen the tibia dislocated at the ancle in three different directions: inwards, forwards, and outwards; and a fourth species of dislocation is said sometimes to occur, viz., backwards: the foot has also been known to be thrown upwards between the tibia and fibula, by the giving way of the ligament which unites these bones; but this accident is only an aggravated state of the internal dislocation.

SIMPLE DISLOCATION OF THE TIBIA INWARDS.

Dislocation inwards.

This is the most frequent of the dislocations of the ancle. The tibia in this accident has its internal malleolus thrown inwards, and so forcibly projecting against the integuments as to threaten their bursting. The foot is thrown outwards, and its inner edge

Symptoms.

rests upon the ground. It rotates easily on its axis. There is considerable depression above the outer ancle, much pain, some crepitus, often at three inches from the lower joints of the fibula upwards, facility of lateral motion of the foot, and considerable tumefaction.

Dissection.

Upon dissection, the internal appearances are as follow. The end of the tibia rests upon the inner side of the astragalus, instead of resting on its upper articulatory surface; and if the accident

has been caused from jumping from a considerable height, the lower end of the tibia, where it is joined to the fibula by ligament, is split off, and remains connected with the fibula, which is also broken from two to three inches above the joint; and the broken end of the fibula is carried down upon the astragalus, occupying the natural situation of the tibia. The malleolus externus of the fibula remains in its natural situation, with two inches of the fibula and the split portion of the tibia; the capsular ligament attached to the fibula at the malleolus externus, and the three strong fibular tarsal ligaments, remain uninjured.

This accident generally happens in jumping from a considerable height, or in running violently with the toe turned outwards when the foot being suddenly checked in its motion while the body is carried forwards upon it, the ligaments on the inner side of the ancle give way. It may also be caused by a fall on that side when the foot is fixed.

To distinguish a fracture of the fibula, the hand must grasp the leg just above the ancle, and the foot must be freely rotated; when the motion of the foot being communicated to the fibula, pain will be felt, and a crepitus perceived.

Mode of reduction.

For the reduction of this dislocation, which cannot be too soon accomplished, the patient is to be placed upon a mattress properly prepared, and is to rest on the side on which the injury has been sustained; the surgeon is then to bend the leg at right angles with the thigh, so as to relax the gastrocnemii muscles as much as possible; and an assistant grasping the foot, must gradually draw it in a line with the leg. The surgeon then fixes the thigh and presses the tibia downwards, thus forcing it upon the articulating surface of the astragalus. Great force is required if the limb be placed in the extended position, from the resistance of the gastrocnemii; and it is pleasing to observe, that after the most violent attempts have been employed by others, a well-informed surgeon will gently bend the limb, and under comparatively slight extension, return the parts to their natural situation.

Treatment.

When the limb has been reduced it is still to remain upon its

outer side in the bent position, with the foot well supported; a many-tailed bandage is to be placed over the part to prevent it from slipping, and this is to be kept wet with an evaporating lotion. Two splints are then to be applied; and each is to have a foot-piece, to give support to the foot, prevent its eversion, and preserve it at right angles with the leg. If much inflammation succeeds, leeches are to be applied to the parts, and the constitution will require relief by taking blood from the arm, and by attention to the bowels; but I shall say no more on this subject until I describe compound dislocation of this joint. A person who has sustained this accident may be removed from his bed in five or six weeks, long straps of plaster being passed around the joint to keep the parts together, and he may be suffered to walk on crutches; but from ten to twelve weeks will elapse before he has the perfect motion of the foot; and much friction and passive motion will be required after the eighth week to restore the natural motion of the joint.

SIMPLE DISLOCATION OF THE TIBIA FORWARDS.

Symptoms. In this accident, the foot appears much shortened and fixed, the heel is proportionally lengthened and firmly fixed, and the toes are pointed downwards. The lower extremity of the tibia forms a hard projection upon the upper part of the middle of the tarsus, under the projected tendons, and a depression is situated before

Dissection. the tendon Achillis. On dissection, the tibia is found to rest upon the upper surface of the os naviculare and os cuneiforme internum; quitting all the articulatory surface of the astragalus, excepting a small portion on its fore part, against which the tibia is applied. The fibula is broken, and its fractured end advances with the tibia, and is placed by its side: its malleolus externus remains in its natural situation, but the fibula is broken about three inches above it. The capsular ligament is torn through on its fore part. The deltoid ligament is only partially lacerated, and the three liga-

Cause. ments of the fibula remain unbroken. This accident arises from a fall of the body backwards whilst the foot is confined, or from that

of a person jumping from a carriage in rapid motion with the toe pointed forwards.

The treatment consists in attending to the following rules. The patient should be placed in bed on his back; one assistant grasps the thigh at its lower part and draws it towards the body, another pulls the foot in a line a little before the axis of the leg, and the surgeon pushes the tibia back to bring it into its place. The same principles are held in view in the mode of reduction as in the former, with respect to the relaxation of the muscles. A many-tailed bandage, dipped in an evaporating lotion, must be lightly applied. The local and constitutional treatment is the same as in the dislocation inwards. Reduction. Treatment.

As to position, it is best to keep the patient with the heel resting on a pillow, and to have a splint, properly guarded, on each side of the leg, having foot-pieces to keep the foot well supported at right angles with the leg, so as to prevent the muscles again drawing it from its place. As in five weeks the fibula will be united, there will be then no danger in taking the patient from his bed, and gentle passive motion may be begun.

The application of a long splint on each side, with a foot-piece to each splint, and this padded in such a manner as to give the foot a direction inwards, outwards, or at right angles, according to the direction of the dislocation, answers better than any other mode of securing it. When this is applied, the foot cannot escape from the situation in which the surgeon has placed it.

Baron Dupuytren, of the Hotel Dieu, a very eminent surgeon, has recommended a single splint, well cushioned, along the outer or inner part of the leg, according to the direction of the dislocation, and fastened to the leg and foot by bandages.—*See a plate in Johnson's Medico-Chirurgical Review.*

PARTIAL DISLOCATION OF THE TIBIA FORWARDS.

This bone is sometimes partially luxated forwards, so as to rest half on the os naviculare and half on the astragalus. The fibula in this accident is broken; the foot appears but little shortened, Symptoms.

nor is there any considerable projection of the heel. The following are the signs of this accident. The foot is pointed downwards and a difficulty is experienced in the attempt to put it flat on the ground; the heel is drawn up, and the foot is in a great degree immoveable.

Case. The first case of this kind which I saw was in a very stout lady who resided at Stoke Newington, who had by a fall, as she said, sprained her ancle. When I examined the limb I found the foot immoveably fixed, pointed downwards, and attended with great pain just above the ancle. I attempted to draw the foot forwards and bend it, but could not succeed. Some years afterwards I saw this lady at Bishop Stortford, walking upon crutches: her toe was pointed, and she was unable to bring any other part of the foot to the ground; the degree of distortion was less than that which occurs in the complete luxation of the bone forwards: but all tension having now been subdued, the nature of the injury was more evident, though I should not have known it decidedly, without an examination of a foot shewn to me by one of my late apprentices, who was so kind as to give me the parts which were taken from a subject dissected at Guy's Hospital. The articular surface of the lower part of the tibia was divided into two, the anterior part was seated upon the os naviculare, the posterior upon the astragalus; these two articulatory surfaces, formed at the lower extremity of the bone, had been rendered smooth by friction. The fibula was found fractured.

The result of this dislocation clearly proves the necessity which exists in these accidents, however slight they may at first sight appear, of not resting satisfied until the foot be returned into its natural position, and restored to its motion; for, if neglected in the commencement, severe inflammation and tension will prevent even a forcible extension from being afterwards useful; and if still longer neglected, the changes in the state of the muscles, and the union of the fractured fibula, will preclude the possibility of a reduction, even under the most violent attempts. The mode of reduction and after treatment will in no respect differ from that

required in the perfect dislocation of the bone forwards, either in regard to the relaxation of the muscles, the bandages, or the local and constitutional treatment.

SIMPLE DISLOCATION OF THE TIBIA OUTWARDS.

This luxation is the most dangerous of the three; for it is produced by greater violence, is attended with more contusion of the integuments, more laceration of ligament, and greater injury to the bone, than either of the others. The foot is thrown inwards, and its outer edge rests upon the ground. The malleolus externus projects the integuments of the ancle very much outwards, and forms so decided a prominence, that the nature of the injury cannot be mistaken. The foot and toes are pointed downwards. Symptoms.

In the dissection of this accident, it is found that the malleolus internus of the tibia is obliquely fractured and separated from the shaft of the bone. The fractured portion sometimes consists only of the malleolus; at others, the fracture passes obliquely through the articular surface of the tibia, which is thrown forwards and outwards upon the astragalus, before the malleolus externus. The astragalus is sometimes fractured, and the lower extremity of the fibula is broken into several splinters. The deltoid ligament remains unbroken, but the capsular ligament is torn on its outer part. The three fibular-tarsal ligaments remain whole in most cases, but when the fibula is not broken they are ruptured. None of the tendons are lacerated, and internal hæmorrhages scarcely ever occur to any extent, as the large arteries generally escape injury. This accident happens either by the passage of a carriage-wheel over the leg, or by a distortion of the foot in jumping or falling. Dissection.

The mode of reduction consists in placing the patient upon his back, in bending the thigh at right angles with the body, and the leg at right angles with the thigh; the thigh is then grasped under the ham by one assistant, and the foot by another: and thus an extension is made in the axis of the leg, while the sur- Reduction.

geon presses the tibia inwards towards the astragalus. The limb, in the simple dislocation, is to be laid upon its outer side, resting upon splints, with foot-pieces; and a pad is to be placed upon the fibula, just above the outer ancle, and extending a few inches upwards, so as in some measure to raise that portion of the leg and support it; and to prevent the slipping of the tibia and fibula from the astragalus, as well as to lessen the pressure of the malleolus externus upon the integuments where they have sustained injury.

Treatment.

The local and general treatment will be the same as in the former cases, although more depletion is required, as greater inflammation succeeds; the greatest care is necessary to prevent the foot from being twisted inwards, or pointed downwards, as either position prevents the limb from being afterwards useful; and this precaution is effected by having two splints, with a foot-piece to each, padded and applied to the ancle on the outer side of the leg. Passive motion should be given to the joint in six weeks after the accident, when the patient may rise from his bed, and be allowed to walk upon crutches, unless impeded by great swelling of the ancle. In the generality of these cases, from ten to twelve weeks will elapse before the cure is complete.

COMPOUND DISLOCATION OF THE ANCLE-JOINT.

These accidents take place in the same direction as the simple dislocations, and the bones and ligaments suffer in the same manner as in those dislocations. The difference, therefore, in these

Opening into the joint.

cases is, that the joint is laid open by a wound in the integuments and ligaments, opposite to the laceration of the skin, by which the synovia escapes, and through which the ends of the bone protrude; this opening in the integuments is generally occasioned by the bone, but sometimes by the pressure of some uneven surface on which the limb may have been thrown.

The bones being replaced by the means which are employed

Local effects.

in the simple dislocation, the effects of this accident upon the parts composing the joint, are as follow: The synovia, as I have stated,

escapes by a large wound through the lacerated ligament; in a few hours inflammation begins; and when an additional quantity of blood is first determined to the part, an abundant secretion issues from this membrane, and is discharged through the wound; the ligaments participate in the inflammation, as well as the extremities of the bones which enter into the composition of the joint. The inflammation of the internal secreting surface of the ligament, in about five days, proceeds to suppuration; at first but little matter is discharged, but it continues increasing until it becomes very abundant; and the lacerated parts of the ligaments and periosteum also secrete matter. Under this process of suppuration, the cartilages become partially or wholly absorbed, but in general only partially; for the ulceration of the cartilage is a very slow process, attended with severe constitutional irritation, and often lays the foundation for exfoliation of the extremities of the bones. When the cartilages are absorbed, granulations arise from the surface of the bones and from the inner side of the ligament; and these inosculate and fill the cavity between the extremities of the bones. Sometimes we find, after accidents to joints, that the adhesive process occurs at one part, and that the cartilage is not absorbed; whilst granulations are formed at others, where the cartilage was removed by ulcerations; and I have seen, after inflammation in joints, the cartilages remain, and their surfaces adhere.

Inflammation and suppuration of the internal ligaments.

Neither this inosculation of granulations, nor the process of adhesion, leads to permanent anchylosis; for if passive motion be begun as soon as the parts, from cessation of pain and inflammation, will permit, motion will be restored, not always entirely, but with very little diminution; and the other joints of the tarsus will acquire such an extent of motion, as to render the deficiency in the mobility of the ancle-joint but little apparent. The aperture in the ligament is filled by granulations; and with respect to the extremities of the bones, when they are joined by ossific union, this junction is effected by the deposit of cartilage, and by a secretion of phosphate of lime, in the usual manner in which bones are formed and repaired.

When passive motion may be applied.

Constitutional derangement.

Thus, then, the compound dislocation of the ancle, leads to inflammation over a very extensive secreting surface; it produces an extended suppuration over the lining of the joint, which occasions much constitutional derangement; and, further, it becomes the source of an ulcerative process, more or less extensive according to the treatment pursued; by this the cartilage is partly or wholly removed, and an irritative fever is supported for a great length of time; and the ulceration sometimes extends over the extremities of the dislocated bones, and leads to a greatly augmented constitutional irritation, and to protracted disease from exfoliation.

Local and constitutional effects.

These local effects are accompanied by the common symptoms of constitutional excitement. In two or three days from the accident, or sometimes as early as twenty-four hours, the patient complains of pain in his back and in his head, shewing the influence of the accident on the brain and spinal marrow. The tongue is furred: white, if the irritation be slight; yellow, if greater; and brown, almost to blackness, if it be considerable. The stomach is disordered: there is loss of appetite, nausea, and sometimes vomiting. Secretion ceases in the intestines, and in the glands connected with them, as the liver, &c.; costiveness is therefore an attendant symptom. The skin has its secretion stopped; it becomes hot and dry; the kidneys also have their secretion diminished; the urine is high-coloured, and small in quantity. The heart beats more quickly, and the pulse becomes *hard*, which is the pulse of constitutional irritation from local inflammation, and in great degrees of this excitement it becomes irregular and intermittent; the respiration is quicker, in sympathy with the quicker circulation; the nervous system becomes additionally affected, in high degrees of local irritation: restlessness, watchfulness, delirium, subsultus tendinum, and sometimes tetanus occur. These are the usual effects of local irritation upon the constitution, occurring in different degrees, according to the violence of the injury, the irritability of the system, and the powers of restoration.

The causes of the violence of these symptoms are, the wound which is made into the joint, and the great efforts required for its repair; for when there is no wound, and the process of adhesion can unite the part, little local inflammation or constitutional irritation occur; and if this be the cause of the violence of the symptoms the principle in the treatment of this accident is easily comprehended; it consists in closing the wound as completely as possible, to assist nature in the adhesive process by which the wound is to be closed, and to render suppuration and granulation less necessary for the union of the opened joint.

Cause of the symptoms.

Principle of cure.

The first question which arises upon this subject is the following: *Is amputation generally necessary in compound dislocations of the ancle?* My answer is, certainly not. Thirty years ago it was the practice to amputate limbs for this accident; and the operation was then thought absolutely necessary for the preservation of life by some of our best surgeons; but so many limbs have been saved of late years, indeed, I may say, so great a majority of these cases exist, that such advice would now be considered not only injudicious, but cruel. It is far from being my intention to state that amputation is never required; I have only to observe, that in a great number of these accidents the operation is unnecessary.

Is amputation required?

But before I give the proofs of what I have advanced, I shall state the mode of treatment which is to be pursued in these cases.

When the surgeon examines the limb, he finds a wound of greater or less extent, according to the degree of the injury. The extremity of the tibia projects if the dislocation of the tibia be inwards; and the tibia and fibula are protruded, if the dislocation of the former be at the outer ancle. The ends of the bones are often covered with dirt from their having reached the ground. The foot is loosely hanging on the inner or outer side of the leg according to the direction of the dislocation. Sometimes, though very rarely, a large artery will be divided; and it is surprising that the posterior tibial artery so generally escapes laceration; the anterior tibial being the only vessel I have known to be torn. The arrest of hæmorrhage is the first object; and for this purpose, if

Treatment.

Artery divided.

the anterior tibial artery be wounded, it must be secured by ligature. The extremity of the bone is to be washed with warm water, as the least extraneous matter admitted into the joint will produce and support a suppurative process; and the utmost care should be taken to remove every portion of it adhering to the end of the bone.

Loose pieces of bone.

If the bone be shattered, the finger is to be passed into the joint, and the detached pieces are to be removed: but this is to be done in the most gentle manner possible, so as not to occasion unnecessary irritation. If the wound be so small as to admit the finger with difficulty, and if small pieces of bone can be felt, the integuments should be divided with a scalpel, to allow of such portions being removed without violence; the incision should be so made as to leave the joint with as much covering of integument as possible. The integuments are sometimes nipped into the joint by the projecting bone; and then it cannot be reduced without making an incision, to allow the skin to be drawn from under the bone; and when the edges of the incised wound are afterwards brought together, no additional evil arises from the extension of the wound.

Integuments.

Reduction.

The mode of reducing the bone is in other respects, similar to that which I have already described when speaking of simple dislocation; by bending the leg upon the thigh, so as to relax the muscles before the extension is made. When the bone has been reduced, a piece of lint is to be dipped in the patient's blood, and applied wet over the wound, upon which the blood coagulates, and forms the most natural, and, as far as I have seen, the best covering for the wound. A many-tailed bandage is then applied, the portions of which should not be sewn together, but passed under the leg, so that any one piece may be removed when it becomes stiff; and by fixing another to its end, the application may always be renewed without any disturbance to the limb; this bandage is to be kept constantly wet with spirits of wine and water. A hollow splint, with foot-piece at right angles, is to be appplied on the outer side of the leg, in the dislocation inwards, and the leg is to

rest upon its outer side: but in the dislocation outwards, it is best to keep the limb upon the heel, with a splint and foot-piece both upon the outer and the inner side; and an aperture in the splint opposite the wound.

In each dislocation the patient's knee is to be slightly bent, to relax the gastrocnemius muscle. The foot must be carefully prevented from being pointed; great care being taken to preserve it at right angles with the leg, otherwise the limb will be useless when the wound is healed. The patient is to be placed on a mattress, and a pillow is to reach from half way above the knee to beyond the foot, and another is to be rolled under the hip, to support the upper part of the thigh-bone. Constitutional treatment.

Blood-letting must be adopted, or not, according to the powers of the constitution; as it is necessary to bear in mind, that the patient has a great trial of his powers to undergo, and will require throughout the process of restoration, all the support which his strength can receive. Purgatives must also be used with the utmost caution; for there cannot be a worse practice, when a limb has been placed in a good position, and adhesion is proceeding, than to disturb the processes of nature by the frequent changes of position which purges produce; and I am quite sure, that in cases of compound fracture, I have seen patients destroyed by their frequent administration. That which is to be done by bleeding, and emptying the bowels, should be effected as soon as is possible after the accident, before the adhesive inflammation arises; after which the liquor ammoniæ acetatis, and tinctura opii, form the patient's best medicine, with a slight aperient at intervals. Blood-letting. Purging.

If the patient complain of considerable pain in the part, in four or five days, the bandage may be raised to examine the wound; and if there be much inflammation, a corner of the lint should be lifted from the wound, to give vent to any matter which may be formed; but this ought to be done with great circumspection, as there is danger of disturbing the adhesive process, if that be proceeding without suppuration. By this local treatment, it will every now and then happen that the wound will be closed by adhesion; Secondary treatment.

but if in a few days it be not, and if suppuration take place, the matter should have an opportunity of escaping; and the lint being removed, simple dressing should be applied. After a week or ten days, if there be suppuration with much surrounding inflammation, poultices should be applied upon the wound, leeches in its neighbourhood, and upon the limb at a distance, and the evaporating lotion should be still employed; but as soon as the inflammation is lessened, the poultices should be discontinued, as they encourage too much secretion, and relax the blood-vessels of the part, so as to prevent the restorative process.

Result. If the cure proceeds favourably, in a few weeks the wound is healed with little suppuration; if less favourably, a copious suppuration takes place, the wound is longer in healing, and exfoliation of portions of the extremity of the bone still further retards the cure. The motion of the joint is not always lost; it is sometimes in a great degree restored: but this depends upon the greater or less extent of suppuration or ulceration. Under the most favourable circumstances, three months generally elapse before the patient can walk with crutches; in many cases, however, a greater length of time is required: he bears upon the foot at different periods of time, according to the degree of injury sustained, as in compound fracture, when adhesion is not at first produced. In compound dislocations, of course, the patient is longer in recovering.

I shall now proceed to state the cases which have induced me to say that amputation, as a general rule, is improper.

The circumstance which led me to doubt the soundness of the opinion which recommended indiscriminate amputation, were these:

Case. I was, many years since, going into the country with a friend of mine, and we met with a surgeon in our journey who put this question: "How do you act in compound dislocations of the ancle-joint?" I do not recollect the reply, but he proceeded to say, "I have had a case of compound dislocation of the ancle-joint under my care, in which I told the patient he must lose his limb:

not approving this advice, his friends sent for another surgeon, who said he thought he could save it: the patient placed himself under his care, and the man is recovering."

About thirty years ago, I received from Mr. Lynn, of Woodbridge, now Dr. Lynn, of Bury St. Edmunds, the astragalus of a man broken into two pieces which he had taken from a dislocated ancle-joint. His letter is as follows:—

Case. Dear Sir,—J. York, aged thirty-two years, being pursued by some bailiffs, jumped from the height of several feet to avoid them. The tibia and a part of the astragalus protruded at the inner ancle. I immediately returned the parts into their natural situation. Suppuration ensued; and in five weeks a portion of the astragalus separated, and another piece a week afterwards, which, when joined, formed the ball of that bone. In three months the joint was filled with granulations; it soon afterwards healed, and the man recovered with a good use of the limb.

I attended a compound dislocation of the ancle-joint, in the year 1797, with Mr. Battley, which I relate in his own words.

Case. "In the month of September, 1797, a gentleman lodging in Duke-street, Smithfield, in a fit of insanity threw himself from a two-pair of stairs window into the street, his feet first reaching the ground. He rose without help, knocked violently at the outer door of the house, and ascended the stairs without the least assistance, bolted the door after him and got into bed. He refused to open the door, and it was obliged to be forced. A neighbouring surgeon was sent for, who, on viewing the case, proposed an immediate amputation, which was not acceded to by his friends; but Mr. Cooper and myself were requested to take charge of the case. On examination there was found a compound dislocation of the ancle-joint. The tibia was thrown on the inner side of the foot; and when the finger was passed into the wound, the astragalus was discovered to be shattered into a number of pieces. The loose and unconnected portions of bone were removed, and the tibia was replaced; after which, lint, dipped in the oozing blood, was wrapped

around the lacerated parts, and the limb was placed on its outer side, with the knee considerably bent. The parts were ordered to be kept cool by the frequent application of evaporating lotion.

The patient remained as quiet as could be expected from a person in his state of mind until the third or fourth day, when a considerable inflammation appeared in the joint, and greatly increased the previous irritable state of his constitution. Leeches, fomentations and poultices were applied to the limb; blood was taken from the arm, purgative medicines were given, and afterwards saline medicines with sudorifics. Extensive suppuration ensued, and continued for six weeks or two months, when it began to lessen, and healthy granulations appeared on the whole wounded surfaces; about this time the state of his mind began to improve, and it continued to amend as his leg advanced in recovery. At the end of four or five months the suppurated parts had filled up, the joint healed, and his mind recovered its natural tone. At the end of nine months he returned to his employment, but the ancle-joint was stiff. In two years he had so far recovered as to walk without the aid of a stick; and at the end of three or four years was able to pursue his avocations nearly as well as at any former period of his life.

Mental symptoms improve.

REMOVING THE ENDS OF THE BONES.

Sawing off the ends of the bones.

There is another mode of treatment in these accidents, which consists in sawing off the extremity of the tibia before the bone is returned into its natural situation; and the reasons which may be assigned for pursuing this practice are as follow.

Reasons.

Difficult reduction.

First. There is in some cases much difficulty in the reduction of the tibia, and great violence must be employed to effect it.

Oblique fracture.

Secondly. The extremity of the bone is often broken obliquely, so that when reduced it will not remain upon the astragalus, but when the point is removed by the saw, it rests without difficulty upon that bone.

Thirdly. The spasmodic contractions of the muscles are much diminished by shortening the bone, as it throws them all into a state of relaxation; whereas, if the bone be reduced by violence when the saw has not been used, the spasm of the limb will be sometimes very violent.

Local irritation diminished.

Fourthly. The local irritation is much diminished by the greater ease with which adhesion is produced of the sawn extremity of the bone to the parts to which it is applied; for it is a mistake to suppose that the sawn end of the bone will not adhere; the contrary is seen in amputation, in sawing off the bone in exostosis, and in the union by adhesion of compound fractures; and that adhesive matter can be thrown out upon cartilaginous surfaces is known to every person who has dissected a diseased joint; it is thus that the end of the tibia adheres to the surface of the astragalus.

Suppuration and ulceration lessened.

Fifthly. When suppuration does occur it is much diminished, and a considerable part of the ulcerative process is prevented by the mechanical removal of the cartilage; for nearly half the articular surface of the joint no longer remains. Cæteris paribus, therefore the case recovers more rapidly.

Less constitutional irritation.

Sixthly. The constitutional irritation is very much lessened by the diminution of the suppurative and ulcerative process, and by the ease with which the parts are restored. In the cases which I have had an opportunity of seeing, there was not more irritative fever than in the mildest cases of compound fracture.

Bone shattered.

Seventhly. It has been found that in cases in which the extremities of the bones forming the joint have been broken into small pieces, and in which these have been removed by the finger, the patient has suffered less, and has more quickly recovered, than when the bone has been returned whole.

No case of death.

Eighthly. I have known no case of death when the extremities of the bones have been sawn off, although I have occasion to mention some in which the cases terminated fatally when this was not done.

Objections.

Limb shorter.

The objections which may be made to this mode of treatment are, that the limb becomes somewhat shorter by the removal of the cartilaginous extremity of the bone; but this I do not think an objection of any considerable weight, if the danger of the case be, as I believe, lessened by it: for the diminished length, which is very slight, is easily supplied by a shoe made a little thicker than usual.

Anchylosis.

The other objection is, that the joint becomes necessarily anchylosed. I doubt very much the reality of this objection, as in two instances I have seen the motion of the part remain; but even when the joint becomes anchylosed, a consequence to which it is liable in either mode of treatment, the motion of the tarsal bones becomes so much increased as to compensate for that of the ancle, the patient walks with much less halting than would be anticipated, and has a very useful limb.

Each mode useful.

My intention, however, is not to advocate either mode of treatment to the exclusion of the other, but to state the reasons which may be justly assigned for the occasional adoption of either. It is only by a comparison of the different results of varied practice that a safe conclusion can be drawn; and from what I have had an opportunity of observing in my own practice, and of learning from that of my friends, I feel disposed to recommend to those whose minds are not settled upon the subject, not hastily to determine against either treatment in the different cases of this injury, as from each mode, under varied circumstances, a strong and useful limb has been saved without any additional risk to the life of the patient.

Cases in which the one or the other should be employed.

If the dislocation can be easily reduced without sawing off the end of the bone; if the bone be not so obliquely broken, but remain firmly placed upon the astragalus when reduced; if the end of the bone be not shattered, for then the small loose pieces of bone should be removed, and the surface of the bone be smoothed by the saw; if the patient be not excessively irritable, so as to occasion the muscles to be thrown into violent spasmodic action in the attempt at reduction, which leads to subsequent displacement when

the limb has been reduced; the bones should be at once returned into their places, and the parts should be united by the adhesive inflammation; but rather than amputate the limb, if the above circumstances were present, I should certainly saw off the ends of the bones.

I shall now proceed to state the cases which I have myself had an opportunity of witnessing, and some which have been furnished by my friends, and shall leave the reader to judge of the propriety of the advice I have given.

COMPOUND DISLOCATION OF THE TIBIA INWARDS.

Case. Mr. Charles Averill, dresser to Mr. Forster, Surgeon of Guy's Hospital, had the kindness to send me the following particulars of a case, the progress of which I often witnessed with pleasure.

John Williams, sailor, aged thirty-eight, a very robust man, was brought into Guy's Hospital, under the care of Mr. Forster, August 9th, 1819, at four o'clock in the morning, with a compound dislocation of the right ancle inwards, and considerable injury to the left, occasioned by his falling from a height of about twenty-six feet, in endeavouring to escape from the Borough Compter in which he was imprisoned. On examining the injured part, I found the tibia protruding three inches through a large transverse wound of four inches in extent, and resting on the inner side of the os calcis; the cartilaginous surface of the astragalus could be readily felt on passing my finger into the wound; the fibula was broken. I first sawed off the whole of the cartilaginous end of the tibia, when the bone was easily replaced; the edges of the wound were then brought as much in contact as possible; lint dipped in blood was applied, and over it straps of adhesive plaster; the foot and leg were wrapped in cloths wet with a lotion of acetate of lead, and the limb was laid on its side. He complained of great pain in the left leg, which was very much swollen all around the ancle; ten leeches were applied to it, and afterwards the liquor plumbi

subacetatis dilutus, which relieved the pain; thirty drops of laudanum were given, and he remained easy. On the following day sixteen ounces of blood were taken from him, and five grains of calomel were given. On the 12th, the dressings were removed; the wound looked well. On the 17th, a suppuration had commenced; and the discharge having rather a fœtid smell, the nitric acid lotion was applied*. September 2nd, the matter gravitating to the outer side of the leg, an opening was made, by which it was discharged, and adhesive plaster applied to the original wound, which was healing fast; the discharge gradually diminished; and on the 21st of September, six weeks from the accident, both wounds were quite healed. He has not yet left his bed. There is motion at the ancle: the toe turns out but very little, and does not point downwards. He wears splints, and the strength of the limb is daily increasing. When the swelling of the left ancle diminished, a fracture of the external malleolus was also there discovered.

Use of nitric acid in sloughing wounds.

This man escaped from the hospital on the 24th of October, was retaken two months afterwards, and conveyed to the Borough Compter. He has free motion of the right ancle, and suffers more from the injury to the left.

DISLOCATION OF THE ANCLE FORWARDS.

Case.

My dear Sir:—I have much pleasure in sending you an account of the case I mentioned to you last night, together with a sketch by which I have endeavoured to shew the position of the limb at the time when I saw the patient.

James Price, aged thirty-nine, a very robust man, was coming to town on Monday, the 1st of March, in a light cart drawn by one horse. In passing through Clapham the horse ran away, and

* The nitric acid lotion, during the sloughing process, is the best application with which I am acquainted. I order it in the proportion of fifty drops of the acid to a quart of distilled water, apply it by linen covered with oiled silk.

falling, overturned the cart, and threw Price's legs under one of the shafts; in endeavouring to extricate himself he received a severe injury to the right ancle. By the direction of Mr. Parratt, he was immediately conveyed to St. Thomas's Hospital, where I saw him; and on examination found that the tibia had been dislocated forwards and a little inwards, its inferior extremity resting on the fore part of the astragalus and os naviculare: the deltoid ligament must have been torn through, as the inner malleolus was not fractured. The heel projected very considerably, and the foot was turned outwards in a slight degree and downwards, the toes being pointed. The fibula was fractured about two inches above the external malleolus, at which part there was a considerable depression. The reduction was very easily accomplished by flexing the leg on the thigh, which was firmly held by my dresser, Mr. Campbell, as I drew the foot downwards and forwards, and pressed the tibia backwards. The limb was placed in the flexed position, on the heel; since which time the patient has been perfectly tranquil, and the limb remains in its proper position.

Experiment.

I was anxious to ascertain what steps nature pursued in order to restore a part in which the extremity of a bone, forming a joint, had been sawn off; and I therefore instituted the following experiment.

I made an incision upon the lower extremity of the tibia, at the inner ancle of a dog, and cutting the inner portion of the ligament of the ancle joint, I produced a compound dislocation of the bone inwards. I then sawed off the whole cartilaginous extremity of the tibia, returned the bone upon the astragalus, closed the integuments by suture, and bandaged the limb to preserve the bone in this situation. Considerable inflammation and suppuration followed; and in a week the bandage was removed. When the wound had been for several weeks perfectly healed, I dissected the

limb. The ligament of the joint was still defective at the part at which it had been cut. From the sawn surface of the tibia there grew a ligamento-cartilaginous substance, which proceeded to the surface of the cartilage of the astragalus, to which it adhered. The cartilage of the astragalus, appeared to be absorbed only in one small part; there was no cavity between the end of the tibia and the cartilaginous surface of the astragalus. A free motion existed between the tibia and astragalus, which was permitted by the length and flexibility of the ligamentous substance above described, so as to give the advantage of a joint where no synovial articulation or cavity was to be found. This experiment not only shews the manner in which the parts are restored, but also the advantage of passive motion: for if the part be frequently moved, the intervening substance becomes entirely ligamentous; but if it be left perfectly at rest for a length of time, ossific action proceeds from the extremity of the tibia into the ligamentous substance, and thus produces an ossific anchylosis.

CASES WHICH RENDER AMPUTATION NECESSARY.

Cases requiring amputation.

But still cases occur in which amputation is found absolutely necessary, either to preserve the life of the patient, or to prevent his being doomed to the constant necessity of using crutches on account of the deformity and stiffness of the limb.

Does not always succeed.

It seems to me, however, to be by much too prevailing an opinion, that the amputation of the limb is a sure means of preserving life; for when this operation used to be more frequently performed in our hospitals than it now is, for compound dislocation of the ancle and compound fracture of the leg, a considerable number of our patients died. Very lately a man at Tring had his foot torn off by a threshing machine, and the limb was obliged to be amputated at the usual place below the knee. The operation was performed by Mr. Firth, but the man died in the evening of the sixth day: and a case has occurred since I commenced the publication of this work, of equally fatal termination.

The circumstances which I have known to create this necessity are,—

I. *The advanced Age of the Patient.*

Age. At an advanced age the powers of the body become so much weakened, that the patient is unable to bear the constitutional excitement which the suppurative inflammation of the joint produces; and as amputation does not expose him to this process, it is better to have recourse to that operation. However, I ought to observe, that when in my lectures I stated what I have now advanced, the pupils flocked around me after lecture, and have told me of cases of recovery, even of very old persons; but in the practice of hospitals in this great metropolis, very aged persons sink under these accidents, if the limb be not amputated.

2. *A very extensive lacerated Wound will give rise to a necessity for this Operation.*

3. *A difficulty in Reducing the Bones has been considered as a reason for Amputation.*

Difficult reduction. This circumstance, however, is rather a motive for removing the extremities of the bones by the saw, than for performing amputation; after which removal, the reduction of the tibia is easily effected, and a useful limb is preserved to the patient.

4. *The Bones are sometimes extremely shattered.*

Bones shattered. If the lower extremity of the tibia be broken into small pieces, the loose portions of bone ought to be removed, and the end of the tibia to be smoothed by a saw; but if, in addition to this comminution, the lower extremity of the tibia be obliquely broken, and a large loose portion of bone be felt with the fingers, then it will be proper to amputate: also, if the astragalus be broken, the portions of this bone should be removed, otherwise they will separate by ulceration, or occasion considerable local irritation. But if the end of the tibia and the tarsal bones, as

the astragalus and os calcis, are broken, then amputation will be required.

5. *The Dislocation of the Tibia at the Outer Ancle,*

Dislocation outwards.

Produces much more injury and danger than that at the inner, and amputation will be more frequently required for it, because both the bones and soft parts suffer more than in the dislocation inwards.

6. *It sometimes happens, that when the Bone is replaced it will not remain in its Situation, and all the Symptoms of the Injury become renewed.*

Oblique fracture with dislocation.

This circumstance arises when the tibia, in the dislocation outwards, is obliquely broken; and as only a small portion of the articulating surface remains on the dislocated extremity of the tibia, it will not rest on the tibia when it is reduced.

7. *The Division of a large Blood-vessel might, with an extensive Wound of the Integuments, lead to a necessity for Amputation.*

Division of an artery.

But I should not, on that account, at once proceed to the operation. The case from Mr. Sandford, of Worcester, sent me by Mr. Carden, clearly shews that the division of the anterior tibial artery does not, if it be well secured, prevent the patient's recovery. I also once saw a compound fracture close to the ancle-joint, accompanied by a division of that artery; yet, although the patient was in the hospital, and being a brewer's servant possessed the worst constitution to struggle against severe injuries, this man recovered without amputation.

The posterior tibial artery is a vessel of more importance, and is accompanied by a large nerve, which would not be likely to escape injury when the artery was divided by the dislocated bone. Yet the magnitude of the anterior tibial artery, and its free anastomosis with the posterior, would not entirely preclude the hope of preserving the foot under an injury of the posterior tibial artery.

8. *Mortification of the Foot,*

Sometimes ensues, and becomes a sufficient reason for amputating the limb; but this must generally be done when limits appear to be set to the extension of the mortification. However, it may be observed, that in the mortification which ensues from the division of a blood-vessel, where the brachial artery had been divided, and the elbow-joint dislocated, I have seen the arm removed above the injured part, while the limb was still dying towards the seat of the wounded artery, and the patient was restored to health. And I have also known a case of popliteal aneurism, in which the artery and surrounding parts were so compressed by the swelling, that mortification began at the foot, and was extending to the knee; and, although no limit was yet set to the mortification, the limb was amputated, and the patient recovered. So that mortification, when it arises from injury to a blood-vessel, or other local injury, in a healthy constitution, admits of a practice different from that which is pursued in mortification arising from constitutional causes. Gangrene.

Excessive Contusion may be another reason for Amputation;

And therefore in those cases in which heavy laden carriages pass over joints and bruise the integuments so as to occasion the formation of extensive slough, and produce at the same time, generally, the worst examples of compound dislocation, in regard to the state of the bones, I should immediately amputate; for such cases are very different from those which are caused by jumping from a considerable height, from a carriage rapidly in motion, or by a fall in walking or running. Contusion.

Extensive Suppuration will also be a reason for Amputation.

I have known, after an attempt to save the limb, the patient have more extensive suppuration than his constitution could support, followed by an ulceration of the ligaments, by which the joint became additionally exposed, and the bones were again displaced: Suppuration.

hence there arose an absolute necessity to remove the limb for the preservation of his life.

9. *A necessity for Amputation may also be produced by Exfoliations of Portions of Bone, which,*

Exfoliation.

While locked in the surrounding parts of the bone, are incapable of becoming separated, and thus keep up a state of continued irritation. My friend, Mr. Hammick, had the kindness to send me a specimen of this kind, which he was obliged to amputate. The loose portion of bone was seated between the lower extremity of the tibia and fibula, and reached to the ancle joint; both the bones had been broken, and had become re-united, and the uniting medium had inclosed and incarcerated the dead portion of bone. It is probable, from the appearance of the parts, that this portion of bone never would have been able to escape from the place in which it was locked.

10. *Excessive Deformity of the Foot,*

Deformity.

Will also give rise to a necessity for amputation; and this deformity will take place in three directions. First, when the foot is suffered to turn outwards, whilst the leg is placed upon the heel in the dislocation inwards. Secondly, when it is turned inwards; and, thirdly, when the foot remains pointed. The first is best opposed by placing the leg upon its outer side, when that is compatible with the treatment of the wound; in the second case, it is best to keep the foot on the heel; and in both cases, splints having a foot-piece both on the inner and outer side of the foot, must be applied; the third requires similar splints, and a tape as a stirrup, placed under the foot, and fastened to the splint on the fore and middle part of the leg to keep the foot supported. The splints should be so padded as to preserve it in its proper direction.

The following case from Mr. Norman, of Bath, shews the necessity for amputation, when great deformity is permitted to occur.

Case.

I was sent for to Bradford, some years since, to amputate a leg

directly after an accident of this kind. I found the lower extremity of the tibia, with the astragalus loosely attached to it, projecting at the inner ancle. The wound was not large, and the soft parts were little injured. I removed the astragalus, and reduced the tibia, leaving it to rest on the os calcis. I did not again see my patient during the healing of the wound; I believe it got well without any severe symptoms, but the os calcis was drawn up against the posterior part of the tibia, to which it firmly united, and the foot became immoveable, with the toe pointed downwards. In this state he came to Bath two years afterwards, when I amputated the leg, and the patient did well.

GEORGE NORMAN.

Bath, August, 2d, 1819.

11. *Amputation has been recommended in those Cases in which Tetanus occurs after this Injury.*

Tetanus.

Of tetanus I have seen one case from compound dislocation of the ancle, and have heard of another. That which I saw was in Mr. Yare, stable-keeper, who had a compound dislocation of the tibia inwards, and in whom I reduced the bones, and placed the limb on its outer side. For a few days he proceeded without any alarming symptoms. The only circumstance in which his case differed from what I expected, was in the slight inflammation which succeeded upon the joint; for the restorative process seemed to be scarcely established in him. When I paid him my morning visit, several days after the accident, he said, "Sir, I believe I have caught cold, for my neck is stiff:" and as he said this with his jaws closed, I begged him to shew me his tongue, to ascertain if the jaw was locked: and he tried to open his mouth, but was unable to do so. I then desired that Dr. Ralph might see him, who did all that his mind could suggest to arrest the progress of the symptoms, but unsuccessfully, as the different muscles of volition became affected in the back, the extremities and the abdomen, until he was exhausted by irritation. To amputate under such circumstances would be most unjusti-

fiable, as far as the experience of cases in this climate will enable me to form an opinion.

I have not seen amputation performed for compound dislocation of the ancle, but I have seen it performed for compound fracture just above the joint, and it seemed to me to precipitate the fatal event. I have also known, in one case, the finger amputated for tetanus arising from injury to it, yet the patient died; and I have also heard of a third case in which it was practised, but still the issue was fatal.

There is a species of *chronic tetanus*, which sometimes even succeeds wounds, and which will occasionally subside, and apparently the patient will recover, although little be done by medicine, and nothing by surgery; in such cases it would not be justifiable to amputate.

If any medicine be efficacious, submurias hydrargyri, with opium, is that under which I have seen the majority of these cases recover: and opium should also be applied to the wound.

12. *A very irritable State of Constitution,*

Constitution irritable.

Will sometimes render all treatment unavailing to save the limb, and will now and then prove destructive, even if the operation be performed. There are some persons originally constituted with so irritable a system, that the slightest injuries will destroy them. There is a much greater number whose constitutions, originally good, have been so much injured by excess, by want of exercise, by over exertion of mind, drinking freely of spirits and eating but little, that to them the slightest accidents prove fatal.

One of the most curious examples of this kind which I have seen, was the following.

Case of Barclay's drayman.

A man who worked at Barclay's Brewhouse, in the Borough, was, on Saturday, turning a cask, when a splinter of wood entered his thumb, which he immediately drew out. The following night he requested his wife to rise and make him a poultice; for his thumb, he said, was painful.

On Monday he sent for Mr. John Kent, surgeon in the Borough,

who found his thumb inflamed and painful. Tuesday the inflammation had extended to the hand and fingers. Wednesday a swelling appeared at the wrist, above the ligamentum annulare carpi, and the man had a great deal of irritative fever, and was obliged to keep his bed.

On Thursday, after lecture, Mr. Kent came to me, requesting I would see this man, who had been delirious during the night: his arm being much convulsed, and his body becoming generally so. I went with Mr. Kent, and feeling the thumb, discovered a fluctuation in the theca. I put a lancet into the extremity of the thumb, and a considerable quantity of pus issued. Gratified with the expectation of his being relieved by the discharge of the matter, I was going out of the room to express this feeling to his friends, when I heard a rustling on the bed behind me; and upon Mr. Kent and myself turning back, we saw him under the influence of a convulsive fit, which raised him in his bed, and in which he fell back and expired.

Living as these persons generally do, principally upon porter and spirits, they have constitutions which render them the worst subjects for accident.

Corpulent persons.

Persons who are much loaded with adeps are generally very irritable, and bear important accidents very ill; indeed they frequently perish, whatever plan of treatment be pursued. To this statement, however, there are exceptions in those who, though corpulent, are still in the habit of taking much exercise, as they will retain some vigour of constitution; and in such persons the limb may be attempted to be saved, as in the case described by Mr. Abbott, surgeon of Needham Market; but in those who have become extremely fat, and who have been addicted to habits of indolence, there is but little chance of preserving life but by amputation.

Invitation to correspondence on the subject.

Having thus endeavoured to explain what has fallen under my own observation, and what I have been able to learn from others upon this difficult subject, I beg to express a hope, that any of my friends, who may have had cases under their care which would

throw further light upon the subject, will have the kindness to communicate them to me, whether they make for or against the advice that I have given, as I have no further wish but that all the points respecting this severe accident may be fully elucidated and established; and shall only add, that the observations which I have made in favour of saving the limb in compound dislocations of the ancle-joint, will apply much more strongly in country practice than in that of the large hospitals in London.

The Ancle is sometimes dislocated by Ulceration.

Case. September 23d, 1823. With Mr. Dixon, surgeon, of Kennington, I visited Mr. P., a patient of his, who had a dislocation of the ancle produced by ulceration. An ulcer existed at the inner ancle, which had discharged synovia. The ancle-joint was red and greatly swollen, the foot drawn outwards by the action of muscles, and the internal malleolus thrown inwards upon the astragalus. The tibial arteries were greatly stretched; and the fibula, by its pressure on the malleolus externus, produced considerable and constant pain. Mr. P. is a very old man, and dying of the disease.

FRACTURES OF THE TIBIA AND FIBULA NEAR THE ANCLE-JOINT.

Fracture of the fibula. The *fibula* is frequently broken from two to three inches above the ancle joint, and the patient instantly becomes conscious of the accident by feeling a snap a little above the outer ancle; by the pain which he suffers in his attempt to bear upon the foot; by his inability to place his foot flat upon the ground, resting it rather on the inner side to throw the bearing of the body upon the tibia; and by pain and a sensation of motion at the injured part when the foot is bent or extended. The surgeon discovers the nature of the accident by rotating the foot with one hand, and by grasping the lower part of the leg with the other; at each rotation a crepitus is generally felt. There is also frequently an inequality of the bone at the broken part, which assists in pointing out the nature of the injury.

The cause of this injury is a blow upon the inner side of the foot, or some violence which forces it outwards against the lower extremity of the fibula; and I have known it broken by distortion of the foot inwards. A fall laterally, whilst the foot is confined in a deep cleft, produces this accident. I broke my right fibula by falling on my right side whilst my right foot was confined between two pieces of ice, and I could with difficulty support myself to a neighbouring house by bearing upon the inner side of my foot. I went home in a carriage, and every jolt of it gave me pain at the fractured part as I suspended my leg upon my hand. I knew that the bone was broken by the severe snap which I felt in the part at the moment of the accident. Its cause.

The treatment which this injury requires is, to apply a many-tailed bandage upon the limb, and to keep it wet with a lotion of spir. vini, ℥ aquæ ℥ v.: to apply a splint, with a foot piece upon each side, padded with cushions in such a manner as to preserve the great toe in a line with the patella, an invariable rule on these occasions; and to place the leg upon its side in the semiflexed position, so as to relax the muscles, and render the patient's position as easy as possible. Its treatment.

A want of attention to the treatment of this accident leads to permanent lameness. Dr. Blair, a naval physician in the American war, informed me that he found great difficulty in walking the streets of London on one side of the way, but upon the other he walked better than upon flat ground: and when I remarked his lameness, and inquired into its cause, he informed me, it had arisen from a fracture of the fibula, which happened many years ago; and to which not having applied splints, the foot became twisted, so that he walked better upon an inclined plane than upon flat ground. Lameness from neglect.

FRACTURES OF THE TIBIA AT THE ANCLE-JOINT.

The tibia is often broken into the ancle-joint, or through the bone a little above it; and these fractures pass rather obliquely inwards, or obliquely outwards; the first in a line from the usual Fracture of the tibia.

seat of fracture of the fibula, that is, from one to two inches above the external malleolus to the inner ancle; the second from one to two inches of the tibia above the ancle, downwards and outwards into the joint.

Diagnosis.

The first is distinguished by crepitus at the ancle when the foot is rotated, bent, or extended; and by a slight inclination of the foot outwards. If the fracture does not enter the joint, but obliquely crosses the tibia above it, the lower part of the tibia slightly projects over the malleolus internus.

Treatment.

The treatment in this case consists in using evaporating lotions; the many-tailed bandage; splints with a foot-piece to each, padded so as to incline the foot inwards, and to bring the toe into its natural line with the patella, which is easily effected with the splints to which I have alluded.

Oblique fracture.

The symptoms of the oblique fracture of the tibia downwards and outwards into the joint are, as in the former case, a crepitus upon rotation, flexion, and extension; but the foot is slightly inclined inwards, and the malleolus externus projects more than it naturally would. The same bandages and splints are to be used as in the former case; and the position in both these accidents should be as follows:

Treatment.

The leg should be raised so as to bend and elevate the knee; and the knee should rest upon the gastrocnemius muscle, and upon the heel. The splints will support the foot on each side, and the leg should be supported by a pillow, reaching from the knee to beyond the foot, secured by tapes around it. I have seen both these cases do well when the patient and his leg rested upon the outer side: but the advantage of placing the limb upon the heel is, that it gives the surgeon an opportunity of observing the least deviation in the line of the foot, relatively to the axis of the leg; and this is also an easier position to the patient.

Dislocation upwards from fracture.

The outer portion of the lower extremity of the tibia, at the part at which it joins the fibula, is sometimes fractured and split off from the shaft of the bone in jumping from a considerable height; the foot then rises between the tibia and fibula; a dislocation

of the tibia inwards is produced, and the foot is elevated between the two malleoli. The treatment required in this case is the same as in the dislocation inwards.

Oblique compound fractures into the ancle-joint generally do well if care be taken to produce adhesion of the wound, which is to be effected by applying lint, imbrued in blood, to the lacerated skin, and by leaving it there until it separates spontaneously. The same bandages and splints are required as in simple fractures, but the position must be varied according to the situation of the wound. Even if suppuration occurs the patient will generally recover, unless he be much advanced in years. Oblique compound fractures.

But if, with compound fracture into the joint, there be much comminution of bone, and hæmorrhage from any large vessel, it will be proper to amputate immediately, more especially if the patient be obliged to obtain his bread by his labour; for after recovery, under great comminution, the limb will bear but slight exertion.

DISLOCATION OF THE TARSAL BONES.

SIMPLE DISLOCATION OF THE ASTRAGALUS.

The astragalus is connected above and on each side with the tibia and fibula by its trochlea; below it has articulatory surfaces for its junction with the os calcis, to which it is united by means of a capsular and strong interosseous band of ligament; and anteriorly to the os naviculare, by a capsular, broad, and internal lateral ligament. A simple dislocation of the astragalus sometimes, though rarely, occurs; a compound luxation is still more rare. Junction with other bones.

A simple luxation of the astragalus is a most serious accident, being very difficult to reduce; and should the reduction not be effected, the patient is ever after doomed to a considerable degree of lameness. Simple dislocations.

Being sent for into the country to visit a patient, the surgeon, Case.

Mr. James, of Croydon, whom I met there, requested me to see a gentleman who had a dislocation of the foot, which had happened several weeks before, but had not proceeded to his satisfaction. Upon examination, I found the astragalus dislocated outwards, and the tibia broken obliquely at the inner malleolus. Every attempt to reduce it was made which Mr. James, who is an extremely well-informed man, could adopt; five persons kept up a continued extension when the accident first happened, but without effect; the patient was then taken home, and several persons were employed in extending the foot, and it was thought, after a time, with some success; but the reduction could not, by all their efforts, be rendered complete, as the astragalus still remained projecting upon the upper and outer part of the foot. The extension could not be carried further; the integuments sloughed from that which had been already made; and the wound was a long time in healing. The limb now deviates much from its natural shape; the toes are turned inwards, and pointed downwards; there is some little motion at the ancle, and only a slight degree of it between the projecting and raised astragalus and the other bones of the tarsus.

This accident, then, is of a most serious nature: for the gentleman in question had placed himself under the care of a most intelligent and persevering surgeon, and yet the attempts made at reduction were not successful, merely from the nature of the accident, and not from any fault in the means employed. In these cases the use of pulleys will be required, and the action of the muscles should be lessened by tartarized antimony.

COMPOUND DISLOCATION OF THE ASTRAGALUS.

In the first case of this accident which I had an opportunity of witnessing, the astragalus was thrown inwards and forwards upon the os naviculare; and when I afterwards saw the limb upon the table of the dissecting-room, it having been removed by amputation, I exclaimed, surely that limb might have been saved.

In the case, of which an account was sent me by Dr. Lynn, of Bury St. Edmunds, it will be seen that the discharge of the astragalus, in a compound dislocation of the ancle-joint, did not prevent the patient's recovery; for he says, "In five weeks a portion of the astragalus separated, and another piece a week afterwards, which, when joined, formed the ball of that bone." Case.

Mr. Tyre, of Gloucester, had also under his care a case of compound luxation of the astragalus, in which he cut out the luxated bone, and the patient had a good recovery, with a tolerably useful foot. Case.

DISLOCATION OF THE OS CALCIS AND ASTRAGALUS.

The five anterior bones of the tarsus are sometimes dislocated from the os calcis and astragalus. There is a joint placed transversely between the os calcis and astragalus, and the os naviculare and os cuboides; and this joint is sometimes, but rarely, luxated by very heavy weights falling upon the foot, of which the following is an example.

SIMPLE DISLOCATION.

A man working at the Southwark Bridge, had the misfortune to have a stone of great weight glide gradually on his foot: he was almost immediately brought to Guy's Hospital, and the following were the appearances of the limb. The os calcis and the astragalus remained in their natural situations, but the fore part of the foot was turned inwards upon the bones. When examined by the students, the appearance was so precisely like that of a *club foot*, that they could not at first believe that it was not a natural defect of that kind: but upon the assurance of the man, that previously to the accident his foot was not distorted, an extension was made by fixing the leg and the heel; the fore part of the foot was then drawn outwards, and thus the reduction was effected. This person was discharged Case.

from the hospital in five weeks, having the complete use of his foot.

DISLOCATION OF THE OS CUNEIFORME INTERNUM.

I have twice seen this bone dislocated: once in a gentleman who called upon me some weeks after the accident, and a second time in a case which occurred in Guy's Hospital. In both these instances the same appearances presented themselves. There was a great projection of the bone inwards, and some degree of elevation, from its being drawn up by the action of the tibialis anticus muscle; and it no longer remained in a direct line with the metatarsal bone of the great toe. In neither case was the bone reduced.

The subject of the first of these accidents walked with but little halting, and I believe would in time recover the use of the foot, so as not to appear lame. The cause of the accident was a fall from a considerable height, by which the ligament was ruptured which connects this bone with the os cuneiforme medium, and with the os naviculare.

The second case, which was in Guy's Hospital, my apprentice Mr. Babington, informed me, happened by the fall of a horse through which the foot was caught between the horse and the curb-stone.

The treatment of this injury will consist in confining the bone in its place by at first binding it with a roller dipped in spirits of wine and water, with which it must be constantly kept wet: when the inflammation is subdued, a leathern strap is to be buckled around the foot, to keep the bone in its place till the ligament be united.

The metatarsal bones I have never known luxated: their union with each other, and their irregular connexion with the tarsus, prevent it; luxation, therefore, must be a very rare occurrence.

DISLOCATION OF THE TOES FROM THE METATARSAL BONES.

This is a very uncommon accident: but I had a man under my

care at Guy's Hospital, who had such a degree of lameness as to be unable to get his bread by his daily labour, owing to an injury sustained by falling from a considerable height, and alighting upon the extremities of his toes. Upon examination of the bottom of the foot, a considerable projection was found at the roots of all the smaller toes, each of the extremities of the metatarsal bones being placed under the first phalanges of those toes. Several months had elapsed from the time of the accident; and at first, from the swelling of the foot, it was not detected.

No extension, at the time when I saw him, could answer any purpose; and the only mode of relief was to wear a piece of hollow cork at the bottom of the inner part of the shoe, to prevent the pressure of the metatarsal bones upon the nerves and blood-vessel.

The toes are sometimes dislocated; but as the mode of their reduction will be the same as that of the fingers, I shall reserve the subject until I describe the dislocation of the fingers.

DISLOCATIONS OF THE LOWER JAW.

Structure of the articulation.

An articular cavity is formed behind the root of the zygomatic process of the temporal bone, which receives the condyloid process of the lower jaw at the time when the mouth is shut; and a prominence which is placed before this cavity receives the lower jaw when the teeth are advanced upon the upper; both the cavity and the prominence are covered with articular cartilage. The condyloid process of the jaw rests in the cavity with an intervening cartilage whilst the mouth is shut, but it advances upon the root of the zygomatic process when the jaw is much opened, or the lower teeth are advanced. Between the condyloid process and the cartilaginous surfaces an inter-articular cartilage is placed, having a double concave surface, which allows of the free motion of the jaw, and of its advance upon the zygomatic articular tubercle; whilst the coronoid or anterior process of the jaw is received between the zygomatic arch and the surface of the temporal bone.

Inter-articular cartilage.

Ligaments. A capsular ligament unites the condyloid process to the temporal cavity and to the prominence before it, and joins, in its passage from one bone to the other, the edge of the inter-articular cartilage; whilst a strong internal lateral ligament passes from the margin of the articular cavity to the inner surface of the angle of the lower jaw.

Muscles. The jaw is drawn upwards and downwards, backwards and forwards, and transversely. Its elevation is produced by the temporal, the masseter, and the pterygoideus internus; its depression by the platysma myoides, digastricus, mylo hyoideus, genio hyoideus, and genio hyo glossus. The jaw is drawn backwards by the temporal muscle, and by a part of the masseter; and when the os hyoides is fixed by the digastricus, the genio hyoideus, and genio hyo glossus, it is pulled forwards by a portion of the masseter, and by the combined action of the pterygoidei externi.

The lateral motions of the jaw are principally produced by the contractions of the external pterygoid muscles, which in alternate actions pull the jaw from side to side, and give it, with the other muscles, its grinding action, in which these muscles are assisted by the oblique motion forwards, given to the jaw by the pterygoideus internus.

Luxations. The lower jaw is subject to two species of dislocation: viz., the complete and the partial. When the dislocation is complete, both the condyles of the jaw are advanced into the space between the zygomatic arch and the surface of the temporal bone; but when it is partial, one condyloid process only advances, and the other remains in the articular cavity of the temporal bone.

COMPLETE LUXATION OF THE JAW.

Complete luxation. This accident is indicated by the open state of the mouth, and by the impossibility of closing it, either by the patient's efforts,

Symptoms. or by pressure made upon the chin. The lower jaw may be still in some degree approximated to the upper by muscular efforts, but the lower teeth, if the mouth could be closed, would be in a line anterior to the upper. Some degree of depression of the jaw

may also still be produced, but to an inconsiderable extent. Thus the appearance of the patient is that of a continued yawning. The cheeks are projected by the advance of the coronoid processes towards the buccinator muscle, and there is a depression just anterior to the meatus auditorius, from the absence of the condyloid process from its cavity. The saliva is not retained in the mouth, but dribbles over the chin; and a very considerable increase of this secretion follows, in consequence of the irritation of the parotid glands.

The pain accompanying the accident is severe, but I have never seen any dangerous effect produced by it: on the contrary, the jaw becomes nearly closed by time, and a considerable degree of motion of the jaw is recovered.

This accident may be caused by taking into the mouth too large a body: as I have known when two boys in play, struggling for an apple, one has forced it into his mouth and dislocated his jaw. A blow upon the chin, when the mouth is widely opened, produces the same effect. Yawning very deeply is also a frequent cause of the accident. Causes.

A sudden spasmodic action of the muscles will also produce this dislocation when the mouth is opened; and it has often happened in attempts to extract the teeth, where the mouth has been opened too widely. Mr. Fox, dentist, whose death we have to deplore as a man of science, informed me that he was called to a lady who had a tooth which required to be extracted, and that in the attempt to do so, a sudden spasm dislocated the jaw.

In this accident, the jaw must be immediately restored to its situation; and the mode of reduction I shall explain by the following case.

A madman, confined in one of the houses in Hoxton, during an attempt to give him some food, which the keeper was obliged to force him to receive, had his jaw dislocated. Mr. Weston, surgeon of Shoreditch, was sent for; who, finding the man very powerful and very unmanageable, preferred rather to send for some other surgeon, to consider with him the best mode of making the Case.

attempt at reduction. When I saw the man I thought that a surgeon must be as insane as the patient who would employ the usual means of reduction; and I therefore desired that the keepers would place the patient on a table upon his back, with a pillow under his head, and that he should be held by several persons. I ordered two table forks to be brought me, and wrapped a handkerchief around their points. Placing myself behind the patient's head, I carried the handles of the forks, into the mouth, on each side, behind the molares teeth; then directed them to be held, and placing my hand under the chin, I forcibly drew it to the upper jaw, and the bone was easily and quickly reduced.

In the above mentioned case the handles of the forks were not used as levers, by lifting them; they only rested upon the jaw, which was used as a lever upon them, depressing the processes as the jaw was elevated, and thus directing the bone backwards into its natural situation. But as wood is liable to injure the gums, it is better to substitute two corks, which are to be placed behind the molares teeth on each side of the mouth, and over these the chin is to be raised. They are equally effectual in reducing the bone, and are less likely to injure it, or to bruise the soft parts. It has been recommended in these cases, to use a piece of wood as a lever, by introducing it between the molares teeth, first on one side and then on the other, reducing one side first and then using the same means to the other. Mr. Fox, in the case before alluded to, thus succeeded: he placed a piece of wood, a foot long, upon the molar tooth on one side, and raising it at the part at which he held it, depressed the point at the jaw on that side, and reduced the jaw. He then performed the same operation on the other side, and thus replaced the bone. But the corks, the recumbent posture, and the elevation of the chin, constitute the mode which I prefer.

Corks to be preferred.

Levers.

In reducing this dislocation, the surgeon generally wraps a handkerchief round his thumbs, placing them at the roots of the coronoid processes, and depressing the jaw, forces it backwards as well as downwards, when the bone suddenly slips into its place;

but this mode does not so easily succeed as the others, excepting in recent dislocations. When the jaw has been once dislocated, it is very liable to the same accident, and therefore a broad tape, with a hole cut in it to receive the chin, divided into four ends by splitting on one side some way down, is to be tied over the summit of the head and occiput, to confine the jaw until the lacerated parts have healed, by which the tendency to subsequent luxation is diminished. Liable to recur.

PARTIAL DISLOCATION OF THE JAW.

In this case, the condyloid process advances under the zygomatic arch on one side only, producing an incapacity to close the mouth: but is not so widely opened as in the complete dislocation. It is easy to distinguish this accident, as the chin is thrown to the side opposite to the luxation, and the incisores teeth are not only advanced upon the upper jaw, but are no longer in a line with the axis of the face. The cause of this accident is a blow on the side of the face when the mouth is opened, and in one case it occurred from vomiting in sea sickness. In this example, the lady, Miss Belfour, daughter of the late Admiral Belfour, of Portsmouth, reduced her jaw by an oyster-knife, which she turned half round upon the side of the jaw between the teeth, and so returned it to its place. Partial dislocation. Symptoms.

In this injury, the lever of wood reduces the bone most easily, but the cork may be used on one side, and the chin be elevated, as in those cases in which the dislocation is complete.

SUBLUXATION OF THE JAW.

As in the knee, the thigh-bone is sometimes thrown from its semilunar cartilages, so the jaw appears occasionally to quit the inter-articular cartilage of the temporal cavity, slipping before its edge, and locking the jaw, with the mouth slightly opened. It generally happens, that this dislocation is quickly removed by natural efforts alone; but I have seen it continue for a length of time, and the motion of the jaw, and the power of closing Symptoms.

Cause. the mouth, have still remained. This state of the jaw happens from extreme relaxation. The patient finds himself suddenly incapable of entirely closing the mouth; some pain is felt, and the mouth is least closed on that side on which the pain is felt.

Reduction. Force for removing these appearances must be applied directly downwards, so as to separate the jaw from the temporal bone, and to give an opportunity for the cartilage to replace itself upon the rounded extremity of the condyloid process.

Relaxation of ligaments. In extreme degrees of relaxation, a snapping is felt in the maxillary articulation just before the ear, with some pain, arising from the sudden relapse of the jaw into its socket, which the relaxation of the ligament had permitted it to quit, and to advance upon the zygomatic tubercle.

Young women are generally subject to this sensation, and the means which I have found most frequently and quickly tending to insure their recovery, have been ammonia and steel as medicine; with the shower-bath, and the application of a blister before the ear, when the complaint has continued for a length of time.

DISLOCATIONS OF THE CLAVICLE.

As the clavicle is the only medium by which the arm is articulated with the bones of the chest, it might be expected that its dislocation would be extremely frequent; but this bone is so peculiarly and strongly articulated, both with the sternum and scapula, as to render its dislocation comparatively rare.

Dislocations rare.

Articulation. In other articulations we find a capsular ligament proceeding from the edges of the articulating surfaces and peculiar ligaments, to give strength to the junction of the bones; but in the articulation of the clavicle, like that of the lower jaw and knee, we meet with an inter-articular cartilage, composing a part of the articulating apparatus.

JUNCTION OF THE STERNAL EXTREMITY OF THE CLAVICLE WITH THE STERNUM.

Bones. The articulating surfaces, both of the sternum and clavicle, are

in part rounded, and in part depressed; and both are covered by an articular cartilage similar to that of the other joints. A capsular ligament proceeds from the end of the clavicle to the edge of the articulating surfaces of the sternum, and it is strengthened by short ligaments, which pass directly from one bone to the other. Cartilage.

Within the capsular ligament is situated the inter-articular cartilage, joined at the upper part of the joint to the clavicle, and to the capsular ligament; and, below, to the edge of the articular surface of the sternum, and to the capsular ligament; it is inclined under the end of the clavicle with the capsular ligament, so that the clavicle rests upon its surface, and it is also interposed between that bone and the sternum. Of that portion of this cartilage which is inclined to the clavicle, only about one half is smooth, to allow of the motion of that bone, and this is its lower and anterior part. The residue of it adheres to the articular cartilage of the clavicle, forming a flat, rough surface; but on the side towards the sternum, the inter-articular cartilage forms a smooth and concave surface, which allows of its free motion on that bone. The inter-articular cartilage is placed not perpendicularly, but obliquely; its upper end is inclined inwards, and its lower end outwards, towards the first rib. From the upper point of the clavicle proceeds an inter-clavicular ligament, which adheres to the capsular ligament, and slightly to the sternum; and traversing the upper and back part of the sternum, it is fixed in the extremity of the opposite clavicle, and unites very strongly one clavicle to the other. Inter-clavicular ligament.

The clavicle is also joined to the first rib by a clavicular-costal, or as it is called, rhomboid ligament, which proceeds from the inferior edge of the sternal end of the clavicle to the cartilage of the first rib. Clavicular-costal ligament.

The motion of the clavicle, as well as that of the sternum, forwards and backwards, is performed upon the smooth surface of the inter-articular cartilage, which is applied to the sternum; whilst the motion of the clavicle, upwards and downwards, is Motion of the clavicle.

produced upon the portion of the smooth surface of the inter-articular cartilage, which is applied to the clavicle: and another advantage derived from this mode of articulation is, that it allows of the motion of the bone outwards and backwards to a considerable extent, without occasioning any weakness in the ligament: for, in this view, it may be considered that there are two ligaments; one from the clavicle to the cartilage, and one from the cartilage to the sternum, instead of one loose, long ligament from bone to bone.

DISLOCATIONS OF THE STERNAL EXTREMITY OF THE CLAVICLE.

These are of two kinds: viz., the dislocation *forwards*, the clavicle being then thrown upon the sternum; or *backwards*, when the end of the bone is placed behind the sternum.

DISLOCATION FORWARDS.

The circumstances by which this injury is known are, that upon looking at the upper part of the sternum, a rounded projection is seen; and when the fingers are carried upon the surface of the sternum upwards, this projection stops them. If the surgeon places himself behind the patient, puts his knees between the scapulæ, grasps the shoulders and draws them back, the projection on the sternum disappears; but directly when the shoulders advance, the projection upon the sternum is renewed. The clavicle may be readily traced with the finger into the projection on the sternum. If the shoulder be elevated, the projection descends; if it be drawn downwards, the dislocated extremity of the bone becomes elevated to the neck. The motions of the dislocated clavicle are painful, and the patient moves the shoulder with difficulty. The point of the injured shoulder is less distant from the central line of the sternum than usual. In a very thin person the nature of the accident can be at once ascertained, because the bone is but little covered; but in fat persons it is more difficult to detect. When the patient is at rest, very little pain or tenderness is felt from the accident. It sometimes happens that this dis-

location is incomplete, the anterior portion of the capsular ligament only being torn, and the bone slightly projecting; but generally all the ligaments are lacerated, and the bone, with its interarticular cartilage, is thrown forward. Partial.

The cause of this injury is a fall upon the point of the shoulder, when the force pushes the clavicle inwards and forwards, and projects it on the sternum; but it also frequently happens from a fall upon the elbow at the time when it is separated from the side, by which the clavicle is forced violently inwards and forwards against the anterior part of the capsular ligament. Its cause.

With respect to the means of reduction, and the principle upon which the treatment is to be regulated, there is no difficulty in practising the one, or in understanding the other. The clavicle is easily returned to its place by pulling the shoulder backwards, because then it is drawn off the sternum, and its end falls upon the cavity which naturally received it; but if pressure in this position of the shoulder be not made upon the fore part of the bone, it will be found still liable to project in some degree. Reduction.

The principle, therefore, upon which the extension is made, is to draw the scapula as far from the side as is practicable without inconvenience, and supporting the arm, to prevent its weight from influencing the position of the bone. Principle.

The first of these objects is best effected by the use of the clavicle bandage, and by the application of two pads or cushions affixed to it, which are placed in the axillæ. These pads throw the head of the os humeri from the side, and carry the scapula, and the clavicle connected with it, outwards and backwards, and thus the clavicle is drawn into its natural articular cavity. The second intention is effected by putting the arm in a sling, which, through the medium of the os humeri and scapula, supports it, and prevents the clavicle from being drawn down by the weight of the arm. Mode of extension.

DISLOCATION BACKWARDS.

The dislocation of the extremity of the bone backwards I have Dislocation backwards.

never known to occur from violence, yet it might happen from excessive force, as from a blow upon the fore part of the bone, which should tear the capsular and clavicular costal ligament, and allow the bone to glide behind the sternum, occasioning compression of the œsophagus, and rendering deglutition difficult. The trachea would, from its elasticity, elude pressure and escape to the opposite side of the space by which this tube enters the thorax.

Cause. The only cause of this dislocation that I have known, was produced by great deformity of the spine, by which the scapula advanced and sufficient space was not left for the clavicle between the scapula and sternum; in consequence of which the bone gradually glided back behind the sternum, and produced so much inconvenience by its pressure on the œsophagus, as to lead to a necessity for the removal of its sternal extremity.

This case is extremely creditable to the knowledge, skill, and dexterity of Mr. Davie, surgeon at Bungay, in Suffolk; few would have thought of the mode of relief—very few would have dared to perform the operation—and a still smaller number would have had sufficient knowledge for its accomplishment.

The following particulars I in part received in conversation with Mr. Davie, who fell a victim to his great professional zeal, and in part from Mr. Henchman Crowfoot, surgeon of Beccles. He had the kindness to go over to Dr. Camell, of Bungay, to learn from him some of the particulars, and there met with a person who gave him several others, and who knew the patient for some years after the operation.

Case. Miss Loffly, of Metfield, Suffolk, had a great deformity, arising from a distorted spine, increased by an accident which displaced the sternal extremity of the left clavicle, and threw it behind the sternum. The progressive distortion of the spine gradually advanced the scapula, and occasioned the sternal end of the clavicle to project inwards, behind the sternum, so as to press upon the œsophagus, and occasion extreme difficulty in deglutition. Her deformity had become excessive and her emaciation extreme.

Mr. Davie conceived that he should be able to prevent the gradual destruction which the altered position of the clavicle threatened, by removing the sternal extremity of the bone; and the operation which he performed for this purpose was, according to all I can learn, as follows.

An incision was made of from two to three inches in extent on the sternal extremity of the clavicle, in a line with the axis of that bone; and its surrounding ligamentous connections, as far as he could then reach them, were divided with the saw of Scultetus (often called Hey's); he sawed through the end of the bone, one inch from its articular surface from the sternum, and fearful of doing unnecessary injury with the saw, he introduced a piece of well-beaten sole leather under the bone while he divided it. When the sawing was completed, he tried to detach the bone, but it still remained connected by its inter-clavicular ligament, and he was obliged to tear through that ligament by using the handle of the knife as an elevator, and after some time succeeded in removing the portion of bone which he had separated.

The wound healed without any untoward occurrence, and the patient was enabled to swallow, as the pressure of the clavicle upon the œsophagus was now removed.

She lived six years after the operation, and recovered considerably from her former emaciation. "Of what she ultimately died," says Mr. Crowfoot, "I have not learnt."

JUNCTION OF THE CLAVICLE WITH THE SCAPULA.

Articulation.

The clavicle joins with the scapula about three quarters of an inch behind the extremity of the acromion. The end of the clavicle is slightly convex, and covered by an articular cartilage; the scapula is depressed to receive it, and this surface is also covered by an articular cartilage. Strong ligamentous fibres pass directly from the clavicle to the scapula, and under these a capsular ligament is extended from the head of the socket of the scapula, to the extremity of the clavicle. The surface of junction is very small, the end of the clavicle not being longer than the end of the

little finger of an adult and the cavity in the scapula which receives it is very superficial, being not larger than is required to receive upon its surface the end of the clavicle. But the junction of the two bones is effected by much stronger means, through the medium of the coracoid process of the scapula, which sends forth two ligaments to the clavicle. The first proceeds from the root of the coracoid process, and is fixed in a small tubercle of the clavicle on its under side, at the insertion of the subclavius muscle, and two inches from the extremity of the bone. This ligament has been called the conoid, from its form, but may be better named the internal coraco-clavicular. The use of this ligament is, to bind down the clavicle to the scapula, and to confine the motion of the clavicle forwards and upwards.

Ligaments.

Internal coraco-clavicular.

The second ligament of this part is called trapezoid; it proceeds from the coracoid process, and passes on the under side of the clavicle to near its scapular end, into which it is fixed; I call it the external coraco-clavicular. This ligament is the chief cause which lessens the tendency to dislocation of the scapular end of the clavicle: for when its capsular ligament is divided, the scapula cannot be forced under the clavicle without lacerating this ligament, so great is its resistance. It allows of very free motion of the scapula backwards and upwards, but confines its motions forwards. The motions of this extremity of the clavicle are performed by the subclavius muscle, although other muscles also move this bone.

External coraco-clavicular.

DISLOCATION OF THE SCAPULAR EXTREMITY OF THE CLAVICLE.

This accident is more frequent than the dislocation of the sternal extremity.

When this extremity of the bone is luxated, the signs by which the surgeon ascertains the nature of the injury are as follow.

Symptoms.

The shoulder on that side, when compared with the opposite, appears depressed, for the clavicle is formed to give support to the scapula, and that support is lost in consequence of the accident. The point of the shoulder approaches nearer to the

sternum; and if the distance of the two shoulders from that bone be measured, this inequality is directly detected; the clavicle being naturally the means of preserving the distance of the scapula from the side, to throw out the shoulders, and to render the motions of the arm extensive. But the easiest mode of detecting this accident is, to place the finger upon the spine of the scapula, and to trace this portion of bone forward to the acromion in which it ends; the finger is stopped by the projection of the clavicle, and so soon as the shoulders are drawn back, the point of the clavicle sinks into its place, but it reappears when the shoulders are let go. The point of the clavicle projects against the skin upon the superior part of the shoulder, and much pain is felt when it is pressed.

In this injury the capsular ligament is necessarily torn through, as well as the external ligament, from the coracoid process to the clavicle, or no dislocation of the sternal extremity could occur. The internal ligament, when the dislocation is complete, must be also lacerated; but I have seen the clavicle project but slightly on the acromion in some of these accidents, denoting that the latter ligament had not given way.

It is scarcely probable that the clavicle should be ever dislocated in any other direction than upwards. At least, I have never seen an instance of the clavicle gliding under the acromion; but I would not deny the possibility of such an accident.

Cause.

This species of dislocation is caused by a fall upon the shoulders, through which the scapula is forced inwards towards the ribs, and the accident which produces it is excessively violent. It has been said, that the action of the trapezius muscle alone could produce this effect; but that is impossible, as this muscle would not influence both the ligaments of the coracoid process, which must be torn through to produce the dislocation.

Reduction.

In the treatment of this accident, I adopt the following plan: The assistant, standing behind the patient, puts his knee between the shoulders, and draws them backwards and upwards, when the clavicle sinks into its socket. A thick cushion is then placed in

each axilla, for three purposes: First, to keep the scapula from the side: Secondly, to raise the scapula: Thirdly, to defend the axillæ from being hurt by the bandages; on which last account a cushion is employed on each side. Then the clavicle bandage is applied, and its straps should be sufficiently broad to press upon the clavicle, the scapula, and the upper part of the os humeri, to keep the former down, the scapula inwards and backwards, (which is the chief object,) and the arm backwards and elevated. To secure these objects more effectually, the arm is to be suspended in a short sling, by which it is made to support the scapula in its proper situation.

At the conclusion of my lecture upon this subject I have always given this counsel to the pupils:—"You are not to expect that the parts, after the utmost care in the treatment, will, in dislocations of either end of the clavicle, be exactly adjusted; some projection, some slight deformity will remain: and it is necessary, from the first moment of the treatment, that this should be stated to the patient, as he may otherwise suspect that the fault has arisen from your ignorance or negligence. You may at the same time inform him, that a very good use of the limb will be recovered, although some deviation from the natural form of the parts may remain, in a slight projection on the sternum, or some elevation of the sternal extremity of the clavicle."

DISLOCATION OF THE CLAVICLE WITH FRACTURE OF THE ACROMION.

There is a preparation of this injury in the Museum at St. Thomas's Hospital, and the following account of the case was given me by Mr. Smith.

Case. A man, aged sixty years, was admitted into King's Ward, St. Thomas's Hospital, October 19, 1814, having fallen from a tree two or three days before. The surgeon to whom he applied told him that nothing was injured; but he himself persisted in saying his shoulder was broken, and walked up from Maidstone to the hospital. On examination, his shoulder appeared fallen as if displaced; but a little attention shewed that this was not the case. What

however, the accident was determined to be, I do not recollect; but the following treatment was adopted. Cushions were put in the axillæ, and a stellate bandage applied, with another just above the elbow to bind it to the side, and the arm was put in a sling, which seemed to keep the parts in their proper position; but the next morning the bandages were loose. Supposing that this effect was produced by restlessness, they were again applied, but continued slipping off, day after day, until a week from his admission, when a long splint, placed across the shoulders, was bound to them by rollers, and the parts resumed their natural situation; but after a short time, they were also obliged to be removed on account of the extreme irritability of the patient. He was then ordered to lie in bed upon his back without any bandage, but the parts became again displaced. No other attempt at relief was made, and he died on the 7th of December following, of some pulmonary disease, after an illness of three weeks.

On examination of his body, the clavicle was found dislocated at its scapular extremity, and projected considerably over the spine of that bone. The acromion process, just where the clavicle is united with it, was broken off.

The splint across the shoulders seemed likely to have succeeded in keeping the parts in apposition, if the man's illness and impatience would have permitted him to continue to wear it.

STRUCTURE OF THE SHOULDER-JOINT.

Shoulder-joint.

The shoulder-joint is composed of two portions of bone; the glenoid cavity of the scapula, and the head of the os humeri.

Glenoid cavity.

The glenoid cavity is similar in form to a longitudinal section of an egg, with its larger extremity downwards and outwards, and its smaller upwards and inwards; the cavity is so superficial, that the head of the humerus rather rests upon its surface than is received into its hollow; it is, however, slightly concave, and is covered by an articular cartilage, which is somewhat extended beyond the edge of the bony cavity.

Coracoid process.

The coracoid process of the scapula is situated at the upper

point of the glenoid cavity, and its basis extends from thence to the notch of the superior costa; it rises and inclines inwards and forwards, terminating in a point, which is situated under the clavicle, one third the length of that bone from its junction with the spine of the scapula, and on the inner side of the head of the os humeri, under the pectoral muscle. It covers and protects the joint on its inner side.

Cervix scapulæ.

The glenoid cavity is united to the body of the scapula by a narrow neck, which is called the cervix scapulæ; and its narrowest part is opposite to the notch of the superior costa of the scapula.

Head of the humerus.

The head of the humerus is divided into three portions. The first is an articular surface forming a small part of a sphere, which rests upon the glenoid cavity of the scapula, and is covered with an articular cartilage; the second is a process called the larger tubercle, formed for the insertion of three muscles; it is situated on the outer portion of the head of the bone, under the deltoid muscle; and the third is a process called the lesser tubercle, which is situated on the inner side of the head of the bone towards the axilla; and in the usual position of the arm, nearly in a line with the point of the coracoid process of the scapula.

Bicipital groove.

Between these two processes is a groove, which lodges the tendon of the long head of the biceps muscle, and is termed the bicipital groove.

Cervix humeri.

Immediately below the head of the humerus is situated that portion of the bone called the cervix humeri.

Capsular ligament.

The capsular ligament of this joint surrounds the head of the bone, and is attached to the whole circumference of the edge of the glenoid cavity, excepting where the tendon of the biceps muscle passes under it; and at that point it arises from a ligament which proceeds from the coracoid process to the edge of the glenoid cavity. The capsular ligament is also fixed to the two tubercles, and towards the axilla, to the neck of the humerus, just below its articular surface. This ligament is not of a uniform thickness; but at those parts where the joint is not defended

from injury by the tendinous insertions of muscles, the capsular ligament itself is thickened, and is capable of sustaining great violence; and this difference is remarkably shewn in that part of the ligament which is placed in the axilla, it being of a strong tendinous nature.

Muscles of protection to the joint.

Four muscles are destined to move the os humeri, and to strengthen the capsular ligament. The first, the supra-spinatus, which arises from the fossa supra-spinata, covers the head of the bone, blends its tendon with the capsular ligament, and is inserted into the larger tubercle; the second, the infra-spinatus muscle, which proceeds from the fossa infra-spinata, adheres to the back part of the capsular ligament, and is also fixed to the greater tubercle; the third, the teres minor, which arises from the lower edge of the scapula, adheres to the back part of the capsular ligament, and is inserted into the greater tubercle, and into the cervix humeri; the fourth, is the subscapularis muscle, which fills up the venter, or inner concave surface of the scapula; it passes over the inner side of the head of the bone, and is fixed to the smaller tubercle, firmly adhering to the capsular ligament as it passes over its inferior and inner surface. It is between the subscapularis muscle, and the teres minor, that the capsular ligament is found of great strength, as there are no muscles inserted into that part to protect the joint from injury.

Muscles of motion to the joint.

The deltoid muscle, the coraco-brachialis, and the teres major, which are also muscles of this joint, are not united with the capsular ligament as the other muscles, being only destined for the motion, and not particularly for the projection of the shoulder-joint.

Tendon of the biceps.

The tendon of the long head of the biceps protects the upper part of the joint, where it otherwise would be weak; for this tendon is situated between that of the supra-spinatus and subscapularis: it arises from the upper point of the edge of the glenoid cavity of the scapula, and passes over the head of the bone into the groove between the two tubercles and the portion of the capsular ligament. Reflected towards the articular cartilage

of the os humeri it adheres to the surface of this tendon, so that the synovia is prevented from escaping.

Cause of the frequency of dislocation.

The shoulder-joint has a greater extent and variety of motion than any other joint in the body; and its dislocations are, consequently, more frequent than those of all the other joints in the body collectively: those of the ancle-joint being next in frequency.

DISLOCATIONS OF THE OS HUMERI.

Four kinds of dislocation.

This bone is liable to be thrown from the glenoid cavity of the scapula in four directions; three of these luxations are complete, and one is only partial.

Downwards and inwards.

The *first* is downwards and inwards; it is usually called the dislocation into the axilla, and in this accident the bone rests upon the inner side of the inferior costa of the scapula.

Forwards.

The *second* is forwards upon the pectoral muscle, when the head of the os humeri is placed below the middle of the clavicle, and on the sternal side of the coracoid process.

Backwards.

The *third* is the dislocation backwards, when the head of the bone can be both felt and distinctly seen, forming a protuberance on the back and outer part of the inferior costa of the scapula, and situated upon its dorsum.

Partial dislocations.

The *fourth* is only partial, when the anterior portion of the capsular ligament is torn through, and the head of the bone is found resting against the coracoid process of the scapula, on its outer side.

Of the dislocation upwards.

It has been supposed that a dislocation of the os humeri upwards might occur, but it is obvious that this could only happen under fracture of the acromion. It is an accident which I have never seen.

Dislocation in the axilla.

Of the dislocation in the axilla I have seen a multitude of instances; of that forwards on the inner side of the coracoid process several, although these are much less frequent than that in the axilla; of the dislocation backwards I have seen only two instances during the practice of my profession for thirty-eight

PLATE XV.

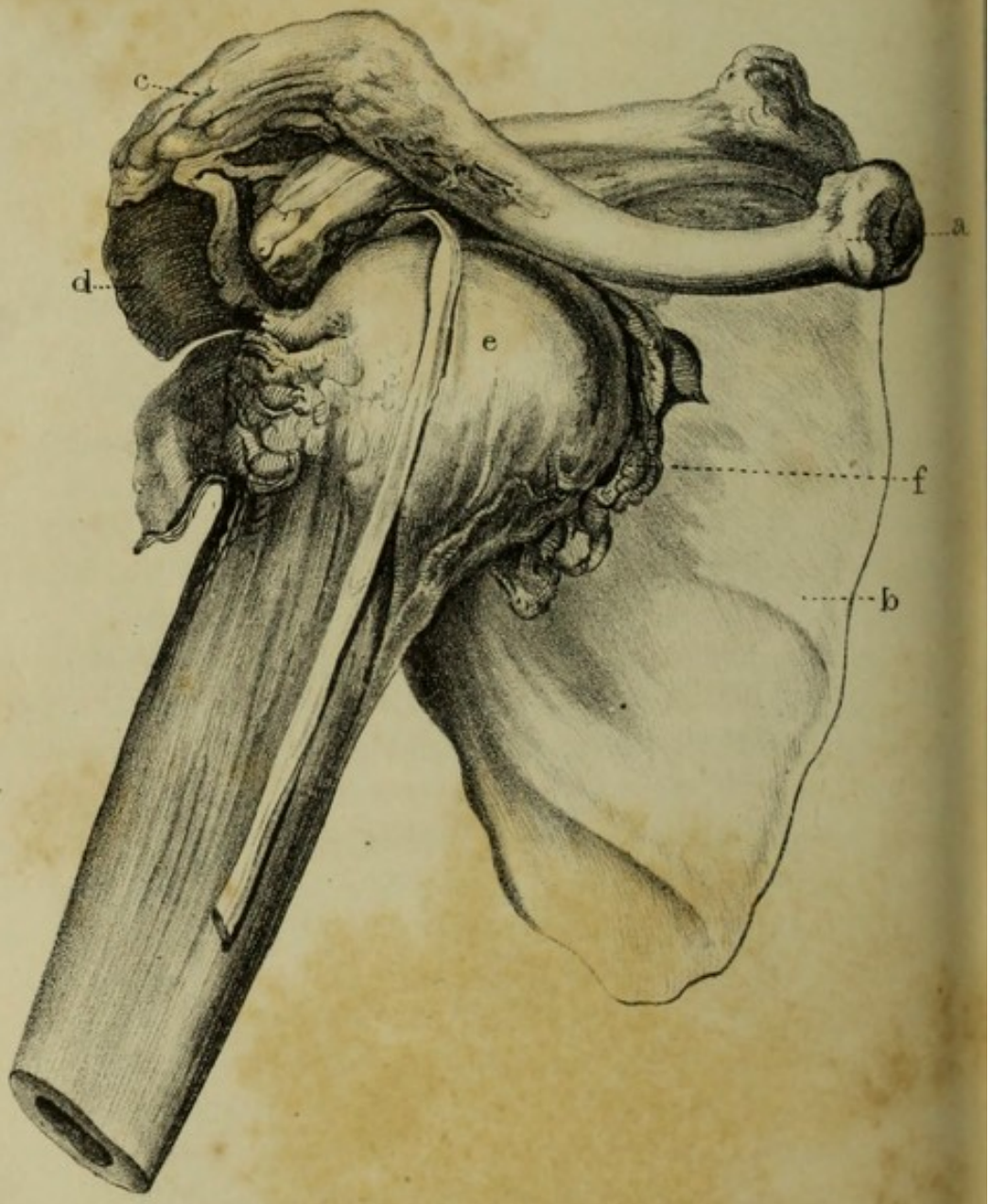


PLATE XV.

Dislocation of the os humeri forwards, under the clavicle, and behind the pectoral muscle.

a, Clavicle.

b, Scapula.

c, Acromion.

d, Glenoid cavity of the scapula, from which the os humeri had been thrown, and on the inner side of this cavity is seen the coracoid process.

e, The head of the os humeri, with the tendon of the biceps passing over it; the head of the bone under the middle of the clavicle, in the centre of the scapula, and on the inner side of the coronoid process.

f, Portions of the new ligament, which inclosed the head of the bone.

years. I do not believe in any change of place after dislocation, when the muscles have once contracted, (except from subsequent violence, which is very uncommon,) beyond that slight change which pressure, by producing absorption, will sometimes occasion.

The bone is generally at once thrown into the situation which it afterwards occupies: so that, excepting from circumstances of great violence, the nature and direction of the dislocation are not subsequently changed.

DISLOCATION IN THE AXILLA.

Signs of dislocation into the axilla.

The usual signs in this dislocation are as follow: a hollow is produced below the acromion, by the displacement of the head of the humerus from the glenoid cavity, and the natural roundness of the shoulder is destroyed, because the deltoid muscle is flattened and dragged down with the depressed head of the bone. The arm is somewhat longer than the other, as the situation of the bone upon the inferior costa of the scapula is below the level of the glenoid cavity. The elbow is with difficulty made to touch the patient's side, from the pain produced in this effort by pressure of the head of the bone upon the nerves of the axilla; and upon this account it usually happens, that the patient himself supports his arm at the wrist or fore-arm with the other hand, to prevent its weight pressing upon these nerves. The head of the os humeri can be felt in the axilla, but only if the elbow be considerably removed from the side. I have several times seen surgeons deceived in these accidents, by thrusting the fingers into the axilla when the arm is close to the side, when they have directly said, "this is not a dislocation;" but upon raising the elbow, the head of the bone could be distinctly felt in the axilla; for that movement throws the head of the bone downwards and more into the axilla.

The motion of the shoulder is in a great degree lost, more especially in the direction upwards and outwards, for the patient can no longer raise his arm by muscular effort, and even the

surgeon generally finds some difficulty in overcoming its fixed position; it is usual, therefore, as a first question in detecting dislocation, to ask the patient if he can raise his arm to his head, and if there be dislocation, the answer is invariably that he cannot. The power of rotation of the arm is also lost; but the motion of the limb forwards and backwards, as it hangs by the side, is still preserved. There is, however, great difference in respect to the motion of the limb, and this depends upon the age of the patient: in old people the relaxed state of the muscles will not only admit of motion, but allow the surgeon to carry the arm to the upper part of the head. On moving the limb, a slight crepitus will sometimes be felt from inflammatory effusion, and from the escape of synovia, but by the continuance of the motion this soon ceases; the crepitus, however, in these cases, is never so strong as that which a fracture produces. The central axis of the arm is changed, for the central line runs into the axilla.

In this accident numbness of the fingers frequently occurs from the pressure of the head of the bone upon a nerve or the nerves of the axillary plexus.

These are circumstances of the greatest moment: but it will be seen that the accident can be detected principally by the fall of the shoulder, by the presence of the head of the bone in the axilla, and by the loss of the natural motions of the joint. But a few hours make these appearances much less decisive, from the extravasation of blood, and from the excessive swelling which sometimes ensue; when, however, the effused blood has become absorbed, and the inflammation has subsided, the marks of the injury become again decisive. At this period it is that surgeons of the metropolis are usually consulted; and if we detect a dislocation which has been overlooked, it is our duty, in candour, to state to the patient, that the difficulty in the detection of the nature of the accident is exceedingly diminished by the cessation of inflammation, and the absence of tumefaction.

Circumstances that render the nature of the accident difficult to be ascertained.

It may be also observed, that there is great difference in the facility with which the accident is discovered in thin persons of ad-

Circumstances that render it easy.

vanced age, and in those who are loaded with fat; or who have, by constant exertion, rendered their muscles excessively large.

DISSECTION OF THE DISLOCATION INTO THE AXILLA.

I have dissected two cases of recent dislocation downwards. A sailor fell from the yard-arm on the ship's deck, injured his skull, and dislocated the arm into the axilla. He was brought into St. Thomas's Hospital in a dying state, and expired immediately after he was put into his bed. On the following day I obtained permission to examine his shoulder, which I removed from the body for the purpose of obtaining a more minute examination; and the following were the appearances which I found. On removing the integuments, a quantity of extravasated blood presented itself in the cellular membrane, lying immediately under the skin, and in that which covers the axillary plexus of nerves, as well as in the interstices of the muscles, extending as far as the cervix of the humerus, below the insertion of the subscapularis muscle.

Appearances upon the dissection of the limb.

The axillary artery, and plexus of nerves, were thrown out of their course by the dislocated head of the bone, which was pushed backwards upon the subscapularis muscle. The deltoid muscle was sunk with the head of the bone. The supra and infraspinatus were stretched over the glenoid cavity and inferior costa of the scapula. The teres major and minor had undergone but little change of position; but the latter near its insertion, was surrounded by extravasated blood. The coraco-brachialis was uninjured. In a space between the axillary plexus and coraco-brachialis, the dislocated head of the bone, covered by its smooth articular cartilage and by a thin layer of cellular membrane, appeared. The capsular ligament was torn on the whole length of the inner side of the glenoid cavity, which would have admitted a much larger body than the head of the os humeri through the opening. The tendon of the subscapularis muscle, which covers the ligament, was also extensively torn. The opening of the ligament, by which the tendon of the long head of the biceps passed,

was rendered larger by laceration, but the tendon itself was not torn. The head of the os humeri was thrown on the inferior costa of the scapula, between it and the ribs; and the axis of its new situation was about an inch and a half below that of the glenoid cavity, from which it had been thrown.

The second case which I had an opportunity of examining, was one in which the dislocation had existed five weeks, and in which very violent attempts had been made to reduce the dislocated bone, but without success. The subject of the accident was a woman fifty years of age. All the appearances were distinctly marked; the deltoid muscle being flattened, and the acromion pointed; the head of the bone could also be distinctly felt in the axilla; the skin had been abraded during the attempts at reduction, and the woman apparently died from the violence used in the extension. Upon exposing the muscles, the pectoralis major was found to have been slightly lacerated, and blood effused; the latissimus dorsi and teres major were not injured; the supra-spinatus was lacerated in several places; the infra-spinatus and teres minor were torn, but not to the same extent as the former muscle. Some of the fibres of the deltoid muscle, and a few of those of the coraco-brachialis, had been torn; but none of the muscles had suffered so much injury as the supra-spinatus. The biceps was not injured.

Having ascertained the injury which the muscles had sustained in the extension, and, in some degree, the resistance which they opposed to it, I proceeded to examine the joint.

The capsular ligament had given way in the axilla, between the teres minor and subscapularis muscles; the tendon of the sub-scapularis was torn through at its insertion into the lesser tubercle of the os humeri; the head of the bone rested upon the axillary plexus of nerves and the artery. Having determined these points by dissection, I next endeavoured to reduce the bone, but finding the resistance too great to be overcome by my own efforts, I became very anxious to ascertain its origin. I therefore divided one muscle after another, cutting through the coraco-brachialis,

teres major and minor, and infra-spinatus muscles; yet still the opposition to my efforts remained, and with but little apparent change. I then conceived that the deltoid must be the chief cause of my failure, and by elevating the arm, I relaxed this muscle; but still could not reduce the dislocation. I next divided the deltoid muscle, and then found the supra-spinatus muscle my great opponent, until I drew the arm directly upwards, when the head of the bone glided into the glenoid cavity. The deltoid and supra-spinatus muscles, are those which most powerfully resist reduction in this accident.

It appears from these dissections, that the best direction in which the arm may be extended for reduction, is at a right angle with the body, or directly horizontally, rather than obliquely downwards: as the deltoid, supra and infra-spinati muscles, are, in this position of the limb, thrown into a relaxed state, and these muscles are, as I have explained, the principal sources of the resistance. The biceps is to be relaxed by slightly bending the elbow. The arm may be extended directly outwards, in the line between the pectoralis major on the outer side, and the latissimus dorsi and teres major on the inner; but if there be any deviation from this line, it will be better rather to advance the arm, to lessen the power of the pectoralis major.

This dissection explains the reason why the arm is sometimes easily reduced soon after the dislocation, by raising it suddenly above the horizontal line, and placing the fingers under the head of the bone, so as to raise it towards the glenoid cavity, which, as every tyro knows, will sometimes prove effectual; because, in this position, the muscles of opposition are relaxed so as to oppose no resistance to reduction.

DISSECTION OF A DISLOCATION WHICH HAD BEEN LONG UNREDUCED.

Dissection of an old dislocation.

The head of the bone is found altered in its form; the surface towards the scapula being flattened, a complete capsular ligament covers the head of the os humeri. The glenoid cavity is completely filled by ligamentous matter, infused by a slow inflammatory process; in this ligamentous matter are suspended small

portions of bone, which appear to be of new formation, as no portion of the scapula or humerus is broken; a new cavity is formed for the head of the os humeri on the inferior costa of the scapula, but this is glenoid, like that from which the os humeri had escaped.

Causes of dislocation into the axilla.

The common causes of dislocation of the os humeri into the axilla are, falls upon the hand while the arm is raised above an horizontal line, by which the head of the bone is thrown downwards; also a fall upon the elbow, when the arm is raised from the side: but the most frequent cause is a fall directly upon the shoulder on some uneven surface, by which the head of the bone is driven downwards, whilst the muscles are but ill prepared to resist the shock.

Frequency of its recurrence.

When the arm has been once dislocated, if great care be not taken of the limb after its reduction, it is extremely liable to a recurrence of the accident. I remember, particularly, a carpenter, who used to be a frequent visitor at Guy's Hospital for several years, for the purpose of having his shoulder reduced. Slighter causes than that which originally produced it, will renew the dislocation; I have known it to recur from the act of throwing up the sash of a window. During my apprenticeship at St. Thomas's Hospital, in going through the wards early one morning, I was directed to see a man who had just dislocated his shoulder, which he had frequently done before, as he was lying in bed; and upon inquiring how it had happened, the man replied, that it occurred merely in the effort of rubbing his eyes and stretching himself upon waking; but this disposition to the recurrence of dislocation may be prevented, by directing that the arm be kept fixed close to the side, and the shoulder rather elevated by a pad in the axilla, for three weeks after its reduction; during which time the ruptured tendon of the subscapularis, and the capsular ligament will be united: a process which motion greatly impedes, if not wholly prevents.

REDUCTION OF THE DISLOCATION IN THE AXILLA.

Means employed for reduction.

Various have been the means suggested for the reduction of the

head of the humerus, when dislocated downwards into the axilla; but, under the different circumstances attending this accident, different means must be employed: the first, and that which I usually adopt in my private practice in all recent cases, is

By the Heel in the Axilla:

And the best mode of its application is as follows. The patient should be placed in the recumbent posture, upon a table or sofa, near to the edge of which he is to be brought; the surgeon then binds a wet roller round the arm immediately above the elbow, upon which he ties a handkerchief; then with one foot resting upon the floor, he separates the patient's elbow from his side, and places the heel of his other foot in the axilla, receiving the head of the os humeri upon it, whilst he is himself in the half sitting posture by the patient's side. He then draws the arm by means of the handkerchief, steadily for three or four minutes, when, under common circumstances, the head of the bone is easily replaced; but if more force be required, the handkerchief may be changed for a long towel, by which several persons may pull, the heel still remaining in the axilla. I generally bend the fore-arm nearly at right angles with the os humeri, because it relaxes the biceps, and consequently diminishes its resistance. I have, in many cases, extended from the wrist, by tying the handkerchief just above the hand, but more force is required in this than in the former mode, although it has this advantage, that the bandage is less liable to slip. In recent cases it very rarely happens that this mode of extension fails, and it is so easily applied in every situation, that I have recommended all our young men to employ it in the first instance, when called to this accident.

Heel in the axilla.

Second Mode.

Second mode.

But in those cases in which the muscles are of very considerable strength, and the dislocation having existed for several days, the muscles have become permanently contracted, so that the limb is

strongly fixed in its new situation, more force is required, and the following means should be employed. The patient must be placed upon a chair, and the scapula fixed by means of a bandage, which allows the arm to pass through it; that which we use at our hospital is a girth buckled on the top of the acromion, so as to raise the bandage high in the axilla, and thus enable it more completely to fix the scapula, which is the *principal object* to be attended to, as otherwise all efforts will be inefficient. When I first saw the mode of reduction practised thirty-eight years ago, a round towel was used instead of this bandage, which was placed in the axilla, and crossed the chest; but it appeared to me that by this means the lower angle of the scapula alone was fixed, and that the glenoid cavity was drawn with the arm when extension was made: I directed, therefore, that the towel should be tied over the opposite shoulder with a handkerchief, so that it should be raised in the axilla on the injured side, and thus embrace a larger surface of the scapula; but still I found the scapula drawn from the side with the arm, and therefore had the bandage made as described. A wet roller is next to be bound around the upper arm just above the elbow, from which situation it cannot slip; and upon this a very strong worsted tape is to be fastened, in a manner to be described when speaking of the reduction of dislocated fingers. The arm should then be raised at right angles with the body, and if there be much difficulty in the reduction, it should be elevated above the horizontal line, more completely to relax the deltoid and supra-spinatus muscles. Two persons should then draw from the bandage affixed to the arm, and two from the scapular bandage, with a steady, equal, and combined force; jerking should be entirely avoided, and every aim at quick reduction should be discountenanced: *slowly and steadily* should be the word of command from the surgeon; who, after the extension has been kept up for a few minutes, should place his knee in the axilla, resting his foot on the chair upon which the patient sits; he should then raise his knee by extending his foot, and placing his right hand upon the acromion, push it downwards and inwards, when the head of the

Application of the bandage.

bone will usually slip into its natural position. Whilst the extension is proceeding, I have seen a gentle rotatory motion of the arm diminish opposition of the muscles, and the bone suddenly slip into its place.

But when a limb has remained a considerable length of time dislocated; when the muscles are so powerfully contracted that the force of men cannot be so steadily exerted as to reduce the limb, after several attempts, the minds and bodies of the assistants becoming fatigued, and their efforts violent and unequal, then we employ the third mode of reduction—

By means of the Pulleys.

Pulleys.

And here let it be understood, that they are not adopted with a view of employing greater force, for that might be obtained by the aid of more persons; but they are introduced to enable the surgeon to employ the force gradually and equally; to avoid jerks and unequal extension, which, in protracted cases, the efforts of men are sure to produce. If therefore I saw a surgeon, as soon as the pulleys were fixed, draw them violently, and endeavour suddenly to reduce the limb, I should not hesitate at once to say, "That gentleman is ignorant of the principle upon which this mechanical power is employed, and has still this part of his profession to learn." For the application of the pulley the patient is to be seated between two staples, which are screwed into the wainscot on each side of him; the bandages are then applied, precisely as in the former mode, in which the extension is performed by men, and the force is applied in the same direction: the surgeon should first draw the pulley, as the class of people usually summoned to his assistance, being ignorant of the principle upon which it is employed, would use too great violence; he should draw gently and steadily, until the patient begins to complain of pain, and then cease, keeping up the degree of extension, and conversing with the patient to direct his mind to other objects. In two or three minutes, more force should be applied, and continued until pain be again complained of, when the surgeon should again cease

Application of the pulley.

to increase the force; and thus he should proceed for a quarter of an hour, at intervals slightly rotating the limb. He should, when he has applied all the extension he thinks right, give the string of the pulley to an assistant, desiring the existing degree of extension to be supported; then, putting his knee in the axilla, and resting his foot upon the chair, he should gently raise and push back the head of the bone towards the glenoid cavity, when the bone will pass into its socket; this takes place generally without the snap which is heard when other means are employed, yet both the surgeon and the patient are aware of some motion of the head of the bone at the time*. If the pulleys be thus employed the extension will be conducted infinitely more steadily and effectually than when performed by men. In my hospital practice I ordered the patient to be bled, and put into a warm bath at the temperature of 100 to 110; and I give him a grain of tartarized antimony every ten minutes until he becomes faint; then I order him to be removed from the bath, to be wrapped in a blanket, and immediately placed upon a chair for extension, before his muscles have had time to recover,—which expedient lessens the necessity of employing very considerable force. Mr. Henry Cline, surgeon to St. Thomas's Hospital, son to my most excellent master, and who would have made an excellent practical surgeon if the hand of death had not prematurely deprived the world of his useful talents, was in the habit of directing his patients to support a weight for a length of time before the extension was begun, with a view of fatiguing the muscles, and lessening their power of resistance. In apartments where it is not convenient to place the pulleys in the walls, I have fixed them in the floor, on each side of the patient, who must, under these circumstances, sit upon the floor. When the reduction has been effected, a small cushion should be placed in the axilla, and fixed there by a stellate bandage, to prevent the head of the

Efficacy in producing a tendency to syncope.

Constitutional means of assisting reduction.

Means of preventing the head of the bone slipping from its situation immediately after the reduction.

* One of our pupils, a Mr. Bartlett of Ipswich, has invented a small spring by means of which the strings are attached to the pulley, and which can suddenly detach them while the knee is in the axilla. This instrument may sometimes be useful.

bone from again slipping out of its situation, which the excessive relaxation of the muscles would readily permit: but the cushion should not be so large as to separate the arm from the side. The sling is to be also worn to support the arm.

There is still a fourth mode of reducing the dislocation into the axilla, which is applicable to recent dislocations, to delicate females, and to very old, relaxed and emaciated persons, viz.:

By the Knee in the Axilla.

Fourth mode of reduction.

The patient is seated upon a low chair, the surgeon placing himself by him, separates the dislocated arm from the side sufficiently to admit his knee into the axilla, and resting his foot upon the side of the chair, he places one hand upon the os humeri, just above the condyles, and the other upon the acromion scapulæ; he then pulls down the arm over the knee, and in this manner reduces the dislocation. Even in persons of powerful muscles, I have known this mode succeed, when the patient remained in the state of intoxication in which he was found when the accident happened.

The use of the Ambe.

The Ambe has been recommended for the reduction of dislocations in the axilla; and this instrument was, in the last century, improved by the addition of a screw for the purpose of rendering its extension more gradual. It may succeed very well in recent cases, and in those persons whose muscles are not very powerful, but when a continued extension must of necessity be used to reduce the bone, as its fixed point of action is upon the ribs of the patient, it produces too much injury to the side, is too painful to be borne long, and is, therefore, an instrument which cannot be recommended for general use.

Mr. Kirby, surgeon in Dublin, has lately advised an ingenious mode of applying force in dislocations of the shoulder: the scapula being fixed and the bandage applied to the arm, the patient sits upon a mattress which is laid upon the floor, and the assistants, to whose management the extension and counter-extension are consigned, place themselves at his side, sitting opposite to each other,

and disposing their legs so that the soles of their feet are opposed to each other, behind and before the patient. If occasion should require a greater force than the power of two men, another assistant or more may be placed at the backs of the first two, sitting close up to them with their faces turned towards the patient; the extension is now made, with the arm raised nearly to a right angle with the body, and in the direction forwards or backwards, as the circumstances of the case may require. The force should be maintained until it is perceived that the head of the bone (which can be easily felt, and should be pressed upon during the operation) has moved from its new situation; and when the head of the bone is found to change its position, the assistants should slowly diminish their force, while the surgeon directs it towards the glenoid cavity, by pressing the elbow to the side of the patient and slightly raising it.

Slight force necessary for reductions after repeated dislocation.

When a person has frequently dislocated his shoulder, a very slight effort is sufficient to restore the limb to its place; and I know a gentleman in the country who has frequently returned the dislocated head of the humerus into its situation, by walking up to a gate, reaching over as far as he could, and then holding by one of its lower bars, the upper bar of the gate being pressed firmly into the axilla; still retaining his hold, he suffers his body to sink on the other side of the gate, and the head of the bone is thus pushed into the glenoid cavity; this mode of reduction is the same in principle as that of the heel in the axilla, which, as I have already mentioned, in three fourths of recent dislocations, is the best for effecting the reduction.

DISLOCATION FORWARDS, BEHIND THE PECTORAL MUSCLE, AND BELOW THE MIDDLE OF THE CLAVICLE.

Symptoms.

This species of dislocation is much more distinctly marked than the former. The acromion is more pointed, and the hollow below it, from the depression of the deltoid muscle, is much more considerable. The head of the os humeri can be readily and distinctly felt, and even seen, in thin persons, just below the clavicle; and

when the arm is rotated from the elbow, the protuberance may be seen to obey the motions of the arm.

Situation of the head of the humerus.

The coracoid process of the scapula is placed on the outer side of the head of the bone, so that the latter is situated between the scapula and the sternum, and is covered by the pectoralis major muscle. The arm is somewhat shortened, and the elbow is thrown more from the side, and farther back, than in dislocation into the axilla. The axis of the limb is much altered, being thrown inwards towards the middle of the clavicle.

The degree of pain in this accident.

The pain attending this accident is slighter than when the head of the os humeri is thrown into the axilla, because the nerves of the axillary plexus are less compressed; but the motions of the joint are much more materially affected; the head of the bone becoming fixed by the coracoid process and neck of the scapula on the outside, and by the clavicle above: while the muscles of the scapula, as the supra and infra spinati, and teres minor, being put upon the stretch, confine all its motions inwards and backwards. If, therefore, the arm be attempted to be brought forwards, the head of the bone strikes against the clavicle: if outwards, from the side, the coracoid process stops it: its motion backwards, however, is confined not by bone, but by the resistance of muscles. But the strongest diagnostic marks of this dislocation are these; the head of the bone is below the clavicle: the elbow is separated from the side, and thrown backwards; and the rotation of the arm gives motion to the head of the bone under the clavicle.

Diagnostic marks.

DISSECTION OF THE DISLOCATION FORWARDS.

The head of the os humeri is, in this accident, thrown on the inner side of the neck of the scapula, between it and the second and third ribs. I have had no opportunity of dissecting a recent accident of this kind; but in the Museum at St. Thomas's Hospital there is a beautiful specimen of one in a limb which had been long dislocated and which was removed from the shoulder of a patient by Mr. Green, and dissected by Mr. Key, who gave me the following account of the appearances:—The head of the

bone was thrown on the neck and part of the venter of the scapula, near the edge of the glenoid cavity, and immediately under the notch of the superior costa: nothing intervened between the head of the humerus and scapula, the subscapularis being partly raised from its attachment to the venter. The head was situated on the inner side of the coracoid process, and immediately under the edge of the clavicle, without having the slightest connexion with the ribs; indeed, this must have been prevented by the situation of the subscapularis and serratus magnus muscles between the thorax and humerus. The tendons of all the muscles attached to the tubercles of the humerus were perfect, and are shewn in the preparation. The tendon of the biceps was not torn; and it adhered to the capsular ligament. The glenoid cavity was completely filled up by ligamentous structure; still, however, preserving its general form and character. The tendons of the supra and infra-spinatus, and teres minor muscles, adhered by means of bands to the ligamentous structure occupying the glenoid cavity; and to prevent the effects of friction between the tendons and the glenoid cavity in the motions of the arm, a sesamoid bone had been formed in the substance of the tendons. The newly-formed socket reached from the edge of the glenoid cavity to about one-third across the venter. A complete lip was formed around the new cavity, and the surface was irregularly covered with cartilage. The head had undergone considerable change of form, the cartilage being in many places absorbed. A complete new capsular ligament had been formed.

Appearances on dissection.

The pectoralis minor is not mentioned in this dissection; but from the natural situation of the coracoid process, into which this muscle is inserted, it must have passed over the head of the os humeri, as did the pectoralis major.

Causes of dislocation.

The usual causes of this dislocation are, either a fall upon the elbow, or a violent blow upon the shoulder, as in the last-described dislocation. If it be a blow upon the elbow which has produced the accident, it must have been inflicted at a time when the elbow was thrown behind the central line of the body; and when the

shoulder received the blow, the head of the bone must have been driven forwards and inwards.

REDUCTION OF THE DISLOCATION FORWARDS.

In this, as in the former case, we can usually succeed in effecting reduction by placing the foot in the axilla, and by extending the arm in the same manner; excepting that, in this dislocation, the foot is required to be brought more forward to press on the head of the bone, and the arm should be drawn obliquely downwards, and a little backwards; but in those cases in which some days have elapsed before reduction has been attempted, continued extension will be necessary; and, to employ it steadily and effectually, the pulleys should be used.

The same bandage is required as in the dislocation in the axilla, whether the power used be applied through the medium of pulleys, or directly by men. The arm should be bent to relax the biceps muscle; but the principal circumstance to be considered is, the direction in which the bone is to be drawn, and the best direction is slightly downwards; for if it be drawn horizontally, the head of the os humeri is pulled against the coracoid process of the scapula, and a difficulty created which may be avoided. The principle upon which the pulley is employed, and the manner in which the extension is supported, are the same as in the dislocation into the axilla; but the direction is different, the arm being drawn obliquely downwards and backwards. The extension must be kept up longer than in the dislocation downwards, as the resistance is greater; but as soon as the bone is felt to move from its situation, the surgeon should give the strings of the pulley to an assistant, and putting his knee or heel against the head of the bone at the fore part of the shoulder, should push it back towards the glenoid cavity: but this step is not of the smallest utility until the bone has been drawn below the level of the coracoid process: and whilst the surgeon is thus pressing the head of the bone backwards, he should pull the arm forwards from the elbow. This is the plan which I have found by far the most effectual in reducing the dislocation forwards.

DISLOCATION OF THE OS HUMERI ON THE DORSUM SCAPULÆ.

Diagnostic signs.

In this dislocation, the head of the bone is thrown upon the posterior surface of the inferior costa of the scapula. It is an accident which cannot be mistaken, as there is a protuberance formed by the bone upon the scapula, which immediately strikes the eye; and when the elbow is rotated, this protuberance rolls also. The dislocated head of the bone may be easily grasped between the fingers, and distinctly felt resting below the spine of the scapula; the motions of the arm are impaired, but not to the same extent as in either of the other states of luxation.

The unfrequent occurrence of this accident.

Two cases of this accident have occurred in Guy's Hospital in thirty-eight years; the first during my apprenticeship. It happened during the anatomical lecture at St. Thomas's Hospital. The surgery-man came to the theatre, and announced that there was a dislocation of the shoulder at Guy's Hospital; when Mr. Cline went over with the students to see the accident, and met Mr. Foster, under whose care the patient was admitted. The nature of the accident was at once obvious, from the projection of the head of the bone on the dorsum scapulæ. The bandages were applied in the same manner as if the head of the humerus had been in the axilla, and the extension was made in the same direction as in that accident. During the progress of the adjustment of the apparatus, some conversation took place between Mr. Cline and Mr. Foster, as to what variation in direction there should be given to the bone, if the first attempt should not succeed; but in less than five minutes, the bone slipped into the glenoid cavity with a loud snap.

The second case, which occurred several years after, was easily reduced by the dressers, under the same treatment.

PARTIAL DISLOCATION OF THE OS HUMERI.

I believe this is not a very rare accident, and it shews itself by the following marks.

Symptoms.

The head of the bone is drawn forwards against the coracoid process; there is a depression opposite the back of the shoulder-

joint, and the posterior half of the glenoid cavity is perceptible, from the advance of the head of the bone; the axis of the arm is thrown inwards and forwards; the inferior motions of the limb are still capable of being performed; but its elevation is prevented by the head of the humerus striking against the coracoid process; there is an evident protuberance formed by the head of the bone in its new situation, which is felt readily to roll when the arm is rotated.

Case. Mr. Brown, aged fifty years, was thrown from his chaise on his shoulder, and upon examination after the accident, the roundness of the shoulder was lost, and there was a hollow under the acromion; the head of the bone projected forwards and inwards against the coracoid process; the arm could be raised from the side if brought forwards, but with difficulty raised directly upwards. By extension of the shoulders backwards, I at last brought the head of the bone to the glenoid cavity, but it directly again slipped forwards when extension ceased. This dislocation differs from that forwards under the pectoral muscle, the head of the os humeri being still on the scapular side of the coracoid process, while in the complete dislocation forwards, it is thrown on its sternal side.

Cause. This accident happens from the same causes which produce the dislocation forwards. The anterior part of the ligament is torn, and the head of the bone has an opportunity of escaping forwards to the coracoid process.

Means of reduction, and of preventing the recurrence of the dislocation. The mode for its reduction will be the same as that for the dislocation forwards, but it is necessary to draw the shoulders backwards to bring the head of the bone to the glenoid cavity; and immediately when the reduction is completed, the shoulders should be bound back by the clavicle-bandage, or the bone will immediately again slip forwards against the coracoid process.

Dislocation of the shoulder complicated with fracture. Dislocations of the shoulder are sometimes complicated with fracture of the head of the os humeri; and we have a preparation in the Museum at St. Thomas's Hospital, in which the greater tubercle at the head of the bone had been broken off, and the os humeri thrown into the axilla. This complication of accident does

not add to the difficulty of reduction, but, on the contrary, rather facilitates the return of the bone, as the insertion of the principal opponent muscles, the supra and infra spinati, is removed; but it increases the difficulty of retaining the bone within the glenoid cavity after the reduction is completed.

FRACTURE OF THE NECK OF THE OS HUMERI, WITH THE DISLOCATION FORWARDS, UNDER THE PECTORAL MUSCLE.

Case. Mr. John Blackburn fell from his horse, many years ago, at Enfield, and dislocated his shoulder forwards. Mr. Lucas, sen., surgeon of Guy's Hospital, was sent for; who said, after he had made considerable extension, that the bone was reduced. Five weeks afterwards, Mr. B. came to London, and shewed me his shoulder, when, the appearances of dislocation still remaining, I advised a further extension, to which he would not consent. I had frequent opportunities of seeing him afterwards, but the shoulder exhibited the same appearances of dislocation. He had, however, the power of using the hand and arm in all directions excepting upwards, but could not raise his arm to form a rectangle with his body; and he suffered but little pain or inconvenience.

In June 1824, he died; and as he had always promised me the dissection of his shoulder if I survived him, I removed it in the presence of Mr. Arnott, surgeon of Greenwich Hospital, examined it with great care, and have the bones preserved. The deltoid, teres major, and coraco-brachialis muscles, did not appear to me to be altered; the supra-spinatus was lessened, as was the teres minor, which had lost considerably of its natural colour: the infra-spinatus was stretched; the subscapularis, diminished and rounded by the projection of the head of the os humeri, adhered to its cartilaginous surface. The capsular ligament was torn under the subscapularis muscle, but every other part was entire. The head of the os humeri had been thrown forwards on the inner side of the coracoid process, and had united by bone to the scapula; but its cartilage remained under the tendon of the subscapularis.

The neck of the os humeri was broken through, and had been covered by a granular ligamentous substance; but the parts were kept together only by the ligament of the joint, and a new and very useful joint had been formed. The outer edge of the glenoid cavity remained: the surface of the glenoid cavity was granulated and ligamentous. The greater tubercle of the os humeri was exceedingly increased, and the tendon of the biceps passed through the bone. The tubercles were separated with the body of the bone, and not with its head.

This, then, was a case of fracture of the cervix humeri within the capsular ligament, terminating in a ligamentous union.

COMPOUND DISLOCATION OF THE OS HUMERI.

An injury of excessive violence will sometimes occasion the head of the bone to be forced through the integuments, in the dislocation forwards. It happened in the practice of Messrs. Saumarez and Dixon, of Newington; and for the following detail of its circumstances I am indebted to Mr. Dixon.

"My dear Sir:—I feel pleasure in answering the queries you have put. The accident happened to Robert Price, fifty-five years of age, who, on returning in a state of intoxication from the Borough, fell down upon his shoulder. Upon examination, I found that the head of the bone, having passed through the integuments in the axilla, lay exposed upon the anterior part of the chest, and situated over the pectoral muscle on the right side. The reduction of the dislocation was easy, being performed without the necessity of raising him from the state of stupor and insensibility in which he was lying, by the usual method of extension and counter-extension, taking care only to guide the bone into the glenoid cavity; he was then put to bed and an evaporating lotion applied. On the following morning considerable pain and tension came on; he was bled, and purged freely; a large poultice was applied over the joint, and anodynes were given to lessen the pain and procure

sleep; leeches were frequently applied in the neighbourhood of the joint for the first ten days or fortnight, after which, ā copious discharge of pus issued from the wound in the axilla. The constitution now felt the effects of so important an injury; he became irritable, restless, and lost flesh. Healthy pus was discharged freely from the joint for ten or twelve weeks, when it somewhat abated. A succession of small abscesses, situated in the cellular membrane surrounding the joint, were exceedingly troublesome for several months: some of them formed extensive sinuses, requiring to be freely dilated. The discharge of pus from the joint was kept up nearly twelve months, when it finally ceased, leaving the joint anchylosed, and the wound closed. He was quite recovered fourteen months after the accident, when he called on me, and felt gratified, by shewing how freely he could make use of the fore-arm, and handle his pen for all the purposes of business."

Treatment. Such a case will require an immediate reduction, by the means which I have described for the dislocation of the os humeri forwards; and, in general, the greater the violence doné to the injured limb, the more easy is the reduction, from the diminution of the constitutional powers which so great a shock produces. When the bone is replaced, lint dipped in blood is to be applied to the wound; or if the wound be large, a suture should be employed, and then the lint applied: adhesive plaster should be used to support approximation, and the limb should be kept close to the side by means of a roller passed round the body, including the arm, and thus preventing the least motion of the head of the bone: by these means the suppurative inflammation may be prevented, and the cure may proceed without protracted suffering, or any danger to the patient's life.

PARTIAL DISLOCATION OF THE OS HUMERI FORWARDS.

Case. Mr. Bachelor, of Southville, aged thirty-six, fell from a chaise on the 12th of November, and, as he supposes, pitched on his

shoulder. On rising, he could not move his right arm for ten minutes, when some sudden spasm gave him the power of moving it underhand. Inflammation succeeded; the shoulder became much swollen, with pain down the arm to the fingers, and particularly in the direction of the cubital nerve. On looking at the arm the same evening, he found that the os humeri appeared to be advanced.

It is two months since the injury, and the hand is now benumbed. There is much pain at the insertion of the biceps into the fore-arm, so that he has been often obliged to rise twice during the night to put his hand in warm water.

The appearances are, a projection of the acromion, and a hollow beneath it; the head of the os humeri rests against and under the coracoid process, and the scapular end of the clavicle is opposite to the middle of the head of the bone. The biceps muscle was relaxed and lessened; the coracoid process of the scapula was with difficulty felt above, and to the inner side of the head of the os humeri.

The principle of treatment in these cases is, to oppose the pectoralis major by a clavicle-bandage, with a broad strap over the head of the os humeri, and by bringing the elbow forward, to keep the head of the os humeri back.

DISLOCATION OF THE OS HUMERI BACKWARDS.

Case.

Mr. J. S. Perry, surgeon of St. Bartholomew's Hospital, had the kindness to send me the following case, for which I am much indebted to him. Our large hospitals in London should be made as conducive as possible to the advantage of the public, by a liberal and reciprocal communication.

A man fell from the roof of a coach, and struck the point of his left shoulder against a projecting stone. He suffered little pain from the accident; but finding himself incapable of using his arm, he came immediately to the hospital.

Upon examination, I found that the head of the humerus was

thrown upon the dorsum of the scapula, where it presented a considerable prominence, behind the glenoid cavity, and immediately under the spine of that bone. The vacancy beneath the acromion was not so remarkable as in the axillary dislocation. The arm was closely applied to the side, and slightly inverted, the elbow being directed rather anteriorly. Free motion was practicable forward and backward, but the limb could not be raised or carried across the breast without great difficulty.

Reduction was easily effected in the following manner:—The scapula being fixed, extension was made, by means of a cloth twisted around the elbow, for about three minutes; when, finding no disposition in the head of the bone to return to the cavity, although it was already in close contact with its lower and back margin, I made a fulcrum of my right hand in the axilla, and grasping the elbow in my left, readily succeeded in lifting it into its socket.

FRACTURES NEAR THE SHOULDER-JOINT, LIABLE TO BE MISTAKEN FOR DISLOCATIONS.

FRACTURE OF THE ACROMION.

Diagnostic symptoms.

This point of bone is sometimes broken; in which case, when the shoulders are compared, the roundness of the injured side is lost, and part of the attachment of the deltoid muscle being broken off, the head of the os humeri sinks towards the axilla as far as the capsular ligament will permit. On tracing the acromion from the spine of the scapula to the clavicle, just at their junction a depression is felt, from the fall of the fractured portion. If the distance be measured from the sternal end of the clavicle to the extremity of the shoulder, it will be found lessened on the injured side. If the surgeon raise the arm from the elbow, so as to put the deltoid muscle in motion, the natural form of the shoulder is directly restored; but the deformity returns immediately when the arm is again suffered to fall.

This accident is best detected and distinguished from dislocation by raising the arm at the elbow: having restored the figure of the

part, the surgeon places his hand upon the acromion and rotates the arm, when a crepitus can be distinctly perceived at the point of the shoulder, and along the superior portion of the spine of the scapula. The patient, as soon as the accident has happened, feels as if his arm were falling off, the shoulder dropping with a great sense of weight, and there being but little power to raise the limb.

Fracture of the acromion scapulæ will unite by bone, but it generally unites by ligamentous substance, in consequence of the difficulty which exists in producing adaptation, and in preserving the limb perfectly at rest during the period required for union. In Treatment. the treatment of this accident, the head of the os humeri is the splint which is employed to keep the acromion in its natural situation; and with this view the elbow is raised and the arm is fixed; thus the bone will be elevated to the inferior surface of the acromion, and if it be kept steadily in that position, it will support and keep in its place the broken process. The deltoid muscle should be also relaxed, and this is best effected by a cushion placed between the elbow and the side; for if the elbow be brought close to the side, the broken acromion is further separated. The arm should be raised as much as is possible, and the elbow be carried a little backwards, and then bound to the chest by a roller; in this position it should be kept firmly fixed for three weeks; every thing being done to prevent any motion of the bone. Very little inflammation succeeds this accident, and the disposition to ossific union is very feeble in the separated portions of bone.

If a pad be placed in the axilla, the broken portion becomes widely separated from the spine of the scapula, because it throws out the head of the os humeri.

FRACTURE OF THE NECK OF THE SCAPULA.

But the accident which is much more liable to be mistaken for Symptoms. dislocation, is the fracture through the narrow part of the cervix scapulæ, immediately opposite the notch of the superior costa; by which the glenoid cavity becomes detached from the scapula,

and the head of the bone falls with it into the axilla; the shoulder in this case falls; there is a hollow below the acromion from the sinking of the deltoid muscle, and the head of the os humeri can be felt in the axilla.

Case. A young lady was thrown from a gig, by the fall of the horse, in the Strand; and being carried to her house, a surgeon in the neighbourhood was sent for, who told her the shoulder was dislocated; by extension all the appearances of dislocation were removed, and he bound up the arm. On the following morning he requested me to see the case, as the arm he said was again dislocated. On examination I found the head of the bone in the axilla, and the shoulder so fallen and flattened as to give the accident many of the characters of dislocation; however, by elevating the shoulder, in raising the arm at the elbow, and the head of the bone from the axilla, it was immediately replaced; but when I gave up this support the limb instantly sank again. I then rotated the elbow, and pressing the coracoid process of the scapula with my fingers, by grasping the top of the shoulder directly felt a crepitus. Having satisfactorily ascertained the nature of the accident, I placed a thick cushion in the axilla, and drawing the shoulder into its natural position, secured it by the application of a clavicle-bandage, and in seven weeks it became united without deformity.

The degree of deformity produced by this accident, depends upon the extent of laceration of a ligament, which passes from the under part of the spine of the scapula to the glenoid cavity, and which is not generally described in anatomical books. If this be torn, the glenoid cavity and the head of the os humeri fall deeply into the axilla; but the displacement is much less if this remain whole.

Diagnostic marks. The diagnostic marks of this accident are three: *first*, the facility with which the parts are replaced; *secondly*, the immediate fall of the head of the bone into the axilla, when the extension is removed; and, *thirdly*, the crepitus which is felt at the extremity of the coracoid process of the scapula, when the arm is rotated. The best method of discovering the crepitus is, for the surgeon's

hand to be placed on the top of the shoulder, and the point of the fore-finger to be rested on the coracoid process; the arm being then rotated, the crepitus is directly perceived, because the coracoid process being attached to the glenoid cavity, and being broken off with it, although itself uninjured, the crepitus is communicated through the medium of that process.

Treatment of this accident.

The treatment of this fracture consists in attention to two principles. The first is to carry the head of the os humeri outwards; and the second, to raise the glenoid cavity and arm. The former is effected by a thick cushion placed in the axilla, which presses the head of the bone and glenoid cavity outwards, and this may be confined by the clavicle-bandage; the latter is produced by placing the arm in a short sling, and then the raised head of the os humeri supports the glenoid cavity and cervix scapulæ, and keeps it steadily in its place until union is produced. The time required for recovery from these accidents in the adult is, from ten to twelve weeks; in the very young all the motions of the limb are restored in a shorter period, but it is a long time before the limb recovers its strength.

FRACTURE OF THE NECK OF THE OS HUMERI.

Age.

The humerus is sometimes broken just below its tubercles, through its cervix. I have seen this accident happen both in old and in young persons, but it rarely occurs in middle age. In the young it happens at the junction of the epiphysis, where the cartilage is situated; and in the old it arises from the greater softness of this part of the bone.

Symptoms.

In this fracture the head of the bone remains in its place, but the body of the humerus sinks into the axilla, where its extremity can be felt; and it draws down the deltoid muscle, so as to lessen the roundness of the shoulder. Just as I was writing this account, a child was brought into Guy's Hospital with this accident, on which I made the following notes.

Its age was ten years. The symptoms of the injury were inability of moving the elbow from the side, or of supporting the

arm, unless by the aid of the other hand, without great pain. The tension which succeeded filled up the hollow which was at first produced by the fall of the deltoid muscle. When the head of the bone was fixed, the fractured extremity of the body of the humerus could be tilted under the deltoid muscle so as to be felt, and even seen, by raising the arm at the elbow. Crepitus could be perceived, not by rotating the arm, but by raising the bone and pushing it outwards. The cause of the fracture was a fall upon the shoulder into a saw-pit of the depth of eight feet.

It is in old persons that this accident is most liable to be mistaken for dislocation: for in them the flexibility of the joint is much diminished by it, and the changes of position of the bone are less easily produced.

Diagnostic symptoms.

The best diagnostic marks are the following. Embrace the head of the os humeri with the fingers and fix it, then rotate the arm at the elbow, and it will be found that the head of the bone does not obey the rotatory motion, as it is separated from the body of the humerus by the fracture; which is, in this case, external to the capsular ligament. The reduced bone in these instances unites in from three to six weeks, according to the age of the patient.

Treatment.

The treatment consists in applying a roller from the elbow to the shoulder-joint, in placing a splint on the inner and on the outer side of the arm, and in confining these by means of a roller. A cushion is then to be placed in the axilla, to throw out the head of the bone, and the arm is to be gently supported by a sling; for if it be much raised, the bone will overlap, and the union will be deformed.

STRUCTURE OF THE ELBOW-JOINT.

Bones.

This joint is composed of three bones—the lower extremity of the humerus, the upper part of the ulna, and the head of the radius. The extremity of the os humeri is expanded, and presents two lateral eminences, which are called its condyles, the internal of which is the most prominent; between these condyles the

PLATE XVI.

Fig. 1. A dislocation of the ulna backwards.

a, Os humeri.

b, Ulna.

c, Radius.

d, Insertion of the biceps flexor cubiti into the tubercle of the radius.

e, Olecranon thrown behind the os humeri.

f, Some appearance of injury to the internal condyle of the os humeri.

Fig. 2. Opposite view of the same preparation.

a, Os humeri.

b, Ulna.

c, Radius.

d, Insertion of the biceps into the tubercle of the radius.

e, Olecranon thrown backwards.

f, Head of the radius, which, by its pressure against the external condyle of the os humeri, has produced a socket there for itself.

Fig. 3. *Dislocation of the Radius.* The bone is thrown upon the external condyle, and upon the coronoid process of the ulna.

a, Os humeri.

b, Ulna.

c, Radius.

d, Olecranon.

e, Head of the radius. The coronary ligament and a part of the interosseous ligament is torn through, and the head of the bone is thrown upon the coronoid process of the ulna, and external condyle of the os humeri.

Fig. 1.

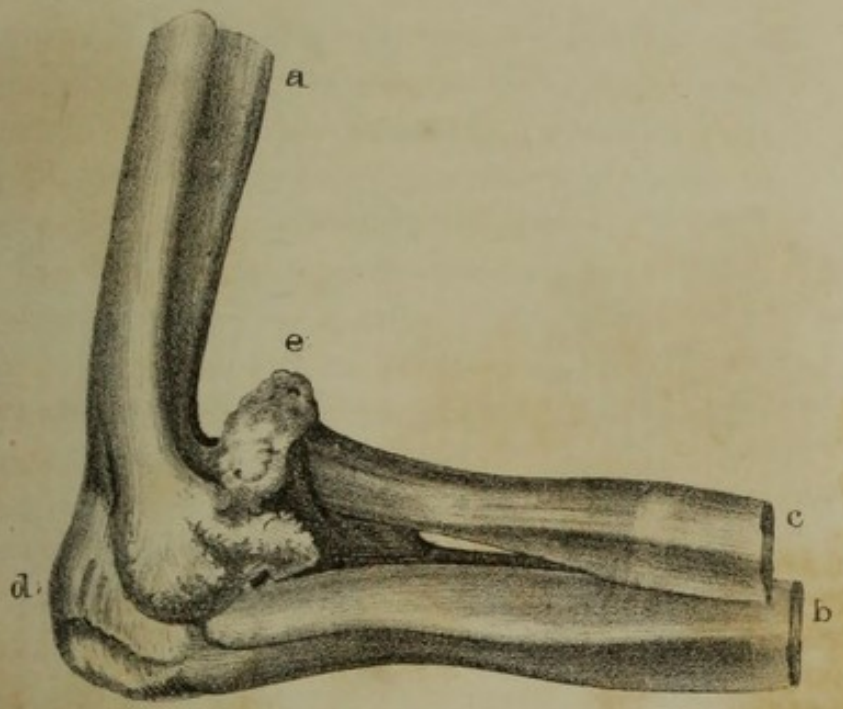


Fig. 2.

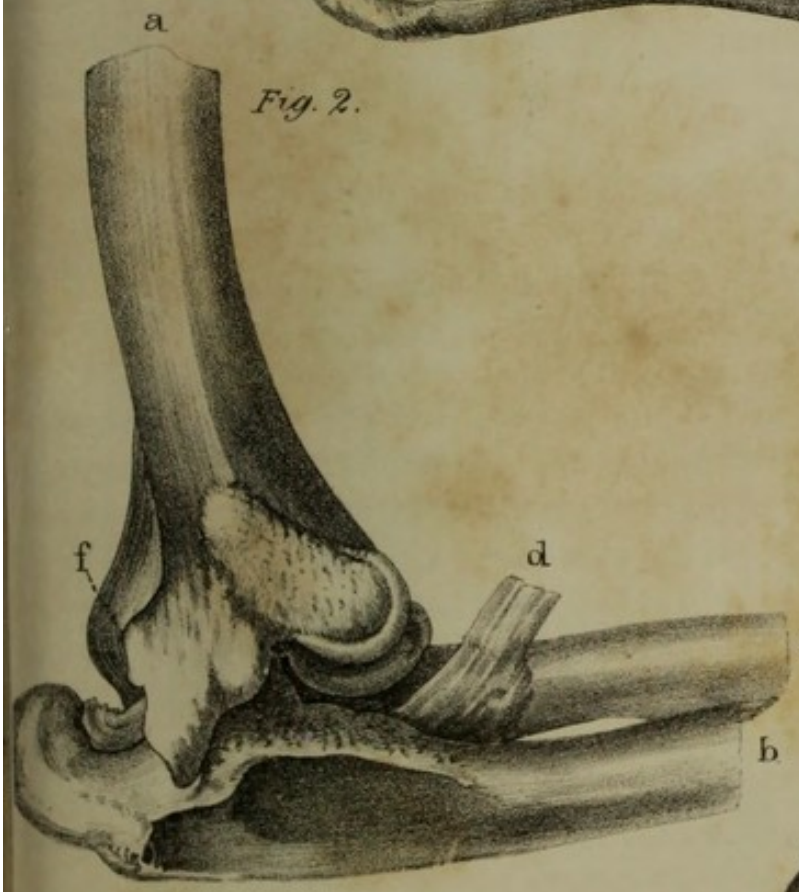
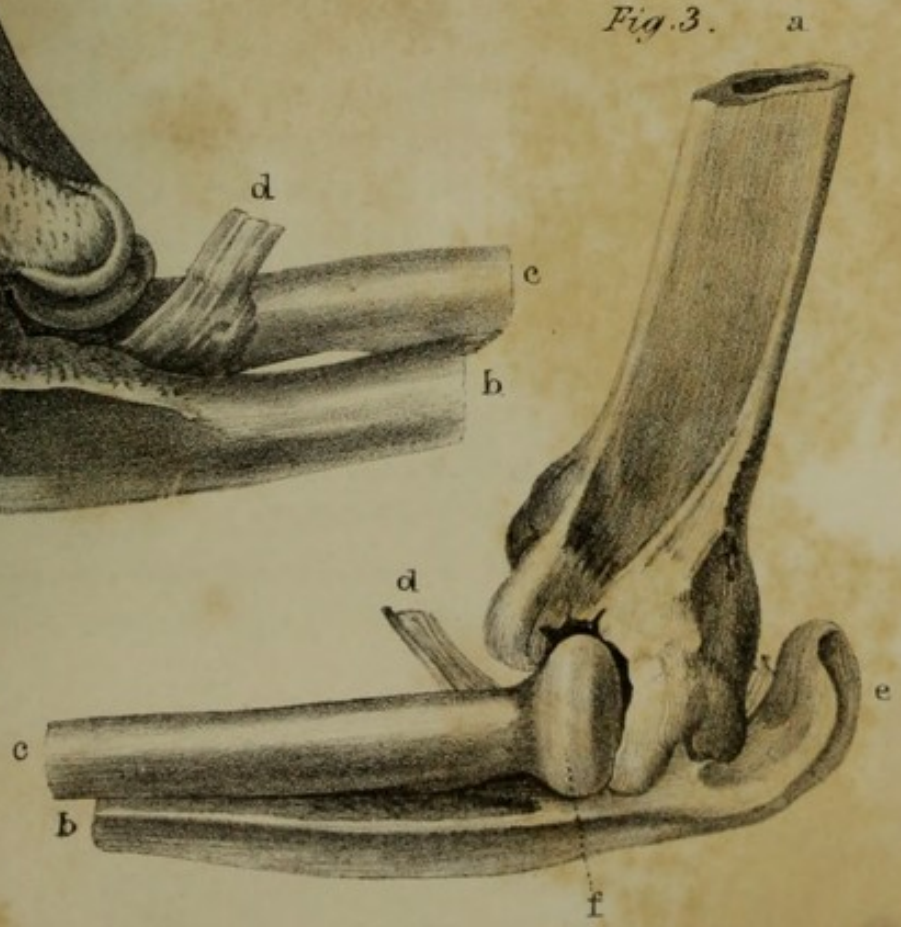


Fig. 3.



articular surface for the ulna is situated, which is in the form of a pulley; and above it, both anteriorly and posteriorly, is situated a deep cavity, with a thin partition intervening. On the lower extremity of the external condyle is placed an articular surface, on which the head of the radius is received. The upper extremity of the ulna forms two processes, with an articulatory surface between them, which is adapted to the pulley-like articular surface of the os humeri: both these surfaces of the ulna and humerus are covered with cartilage. The superior and posterior process of the ulna is called the olecranon, which forms the point of the elbow, and into which the triceps muscle is inserted. The anterior and smaller process is called the coronoid, which gives insertion to the brachialis internus. When the arm is extended, the point of the olecranon is received into the posterior cavity, between the condyles of the humerus; and when it is flexed, the coronoid process passes into the anterior hollow; so that these cavities are formed for the purpose of allowing free extension and flexion of the arm. The head of the radius is rounded, and rests upon the broad articular surface of the humerus, upon which it bends; on its inner side it is received into an articular cavity on the radial side of the coronoid process of the ulna, upon which the radius rolls; and thus all the motions of the fore-arm are performed. Immediately below its head the radius becomes smaller, and this part is called its cervix: at the distance of an inch below its head is seated a process which is called its tubercle.

Ligaments.

The ligaments which bind these bones together are the *capsular*, which is united with the condyles, and with the portion of bone above the cavities of the os humeri; it passes over the extremity of the humerus, and is united behind to the olecranon, and to the coronoid process on the fore part of the ulna; it is also connected to the coronary ligament of the radius. This ligament posteriorly is loose and slender, but on the fore part it is of considerable strength.

Capsular.

Coronary.

The *coronary* ligament surrounds the head of the radius: it is connected above with the capsular ligament, and below with the

neck of the radius, by a thin ligament of sufficient length to allow of rotation of the head of the bone; it is also attached to the fore and back part of the coronoid process of the ulna, at its lateral articulatory surface, and thus firmly unites the radius with the ulna, yet allows of the rotation of the former.

Brachio-cubital. There are four peculiar ligaments:—First, the *brachio-cubital*, or internal lateral ligament, which passes from the internal condyle of the os humeri into the coronoid process of the ulna.

Brachio-radial. Secondly, the *brachio-radial*, or external lateral ligament, which is fixed to the external condyle of the humerus, and to the coronary ligament of the radius; these ligaments give to the joint a strong lateral support.

Oblique. The third ligament is the *oblique*, which passes from the coronoid process of the ulna to the radius, just below its tubercle; and it is this ligament which limits the rotation of the radius.

A ligament also reaches from the inner side of the coronoid process to the olecranon; and when this latter process is broken off, it is this ligament, in some instances, which prevents its extensive separation.

Muscles. The muscles of the joint are, first, the *brachialis internus*, which passes over the anterior part of the condyles and capsular ligament to which it is attached: it is inserted, in an oblique direction, into the coronoid process, and into the body of the ulna just below it. The use of this muscle is to bend the fore-arm, and give support to the elbow-joint, by strengthening the capsular ligament. The next muscle is the *triceps*, which arises by one of its heads from the inferior costa of the scapula, and by its two others from the os humeri: it descends to the capsular ligament, to the loose portion of which it adheres, and is inserted into the point of the olecranon. This muscle extends the arm, and draws up and supports the capsular ligament. Thirdly, the *anconeus*, which arises from the back part of the external condyle of the humerus, adheres to the capsular ligament, and is inserted to the extent of an inch and a half into the body of the ulna, directly below the olecranon. The course of this muscle is oblique; and

whilst it extends the arm, it supports the capsular ligament. The *biceps* muscle does not protect the ulnar joint, but has great influence in preventing a dislocation of the radius forwards, in the extended state of the arm. It is not connected with the capsular ligament, as the other muscles are; but arising tendinous from the glenoid cavity, and coracoid process of the scapula, it becomes fleshy in its middle, and again forms a tendon at the elbow-joint, which is fixed into the tubercles of the radius. This muscle bends the fore-arm, rotates the radius outwards, that is, supines the hand, and compresses the capsular ligament opposite the head of the radius.

DISLOCATIONS OF THE ELBOW-JOINT.

There are five species of dislocation of this joint:—
First, both bones are dislocated backwards.
Secondly, both are dislocated laterally.
Thirdly, the ulna is dislocated separately from the radius.
Fourthly, the radius alone is dislocated forwards: and
Fifthly, the radius is dislocated backwards.

DISLOCATION OF BOTH BONES BACKWARDS.

Symptoms.

This dislocation is strongly marked by the great change which is produced in the form of the joint, and by its partial loss of motion. The shape of the elbow is altered, as there is considerable projection posteriorly, formed by the ulna and radius, above the natural situation of the olecranon. On each side of the olecranon appears a hollow. A considerable hard swelling is felt at the fore part of the joint, immediately behind the tendon of the biceps muscle, formed by the extremity of the humerus; the hand and fore-arm are supine, and cannot be rendered entirely prone. The flexion of the joint is also in a great degree lost.

DISSECTION OF THIS DISLOCATION.

Dissection of the dislocation backwards.

I have had an opportunity of dissecting a compound dislocation of this joint, where the radius and ulna were thrown backwards,

and it is preserved in the Museum at St. Thomas's Hospital. The coronoid process of the ulna was thrown into the posterior fossa of the os humeri, and the olecranon projected at the back part of the elbow, above its natural situation, an inch and a half, the radius was placed behind the external condyle of the os humeri, and the humerus was thrown forwards on the anterior part of the fore-arm, where it formed a large projection. The capsular ligament was torn through, anteriorly, to a great extent. The coronary ligament remained entire. The biceps muscle was slightly put upon the stretch, by the radius receding; but the brachialis internus was excessively stretched by the altered position of the coronoid process of the ulna.

Cause of the accident.

This accident usually happens in a fall when a person puts out his hand to save himself, the arm not being perfectly extended, so that the bones are forced back behind the axis of the os humeri, by pressure of the whole weight of the body upon them.

This dislocation is easily reduced by the following means. The patient is made to sit down upon a chair, and the surgeon, placing his knee on the inner side of the elbow-joint, in the bend of the arm, and taking hold of the patient's wrist, bends the arm; at the same time he presses on the radius and ulna with his knee, so as to separate them from the os humeri, and thus the coronoid process is thrown from the posterior fossa of the humerus: whilst this pressure is supported by the knee, the arm is to be forcibly, but slowly, bent, and the reduction is soon effected. It may be also accomplished by placing the arm around the post of a bedstead, and by forcibly bending it while it is thus confined. I have also reduced the limb by making the patient, whilst placed upon an elbow-chair, put his arm through the opening in its back, and then, having bent the arm, the body and limb being thus well fixed, the reduction was easily effected.

This dislocation is sometimes undiscovered at first, in consequence of the great tumefaction which immediately succeeds the injury; but this circumstance does not prevent the reduction, even at the period of several weeks after the accident: for I have

known it then effected by bending the limb over the knee, even without the application of very great force.

As soon as the reduction has been accomplished, the arm should be bandaged in the bent position; evaporating lotions should be applied, and the limb be supported in a sling; the fore arm should be bent at rather less than a right angle with the upper arm. A splint may be placed in the sling for the better support of the limb. After-treatment.

LATERAL DISLOCATION OF THE ELBOW.

In this case the ulna, instead of being thrown into the posterior fossa of the os humeri, has its coronoid process situated on the back part of the external condyle of the humerus. The projection of the ulna backwards is greater in this than in the former dislocation, and the radius forms a protuberance behind and on the outer side of the os humeri, so as to produce a hollow above it; the rotation of the head of the radius is distinctly felt by rolling the hand. Sometimes the ulna is thrown upon the internal condyle of the os humeri, so as to produce an apparent hollow above it: the rotation of the head of the radius is distinctly felt by rolling the hand. Sometimes the ulna is thrown upon the internal condyle of the os humeri, but it still projects posteriorly, as in the external dislocation; and then the head of the radius is placed in the posterior fossa of the humerus. The external condyle of the os humeri in this case projects very much outwards. I have never had an opportunity of dissecting this injury. Nature of the accident.

The manner in which the lateral dislocation is produced is the same as in that directly backwards, but the direction of the fall is varied; it is also caused by the wheel of a carriage passing over the arm whilst it is placed upon uneven ground. The reduction of each may be effected as in the former dislocation, by bending the arm over the knee, even without particularly attending to the direction of it inwards or outwards; for as soon as the radius Causes of this accident.

and ulna are separated from the os humeri by the pressure of the knee, the muscles give them a proper direction for reduction.

DISLOCATION OF THE ULNA BACKWARDS.

Symptoms of this accident.

The ulna is sometimes thrown back upon the os humeri without being followed by the radius. The appearance of the limb is then much deformed by the contortion inwards of the fore-arm and hand. The olecranon projects, and can be felt behind the os humeri. Extension of the arm is impracticable, but by a force which will reduce the dislocation; and it cannot be bent to more than a right angle. It is an accident somewhat difficult to detect; but its distinguishing marks are the projection of the ulna, and the twist of the fore-arm inwards.

Dissection.

We have an excellent specimen of this accident in the Museum at St. Thomas's Hospital. It had existed to a great length of time without reduction: the coronoid process of the ulna was thrown into the superior fossa of the humerus; the olecranon is seen projecting behind the os humeri; the radius resting upon the external condyle, and had formed a small socket for its head, in which it was able to roll. The coronary and oblique ligaments had been torn through, and also a small part of the interosseous ligament; the lower extremity of the internal condyle of the humerus seems to have had an oblique fracture in it; but I doubt whether it had been broken, or only altered in form, on account of the unnatural position of the ulna: if it had been broken it was reunited.

Cause.

The triceps was thrown backwards, and the brachialis internus muscle was stretched under the extremity of the humerus. The accident arises from a severe blow on the lower extremity of the ulna, by which it is pushed suddenly upwards and backwards.

Mode of reduction.

This dislocation is more easily reduced than that of both bones; and the best method is to bend the arm over the knee, and to draw the fore-arm downwards; the reduction will then be easy,

as not only the brachialis muscle will act in resistance, but the radius resting against the external condyle, will push the os humeri backwards upon the ulna when the arm is bent.

DISLOCATION OF THE RADIUS FORWARDS.

Symptoms of this accident.

This bone is sometimes separated from the ulna at their junction at the coronoid process, and its head is thrown into the hollow above the external condyle of the os humeri, and upon the coronoid process of the ulna.

I have seen six examples of this accident: its symptoms are as follow: the fore arm is slightly bent, but cannot be brought to a right angle with the upper, nor can it be completely extended. When it is suddenly bent, the head of the radius strikes against the fore part of the os humeri, and produces so sudden a stop to its motion, as at once to convince the surgeon that one bone strikes against the other. The hand is placed in a prone position, but neither its pronation nor supination can be completely performed, although its pronation be nearly complete. If the thumb be carried into the fore and upper part of the elbow-joint, the head of the radius may be there felt; and if rotation of the hand be attempted, the bone will be perceived to roll; this last circumstance, and the sudden stop to the bending of the arm, are the best diagnostic marks of the injury.

Dissection.

In the dissection of this case, the head of the radius is found resting in the hollow above the external condyle of the os humeri; the ulna is in its natural situation. The coronary ligament of the radius, the oblique ligament, and the fore part of the capsular, as well as a portion of the interosseous ligament, are torn through; the laceration of the latter ligament allows the separation of the two bones; the biceps muscle is shortened: and those who have not seen an example of this injury, will do well to consult the bones of the arm in the position I have now described them.

Cause of this accident.

The cause of this accident is a fall upon the hand when the arm is extended; the radius receiving the weight of the body, is forced

up by the side of the ulna, and thrown over the condyle, and upon the coronoid process of the ulna.

Cases.

The first case I saw of this accident was in a woman, who was a patient of Mr. Cline's, in St. Thomas's Hospital, whilst I was an apprentice to him. The most varied attempts which his strong judgment could direct were made to reduce the bone, but they proved ineffectual; and the woman was discharged from the hospital with the dislocation unreduced.

The second case was in a lad to whom I was called by Mr. Balmanno, of Bishopsgate-street; and although I made attempts, by continuing and varying the extension in every direction for an hour and a quarter, I could not succeed in effecting the reduction.

The third case was that of a hair dresser, who having been intoxicated in the evening came to my house on the following morning with his radius dislocated: during the time of examination the patient became faint, and at last fell upon the floor in a state of syncope; this I thought afforded me a most favourable opportunity for replacing the bone; and whilst he was still upon the floor I rested his olecranon upon my foot, so as to prevent the ulna from receding, and then extended the fore arm; and under these favorable circumstances, the radius returned to its natural situation.

The fourth case was that of a gentleman in Old Broad-street, to whom I was called by Mr. Gordon, of Oxford-court, in the city; and the manner in which we succeeded in the reduction was as follows:—We placed our patient upon a sofa, and bent his arm over the back of it; then making extension from the hand without including the ulna, the os humeri being fixed by the sofa, the radius in a few minutes slipped into its place.

The fifth case was that from which was made the preparation preserved in our collection at St. Thomas's Hospital. That preparation was one morning lying on my chimney-piece, when a gentleman of high character at the bar called upon me: who said, "What have you here?" And when I mentioned the

nature of the injury—"Well, that is very curious," said he; "for I have myself been the subject of this accident." He then exposed his arm, and shewed me a dislocation of the radius: it had happened many years before; and he told me that numerous and most violent attempts had been made to reduce it without success.

The observations here stated upon this subject I have usually given in my lectures, carefully explaining the difficulty in restoring the bone to its situation. Once, on an occasion of this kind, Mr. Williams, one of the most intelligent of my pupils, said to me, "I have known the radius reduced in these accidents by extension from the hand only." From a consideration of what he said, and from an experiment on the dead body, placing the radius in the situation in which it was thrown by this accident, I was convinced that the mode of extension mentioned by Mr. Williams, was the best; as, from the connection of the hand with the radius, that bone alone is acted upon; and the ulna being excluded from the force applied, the radius sustains the whole extension. It is also right in making the extension to render the hand supine, as this position draws the head of the radius from the upper part of the coronoid process of the ulna, upon which it would otherwise be directed; and then to draw the fore arm, by pulling the hand, and by fixing the os humeri.

DISLOCATION OF THE RADIUS BACKWARDS.

Appearance of this accident.

This is an accident which I have never seen in the living person; but in the winter of 1821, a man was brought for dissection into the theatre of St. Thomas's Hospital, in whom was found this dislocation, which had never been reduced. The head of the radius was thrown behind the external condyle of the os humeri, and rather to the outer side of the lower extremity of that bone. Mr. Sylvester, from Gloucester, a very intelligent student, had the kindness to make me a drawing of the parts as they were dissected. When the arm was extended, the head of the radius could be seen as well as felt behind the external condyle of the os humeri. On dis-

secting the ligaments, the coronary ligament was found to be torn through at its fore part, and the oblique also had given way. The capsular ligament was partially torn, and the head of the radius would have receded much more, had it not been supported by the fascia which extends over the muscles of the fore arm.

Of the causes of this accident I know nothing, never having seen it in the living subject.

Mode of reduction.

As to its reduction, it will be easily effected by bending the arm; but to secure the bone from subsequent displacement, the arm must be kept steadily bent at right angles, and secured by splints and a circular bandage in that situation, until the union of the coronary ligament has been effected; which will require the lapse of three or four weeks from the accident.

LATERAL DISLOCATION OF THE RADIUS.

Mr. Freeman, surgeon, of Spring-gardens, brought to my house a gentleman of the name of Whaley, aged twenty-five years, whose pony having run away with him, when he was twelve years of age, he had struck his elbow against a tree whilst his arm was bent and advanced before his head. The olecranon was broken, and the radius dislocated upwards and outwards, above the external condyle; and when the arm is bent, the head of the radius passes the os humeri. He has a useful motion of the arm, but neither the flexion nor the extension is complete.

FRACTURES OF THE ELBOW-JOINT.

FRACTURES ABOVE THE CONDYLES OF THE OS HUMERI.

The condyles of the os humeri are sometimes obliquely broken off just above the joint, and the appearance produced is so similar to that of the dislocation of the radius and ulna backwards, that this fracture is very liable to be mistaken for that injury.

Diagnostic mark of the

The appearances of this accident, as will be seen, are like those

of dislocation of the radius and ulna backwards; and the mode of distinguishing the two injuries is, by the removal of all the marks of dislocation on extension, and by their return so soon as the extension is discontinued; in general, also, these accidents are detected by rolling the fore arm upon the humerus, when a crepitus may be felt just above the elbow-joint. nature of this accident.

This fracture happens at all periods of life, but much more frequently in children than in persons of advanced age. The period of life at which the accident happens most frequently.

Its treatment consists in bending the arm, and drawing it forwards to effect replacement: then a roller should be applied while it is in the bent position. The best splint for it is one formed at right angles, of which the upper portion should be placed behind the upper arm, and the lower portion under the fore arm: a splint must also be placed on the fore part of the upper arm, and both should be confined by straps; evaporating lotions should be used, and the arm kept in the bent position by a sling. In a fortnight, if the patient be young, passive motion may be gently begun, to prevent the occurrence of anchylosis; and in the adult, at the end of three weeks a similar treatment is to be pursued. But even after the most careful and judicious means which can be adopted, there is sometimes considerable loss of motion; and when the accident has not been understood, or has been carelessly treated, the deformity and loss of motion become very considerable. Treatment.

FRACTURE OF THE INTERNAL CONDYLE OF THE OS HUMERI.

The internal condyle of the humerus is frequently broken obliquely from the other condyles and body of the bone; and the symptoms by which the accident is known are as follow.

First. The ulna appears dislocated from it and from the broken condyle, projecting behind the humerus when the arm is extended. Symptoms of fracture.

Secondly. The ulna resumes its natural situation in bending the arm.

Thirdly. By grasping the condyles, and bending and extending the fore arm, a crepitus is perceived at the internal condyle.

Fourthly. When the arm is extended, the lower end of the os humeri advances upon the ulna, so as to be felt upon the anterior part of the joint.

I saw a girl, a patient of Mr. Steel, of Berkhampstead, who, by a fall upon her elbow, had fractured the olecranon, and also broken the internal condyle of the os humeri, the point of the broken bone having almost penetrated the skin: the cubital nerve had been also injured, for the little finger and half the ring finger were benumbed.

The cause of this accident is a fall upon the point of the elbow. It usually occurs in youth, before the epiphysis is completely ossified; although I have seen it, but less frequently, in age. It is often mistaken for dislocation.

Treatment.

Its treatment consists in applying a roller round the elbow-joint, to keep the bone in complete apposition; in wetting it frequently with spirits of wine and water; in bending the limb at a right angle, and supporting it in a sling; and in beginning with passive motion, in the child, at the expiration of three weeks after the accident, and at the end of a month in the adult, to prevent loss of motion in the joint.

FRACTURES OF THE EXTERNAL CONDYLE OF THE OS HUMERI.

Diagnostic marks of this accident.

This accident is readily detected by the following symptoms. Swelling upon the external condyle, and pain upon pressure; the motions of the elbow-joint, both of extension and flexion, are performed with pain: but the principal diagnostic sign is, the crepitus produced by the rotatory motion of the hand and radius. If the portion of the fractured condyle be large, it is drawn a little backwards, and carries the radius with it; but if the portion be small, this circumstance does not occur. We have two excellent preparations of this accident in the Museum at St. Thomas's Hospital, and in neither case has there been any other than ligamentous union. In one preparation, in which the external condyle is split obliquely, the bone is somewhat thickened; but although this accident had obviously happened long before death, no union

but that by ligament had been produced. The second preparation is a specimen of the transverse fracture of the extremity of the condyle, within the capsular ligament, in which not the least attempt at ossific union can be detected.

Union by ligament.

It is obvious, therefore, that this principle of ligamentous union extends to all detached portions within a capsular ligament; the vitality of the bone being supported merely by the ligament within the joint.

This accident usually happens in children, by falls upon the elbow; at least, in the course of my observation, a very large proportion of the cases have been in young persons: I have seen it occur in the adult, but very rarely in advanced age.

Treatment.

The treatment required is the following: A roller is applied around the elbow, and above and below the joint. An angular splint is to be adapted, which should admit the elbow, extend behind the upper arm, and receive the fore arm, so as to support it; a roller should then be bound over the whole to keep it firmly fixed. In the child this splint may be made of stiff pasteboard, bent to the shape of the elbow; but the best mode for its application is, to dip it in hot water and apply it wet, so that it may exactly adapt itself to the form of the limb; it thus becomes the best possible support to the injured arm. Indeed, it may be here observed, that for children this is the best mode of making every support of this kind. The splint is to be worn for three weeks, when passive motion is to be begun; it must be very gentle at first, and may be gradually increased as the pain and inconvenience attending it subside.

Result of this injury.

The result of the case depends upon the seat of the fracture: if the bone be broken very obliquely, a steady and long-continued support of the part will occasion it to unite; for in these cases a considerable portion of the fracture is external to the capsular ligament; but if the whole extent of the fracture be within the ligament, it does not, as far as I have seen, unite by bone, whatever be the means employed.

FRACTURE OF THE CORONOID PROCESS OF THE ULNA.

A gentleman came to London for the opinion of different surgeons upon the following case.

Case.

Appearances of the fracture of the coronoid process of the ulna.

This gentleman had fallen upon his hand whilst in the act of running; and, on rising, he found his elbow incapable of being bent, nor could he entirely straighten it: he applied to his surgeon in the country, who, upon examination, found that the ulna projected considerably backwards; but that so soon as he bent the arm, it resumed its natural form. He immediately confined the limb in a splint, and kept it in a sling. When I saw this gentleman in town, several months had elapsed since the accident; yet the same appearances, which the surgeon described when he first saw the injury, remained; namely, the ulna projected backwards whilst the arm was extended, but it was without much difficulty drawn forwards and bent, and the deformity was then removed. It was thought, at the consultation that was held about him in London, that the coronoid process was detached from the ulna; and that thus, during extension, the ulna slipped back behind the inner condyle of the humerus.

Dissection.

I had been in the habit of mentioning this case at lecture, for several years; when on one occasion a person was brought to the dissecting-room at St. Thomas's Hospital, who had been the subject of the same accident; and the joint is preserved in our museum. The coronoid process, which had been broken off within the joint, had united by ligament only, so as to move readily upon the ulna, and thus alter the sigmoid cavity of the ulna so much as to allow, in extension, that bone to glide backwards upon the condyles of the humerus.

Treatment.

As to the treatment of this accident, I am doubtful whether any mode can completely succeed; as the coronoid process, like the head of the thigh-bone, loses its ossific nourishment, and has no other than a ligamentous support. Its life is preserved by the vessels of the reflected portions of the capsular ligament upon the

end of the bone, which do not appear capable of supporting the least attempt at ossific union ; nor is any change on the surface of the bone apparent. It will be proper, however, in this accident, to keep the arm steadily in the bent position for three weeks after the injury, and thus to make the ligamentous union as short as possible, by leaving the bone perfectly at rest.

FRACTURE OF THE OLECRANON.

This process of the ulna is not unfrequently broken off, and the accident is followed by symptoms which render the injury so evident, that the nature of the case can scarcely be mistaken. Pain is felt at the back of the elbow, and a soft swelling is soon produced there, through which the surgeon's finger readily sinks into the joint; the olecranon can be felt in a detached piece, elevated sometimes to half an inch, and sometimes to two inches, above the portion of the ulna, from which it has been broken. This elevated portion of bone moves readily from side to side, but is with great difficulty drawn downwards ; if the arm be bent, the separation between the ulna and the olecranon becomes much greater. The patient has scarcely any power to extend the limb, and the attempt produces very considerable pain ; but he bends it with facility, and if the limb be undisturbed, it is prone to remain in the semiflexed position. For several days after the injury has been sustained, much swelling of the elbow is produced; there is an appearance of ecchymosis to a considerable extent, and an effusion of fluid ensues into the joint in a much larger quantity than is natural ; but the extent to which these symptoms proceed, depends upon the violence which produced the accident. The rotation of the radius upon the ulna is still preserved. No crepitus is felt, unless the separation of the bone be extremely slight.

Symptoms of fracture of the olecranon.

DISSECTION OF THIS ACCIDENT.

This fracture is usually found to have happened through the centre of the olecranon ; and it is most frequently in the transverse

Appearances of the dissection of this accident.

direction; but I have seen the bone broken obliquely, so that the fractured parts presented very thin edges. On that portion of the olecranon attached to the ulna there are some marks of ossific inflammation, and some very slight traces of it on the detached portion. The cancellated structure of the fractured olecranon is filled by ossific matter, and is sometimes smoothed by occasional friction. The os humeri and radius undergo no change. In the appearances of one case which I dissected, and of which I have given a plate, the olecranon is separated two inches from the ulna; the capsular ligament of the elbow-joint is torn through on each side of the olecranon; and the separated portion is united by a ligamentous band, which is stretched from one broken extremity of the bone to the other.

Mode of union. The nature of this injury, then, is as follows. So soon as the extremity of the bone is broken off, it is, by the action of the triceps muscle, drawn up from half an inch to two inches from the ulna, and the extent of its separation depends upon the degree of laceration of the capsular ligament, and of that portion of the ligamentous band which proceeds from the side of the coronoid process of the ulna to that of the olecranon. That I might perfectly understand the nature of this accident, and its means of separation, I tried the following experiments on a dog.

Experiments.

On a dog. The integuments having been drawn laterally and firmly over the end of the olecranon, I made a small incision, and placed a knife upon the middle of that process, in a transverse direction; on striking it with a mallet, the bone was readily cut through; a separation directly took place by the action of the triceps muscle; adhesive matter was effused; and when I examined the limb a month afterwards, I found the bone united by a strong ligament. I broke the olecranon in the same manner in several rabbits: in these experiments blood was first thrown out, and then adhesive matter filled up the space of separation, which subsequently be-

came ligamentous, and firmer and firmer, as the time was protracted between the experiment and examination.

As I found that ligament was formed in each of these experiments, I was anxious to learn whether the olecranon could be made to unite by bone, if a longitudinal fracture were produced with but slight obliquity, so that the broken portions might still remain in contact; and I found that, under these circumstances, the osseous union readily took place. Therefore, this bone, like the extremity of the os calcis when it is broken off, is detached by the action of muscles, and ligamentous union ensues from want of adaptation: but a different cause exists where bony union fails in fractured bones within joints, in the neck of the thigh-bone, in the coronoid process of the ulna, and in the extremity of the external condyle of the os humeri. In these injuries the want of union proceeds from the diminished support which the fractured parts receive; the little that exists being derived through the medium of blood-vessels intended for the nourishment of ligament. The preparations made from these experiments may be seen in the Museum at St. Thomas's Hospital. I have also seen this bone in the living person united by an ossific process, when the fracture has happened very near to the shaft of the ulna.

Union in fractured olecranon depending on adaptation.

The ligamentous substance which generally forms the bond of union in these cases, is often incomplete; having an aperture, and sometimes several apertures in it, when it is of considerable length. The arm is weakened in proportion to the length of the ligament; for if this be very long, extension of the arm is rendered difficult, from the necessarily diminished power of the triceps muscle.

The causes of this injury are, first, a fall upon the elbow when the joint is bent; and secondly, fracture by the action of the triceps muscle only, when a great and sudden exertion is made during the flexed position of the arm.

Causes of this injury.

The treatment of this accident is as follows, but it is to be modified according to the degree of injury. If there be much swelling and contusion, it is right to apply evaporating lotions and leeches for two or three days; and after the inflammation is re-

Treatment of fracture of the olecranon.

duced, a bandage should be applied; but in those cases where but little violence is done to the limb, it should be at once secured by bandage. The principle of the treatment is to preserve the power of the limb, by making the separation of the bones as slight as possible, that their ligamentous union may be shortened; and secondly, to restore the natural motions of the joint. If the swelling and inflammation do not prevent it, the surgeon is to place the arm in a straight position, and to press down the upper portion of the fractured olecranon until he brings it in contact with the ulna; a piece of linen is then laid longitudinally on each side of the joint, a wetted roller is applied above the elbow, and another below it; the extremities of the linen are then to be doubled down over the rollers and tightly tied, so as to cause an approximation: thus the bones are brought and held together: a splint well padded is to be applied upon the fore part of the arm, to preserve it in a straight position, and it is to be confined to it by a circular bandage; the whole is to be frequently wetted with spirits of wine and water.

Principle of treatment.

Position.

This is the only injury of the elbow-joint which requires the straight position; those of the condyles and coronoid process demanding that the limb should be kept bent.

Removal of splints.

In a month the splint is to be removed and passive motion is to be begun; but if it be attempted earlier, the olecranon will separate from the shaft of the bone, and the ligament become lengthened and weakened. All attempts at motion must be made with the greatest gentleness.

Fracture of the olecranon an inch from the point of the elbow into the body of the ulna, requires the same treatment as the common fracture of this portion of bone.

Case.

Miss ——, aged thirty, fell from her horse on her elbow, and broke the ulna one inch from the point of the olecranon. It was kept bent three months, and no extension could be produced by any effort of herself. I forcibly straightened the arm, and kept it so by a wooden splint.

Bony union may, in this case, be readily produced.

COMPOUND FRACTURE OF THE OLECRANON.

In compound fractures of this bone, the edges of the skin must be brought into exact apposition; lint, embued in blood, must be applied on the wound, with adhesive plaster over it, and union by adhesion must be effected if possible; but in other respects the treatment is the same as in simple fracture.

I have seen two cases of this accident, both of which have been successfully treated.

FRACTURE OF THE NECK OF THE RADIUS.

This fracture I have heard mentioned by surgeons as being of frequent occurrence; but there must be some mistake in the statement, for it is an accident which I have never seen; and if instances ever present themselves (which I do not mean to deny) they must be very rare.

Diagnostic marks of this accident.

The injury would be known by fixing the external condyle of the humerus and rolling the radius, when a crepitus would be perceived.

If such an accident should occur, the treatment which it will require will be the same as that which is demanded for fracture of the external condyle of the os humeri.

COMPOUND FRACTURES AND DISLOCATIONS OF THE ELBOW-JOINT.

These generally happen through the internal condyles of the os humeri, and the fracture takes an oblique direction into the joint.

Generally not destructive.

In the most severe accident of this kind, the constitution is generally able to support the injury, if it be judiciously treated; and the recital of the following cases will evince the happy result that may be expected, if union by adhesion be effected in the treatment.

Case.

I was called to Guy's Hospital, to see a brewer's servant, who had a compound fracture of the elbow-joint, caused by his dray passing over his arm, which had considerably comminuted the bones. I could pass my finger readily into the joint, and feel the brachial artery pulsating on its fore part. Considering the violence

done to the part, and the constitution of the patient, who, like most of those in such employment, drank much porter and spirits, and ate but little, I at once told him, I feared there was scarcely any hope of his recovery, unless he consented to the loss of his limb; the man, however, determined not to submit to the operation, although Dr. Hulme, who accompanied me, also endeavoured to convince him of the necessity of amputation; I therefore did all in my power to save both his life and his limb. The bones were easily replaced, and the parts were carefully brought together. The limb was laid upon a splint, lightly bandaged, and placed at right angles. The wound united without any untoward circumstance; and the only check that interrupted his progressive recovery, was the formation of an abscess in the shoulder, which was opened, and immediately healed. The elbow-joint was not even completely anchylosed, for he retained sufficient motion in it to allow him to resume his former occupation.

Treatment of compound fractures of the elbow-joint.

In all cases of this accident, the arm should be kept in the bent position; for as anchylosis, in a greater or less degree, is the certain consequence, it is attended with much less inconvenience in this position than in any other. If the bones be much comminuted, and the wound large, all the detached portions of bone should be removed; but in old people, when much injury is done, there is often not sufficient strength to support the adhesive process, and amputation should be recommended. The edges of the wound should be kept together by placing a piece of lint, dipped in blood, over them, supported by adhesive plaster, and a bandage, lightly applied, wetted with spirits of wine and water.

STRUCTURE OF THE WRIST-JOINT.

Structure of the joint.

The radius and the three first bones of the carpus, form the articular surfaces of the wrist-joint; the radius having an oval cavity at its lower extremity, which receives the rounded surfaces of the

Bones.

scaphoid, lunar, and cuneiform bones. The articular cartilage which covers this surface of the radius is, at its inner edge, extended beneath the ulna, so as to exclude that bone from the gene-

ral cavity of the wrist-joint. This articular cartilage is hollow, both above and below; and at its lower surface it rests upon the os cuneiforme.

A capsular ligament passes from the edge of the articular cavity of the radius, and from the inter-articular cartilage of the ulna, to the three first bones of the carpus, surrounding a large portion of the scaphoid and lunar bones, and but a small surface of the cuneiform. Capsular ligament.

The second joint at this part is that formed between the radius and the ulna. On the inner side of the lower extremity of the radius is situated a hollow articulatory surface, which receives an articular surface on the outer side of the ulna, and both are covered by an articular cartilage. At the lower part of this joint is placed the inter-articular cartilage of the ulna, the outer edge of which is joined to the articular cartilage of the radius, and its inner edge is united to the ulna by ligament, which sinks into a cavity formed at the lower extremity of this bone, between the styloid process of the ulna and its rounded extremity. Ulna-joint.

The capsular ligament, which unites the ulna to the radius, is called the sacciform ligament: it covers the articular surfaces of the two bones, and is united below to the moveable cartilage of the ulna. This joint of the wrist is formed for the purpose of supporting the rotatory motion of the radius upon the ulna, and of strongly uniting one bone to the other. Sacciform ligament.

The wrist is strengthened on each side by peculiar ligaments: one proceeds from the styloid process of the radius, to be fixed to the outer edge of the scaphoid bone, which is the *radio-carpal ligament*; and an *ulna-carpal ligament* extends from the styloid process of the ulna, to the os cuneiforme, and os orbiculare. Radio-carpal. Ulna-carpal.

DISLOCATIONS OF THE WRIST-JOINT.

The dislocations of this joint are of three kinds:—

First, dislocation of both bones.

Secondly, dislocation of the radius only.

Thirdly, dislocation of the ulna.

Mode in which these accidents happen.

The first accident, namely, the dislocation of both bones, is not of very frequent occurrence; but when it does happen, the bones are thrown either backwards or forwards, according to the direction in which the force is applied. If the person in falling puts out his hand to save himself, and falls upon the palm, a dislocation is produced, the radius and ulna are forced forwards upon the ligamentum carpi annulare, and the carpal bones are thrown backwards.

Appearance.

The appearances of this dislocation are these:—A considerable swelling is produced by the radius and ulna, on the fore part of the wrist, with a similar protuberance upon the back of the wrist by the carpus, with a depression above it; the hand is bent back, being no longer in the line with the fore arm.

In the dislocation of the radius and ulna backwards, the person falls upon the back of the hand, the radius and ulna are thrown upon the posterior part of the carpus, and the carpus itself is forced under the flexor tendons, which pass behind the ligamentum carpi annulare: but in each of these cases, two swellings are produced, one by the radius and ulna, and the other by the bones of the carpus, according to the direction in which they are thrown; and these become the diagnostic signs of the accident.

Sprains.

Severe falls upon the palm of the hand will produce sprains of the tendons on the fore part of the wrist, and occasion a very considerable swelling of the flexor tendons, opposite the wrist-joint. This accident assumes the appearance of dislocation, but may always be distinguished from it by the existence of one swelling only, which does not appear immediately after the injury is received, but succeeds it gradually. And further, if the surgeon be called directly after the dislocation has happened, there is then a great flexibility of the hand, as well as distortion, and the extremities of the radius and ulna on one side, and of the carpal bones on the other, are easily detected.

Reduction.

The reduction of this dislocation, in whatever form it may have occurred, is by no means difficult. The surgeon grasps the patient's hand with his right hand, supporting the fore arm with his

left, whilst an assistant places his hands around the upper arm, just above the elbow; they then pull in different directions, and the bone becomes easily replaced. The reduction is, in both cases, the same; for the muscles draw the bones towards their natural position as soon as they are separated from the carpus by extension.

When the hand recovers its natural situation, a roller, wetted in spirits of wine and water, is to be lightly applied around the wrist, and the whole is to be supported by splints placed before and behind the fore arm, reaching as far as the extremities of the metacarpal bones, for the more perfect security of the limb.

DISLOCATION OF THE RADIUS AT THE WRIST.

Diagnostic marks of this accident.

This bone is sometimes separately thrown upon the fore part of the carpus, and lodged upon the scaphoid bone and the os trapezium. The outer side of the hand is, in this case, twisted backwards, and the inner forwards: the extremity of the radius can be felt and seen, forming a protuberance on the fore part of the wrist. The styloid process of the radius is no longer situated opposite to the os trapezium.

Cause of the accident.

This accident usually happens from a fall when the hand is bent back; and I have also known it arise from a fall upon the hand, by which the condyles of the os humeri were broken obliquely, and the radius dislocated at the wrist, being thrown upon the fore part of the scaphoid bone, where it could be distinctly felt: this was the case of the lad whom I mentioned when speaking of fractures of the os humeri; his hand was hanging backwards, and he felt great pain upon its being moved.

The extension necessary to reduce a dislocation of the radius, and the treatment which it demands, are the same which are required for the luxation of both bones; and there is no difficulty in the operation, the hand being extended whilst the fore arm is fixed.

DISLOCATION OF THE ULNA.

As this bone does not form a part of the wrist-joint, but is received into a capsular ligament of its own, and is separated from the wrist by a moveable cartilage, it is more frequently dislocated, separately, than the radius.

When this accident occurs, the sacciform ligament is torn through, and the bone generally projects backwards, without any accompanying fracture of the radius. It rises and forms a protuberance at the back of the wrist; and although it is easily pressed down into its natural position, yet so soon as the pressure is removed the deformity returns, as the lacerated ligament has no longer the power to retain it in its place.

Symptoms.

Diagnostic marks.

The diagnostic marks of the injury are, the projection of the ulna much above the level of the os cuneiforme, and altered position of the styloid process, which is no longer in a line with the metacarpal bone of the little finger.

Mode of reduction.

The reduction is accomplished by pressure of the bone forwards, which brings the ulna into its natural articular cavity by the side of the radius; and to retain it in this situation, splints must be placed along the fore arm, in a line with the back and palm of the hand; the splints should be padded throughout; but upon the extremity of the ulna a compress of leather should be placed, to keep it in a line with the radius; a roller should then be applied over the splints to confine them with sufficient firmness.

COMPOUND DISLOCATION OF THE WRIST, ULNA PROJECTED, AND FRACTURE OF THE RADIUS.

Case.

John Winter fell from a ladder on his hand and knee; the hand was bent back, and the ulna protruded at the inner part of the wrist. Mr. Steel, of Berkhampstead, attended; the bone was reduced, a roller was put around the wrist, and the wound healed very soon by adhesion. In seven weeks he was well, excepting that a slight swelling of the tendons remained for a few weeks longer.

SIMPLE FRACTURE OF THE RADIUS, AND DISLOCATION OF THE ULNA.

A frequent accident.

The radius is frequently broken, and the ulna at the same time dislocated; the fracture usually happens one inch above the articulation. If it occurs in a very oblique direction, so great a displacement of the radius ensues, that dislocation of the ulna forwards is also produced.

Dissection.

There is a preparation of this accident in the museum of St. Thomas's Hospital. The lower end of the radius is seen in its natural situation, articulated with the carpal bones. An inch above the ligamentum annulare carpi, the broken extremity of the radius is seen projecting under the flexor tendons of the wrist, which have been removed to shew its situation; the ulna is dislocated forwards, and rests upon the os orbiculare.

Diagnostic marks of this accident.

The signs of this injury are, that the hand is thrown back upon the fore arm, so as at first sight to exhibit the appearance of a dislocation of the hand backwards; and a projection of the ulna is felt under the tendon of the flexor carpi ulnaris muscle, just above the os orbiculare; and, thirdly, the fractured extremity of the radius is easily detected, under the flexor tendons of the hand. I have seen this accident frequently, and at first did not exactly understand the nature of the injury; indeed, dissection alone taught me its real character.

Mode of reduction and its difficulties.

A very powerful extension is required to bring the broken ends of the radius in apposition, and great difficulty exists in confining them when this is effected. The hand is to be extended by the surgeon, and the fore and upper arm are to be drawn back by an assistant; then a cushion is to be placed upon the inner part of the wrist, and another to the back of the hand, firmly bound down by a roller, for the purpose of keeping the ulna and broken end of the radius in situ; a splint, well padded, is then to be applied to the back part and inner side of the fore arm, which is to extend to the extremities of the metacarpal bones; these splints are to be confined by a roller, reaching from the upper part of the fore arm

to the wrist, and no further. The arm should be then placed in a sling: this position is to be preserved for three weeks in young persons, and for four or five in the aged, before passive motion be attempted. The recovery in these cases is slow; and six months will sometimes elapse before motion of the fingers is completely restored.

FRACTURE OF THE LOWER END OF THE RADIUS WITHOUT DISLOCATION OF THE ULNA.

Symptoms of this accident.

This fracture generally happens about an inch above the styloid process. The cure is difficult, the lower extremity of the broken bone being drawn by the action of the pronator quadratus amongst the flexor tendons, where it may be distinctly felt: in this situation it interferes very considerably with the motions of the fingers, by confining the action of the flexor profundus perforans. Mr. Cline, in his lectures on this subject, used, nearly in these terms, to recommend the following treatment:—"When a fracture of the radius happens just above the wrist-joint, you must be very careful in your treatment of it, to prevent the injury from leading to the permanent loss of the use of the fingers; for so soon as the injury has happened, the pronator quadratus muscle draws the fractured end of the bone obliquely across the fore arm, amidst the flexor tendons; your object, therefore, in the treatment of this accident is, to prevent the action of the pronator from producing that effect; and the mode of treatment which you are to adopt is, to make the hand, by its weight, oppose the action of that muscle. For this purpose, when the bone has been placed in its right position, by drawing the hand in a line with the fore arm, apply a roller around the fore arm to the wrist; then a splint upon the fore and back part of the arm to reach the palm and back of the hand, so as to preserve it in a half supine position; and confine the splints by means of a roller, which should reach only to the wrist. The arm is then to be placed in a sling, which is also to support it no further than to the wrist. Thus the hand, being allowed to hang between the ends of the splints, draws the end of the radius, so as to

Treatment.

maintain a constant extension upon it, opposing the action of the pronator quadratus muscle, and keeping the broken end of the bone constantly in its place."

COMPOUND DISLOCATION OF THE ULNA, WITH FRACTURE OF THE RADIUS.

Often a very serious accident.

This is a very serious accident when the radius is much comminuted; but recovery proceeds very well when the radius is broken without being shattered. I saw a case of this injury in Hertfordshire, in which the man met with the accident by falling upon the back of his hand, and the ulna protruded an inch and a half through the integuments. The bone was immediately reduced and bandaged; the wound healed by the adhesive process, and the man recovered the perfect use of his limb.

Case.

A man was admitted into St. Thomas's Hospital, under the care of Mr. Chandler. I now forget in what manner the accident had happened, but the ulna projected through the integuments at the back of the carpus: and a compound fracture of the radius, with great comminution of the bone, was produced. The ulna was at first replaced, but immediately resumed its dislocated position on the back of the wrist, although it did not again protrude through the skin. The hand and fore arm were placed in a poultice, and were ordered to be fomented twice a day. A copious suppuration ensued, attended with violent constitutional irritation; and Mr. Chandler, in order to save the patient's life, after a lapse of five weeks, amputated the limb.

Dissection.

On dissection, I found the ulna dislocated backwards, and its extremity just drawn within the opening of the integuments, through which it had protruded. The radius was broken into several pieces, some of which being loose, were necessarily a great source of irritation; the tendons and muscles were some of them lacerated, as the extensor carpi radialis longior, and the extensors of the thumb.

Treatment.

In a similar case, it would be proper, when loose pieces of bone can be felt at the extremity of the radius, that the wound should

be enlarged for their removal; and instead of fomentations and poultices, a quantity of lint, dipped in the patient's blood, should be applied round the wrist, lightly bound with a roller. The arm should be supported upon a splint, so as to be kept perfectly free from motion; evaporating lotions should be applied; and the limb should not be disturbed, unless the patient has symptoms of a suppurative process, when a small opening should be made in the bandage to allow of the escape of pus, but still the bandages should be suffered to remain. The patient should be bled from the arm if the inflammation and constitutional irritation be considerable; and, under these circumstances, leeches should be occasionally applied. The bowels should be kept gently open, but all active purging avoided.

DISLOCATIONS OF THE CARPAL BONES.

The eight bones of the carpus are joined to each other by short ligaments, which pass from bone to bone, allowing but a very slight degree of motion of one bone upon another; but besides this mode of articulation, there is a transverse joint between the first and second rows of carpal bones, forming a complete ball and socket. The ball is produced by the rounded extremities of the os magnum and os cuneiforme; the cup, by the scaphoid, lunar, and cuneiform bones. A ligament passes from one row of bones to the other, including this articulation.

Carpal joint.

The dislocation of a carpal bone is but of rare occurrence; the following is an example of the accident.

Case.

Mary Nicholls, aged sixty, slipped down, and, trying to save herself, fell upon the back of her hand, and fractured the radius obliquely outwards, through the lower articulating surface. The fractured portion, with the os scaphoides, was thrown backwards upon the carpus. The wrist was slightly bent, and there was an evident projection at the back of the carpus. The fingers could be completely extended, but only semiflexed. A crepitus might be distinctly felt, either by moving the hand, or the styloid process of the radius backwards or forwards. By slight extension, and steady

pressure upon the displaced part, the fracture was easily reduced. There was much extravasation and pain; six leeches were applied, afterwards evaporating lotions, and two long splints; and as soon as the swelling had in some measure subsided, strips of soap plaster. At the end of six weeks the fracture was firmly united; but the motions of the wrist are still imperfect, and she cannot grasp any thing.

Ganglia are sometimes mistaken for this accident; but in such cases a smart blow with a book will disperse the swelling, and dispel the cloud of doubt which enveloped the mind of the surgeon.

Relaxation of the carpal joint.

The os magnum and the cuneiform bones, from relaxation of their ligaments, are occasionally thrown somewhat out of their natural situation, so that when the hand is bent, they form protuberances at the back of the wrist. This state is productive of so great a degree of weakness, as to render the hand useless unless the wrist be supported.

I was consulted by a young lady, a patient of Mr. Cumming of Chelsea, who had such a projection of the os magnum, that she was, in consequence, obliged to give up her music and other accomplishments, on account of the attendant weakness; for when she wished to use her hand, she was compelled to wear two short splints, which were adjusted to the wrist, and bound upon the back and fore part of the hand and fore arm. Another lady, who had a weakened state of limb, arising from a similar cause, wore, for the purpose of giving it strength, a strong bracelet of steel chain, clasped very tightly around the wrist.

But the supports generally directed to be worn in these cases are straps of adhesive plaster, and a bandage over the wrist to confine and strengthen it. The effusion of cold water upon the hand from a considerable height is also employed, and the part is afterwards rubbed with a coarse towel, to give vigour to the circulation, and strength to the joints.

COMPOUND DISLOCATION OF THE CARPAL BONES.

These accidents are of frequent occurrence, and they are generally caused by guns bursting in the hand; portions of the instrument being forced through the carpus, and between the metacarpal bones.

In these cases a carpal bone may be removed by dissection, and the patient may recover; not only saving his hand, but in a considerable degree, preserving its motions.

When only one or two of the carpal bones are displaced by guns bursting in the hand, they may be dissected away; but if more considerable injury be done, amputation will be necessary.

DISLOCATIONS OF THE METACARPAL BONES.

These bones are so firmly articulated with the bones of the carpus, that I have never seen them dislocated but by the bursting of guns, or by the passage of heavy laden carriages over the hand; and in each of these cases there is generally so much injury produced as to render amputation necessary. In the former of these accidents, a bone, and sometimes two, are capable of being removed; and if it be necessary to amputate the middle and ring fingers, the fore and little fingers may be brought so nicely together, and secured in such exact adhesion, as to produce little deformity.

Amputation often necessary.

Case.

I was called by Mr. Hood, surgeon at Vauxhall, to a Mr. Waddle, of Bow-lane, Cheapside; who, while shooting, had his gun burst, and his hand lacerated by a portion of the barrel passing through its centre. The metacarpal bones of the middle and ring fingers were fractured, and also much comminuted by the violence of the injury; but the integuments were only lacerated, and not completely removed. I dissected out the two fingers, with the metacarpal bones which supported them, and brought the edges of the skin together by suture, approximating the fore and little fingers, and applying a roller so as to bind them together; the parts united perfectly, and the maimed hand was afterwards extremely useful to him; the case, indeed, is highly worthy of inspection.

A boy of twelve years of age was brought into Guy's Hospital, who, by the bursting of a gun, had his thumb and all the fingers excepting the fore finger blown to pieces; the whole hand was exceedingly shattered, and the metacarpal bones were separated from the carpus. Upon examination of the hand, I found that the tendon of the fore finger was uninjured, so that its use remained perfect; and as the integuments could be still saved, so as to cover its metacarpal bone, I dissected out the trapezium (the thumb had been entirely carried away by the concussion) and the metacarpal bones of all the fingers, excepting that of the fore finger, which was afterwards of the greatest use to him. I kept him for some time at the hospital, to shew to the students the restorative powers of nature, and the utility of this finger saved out of the wreck of his hand; he used it as a hook with the greatest facility. Case.

FRACTURE OF THE HEAD OF THE METACARPAL BONE.

The extremity of the metacarpal bone towards the fingers, which is called its head, is sometimes broken off; which produces the appearance of dislocation of the finger, as the head of the bone sinks towards the palm of the hand. In the treatment of this case, a large ball is to be grasped in the hand, which should be bound over by a roller; and thus the depressed extremity of the bone is raised to its natural situation. Fracture.

DISLOCATIONS OF THE FINGERS AND TOES.

The phalanges of the fingers and toes are united by capsular ligaments to the metacarpal and metatarsal bones, and to each other; and their union is further strengthened by lateral ligaments, proceeding from one side of the phalanx to the other. Posteriorly, they are defended by the tendon of the extensor muscle of the fingers; and anteriorly, by the thecæ and flexor tendons. Dislocation of the phalanges, therefore, is but rare: but when this accident does occur, it more frequently happens between the first and second phalanges than between the second and third. Structure.

The second phalanx being thrown forwards towards the thecæ, and the first backwards, I could not learn if the ligaments had been torn, as the dislocation had existed for a length of time, and the ligament, if it had ever been lacerated, was then united; the extensor tendon was very much stretched over the end of the first phalanx.

Diagnostic marks of this accident.

This accident may be readily distinguished by the projection of the first phalanx backwards, while the head of the second may be, although less distinctly, felt under the thecæ.

The reduction may be effected by making extension with a slight inclination forwards to relax the flexor muscles. If the bone has not been dislocated many hours, it is easily reduced; but if neglected at first, this can only be accomplished by a long-continued extension, very steadily applied. I have seen too much mischief arise from injury to the tendons and ligaments of these joints never to recommend the division of them (which some have advised) to facilitate the reduction, when extension will not succeed. The observations which I have made respecting the dislocation of the fingers, also apply to the toes; of which, however, the dislocations are more difficult to reduce, from their greater shortness, and the less pliability of the joints.

DISLOCATION FROM CONTRACTION OF THE TENDON.

Contraction of tendon.

A toe or finger is sometimes gradually thrown out of its natural direction by a contraction of the flexor tendon and thecæ, and the first and second phalanges are consequently drawn up and projected against the shoe, so as to prevent the patient from being able to take his usual exercise.

Amputation required.

I have frequently seen young ladies subject to this inconvenience in the toe, and attributed it to the tightness of their shoes. It appears an extremely harsh measure on the part of the surgeon to amputate a toe under such circumstances, yet it is sometimes absolutely necessary, as the contraction deprives the person of exercise, and many of the enjoyments of life.

In the first person whom I saw with this state of the toe, I refused to amputate, fearful of tetanus being produced by the

operation; but the lady went to another surgeon, who complied with her request, and she did very well. In consequence of the perfect recovery of this lady, and the comfort which she derived from the loss of the annoyance, I was induced, at the request of Mr. Toulmin, of Hackney, to remove one of the toes from a patient of his, which was constantly irritated by the pressure of her shoe in walking, and prevented her from taking the exercise necessary to the preservation of her health; she did very well, perfectly recovering the use of her foot.

The fingers are sometimes contracted in a similar manner by a chronic inflammation of the thecæ and aponeurosis of the palm of the hand, from excessive motion of the hand, in the use of the hammer, the oar, ploughing, &c. When the thecæ are contracted, nothing should be attempted for the patient's relief, as no operation or other means will succeed; but when the aponeurosis is the cause of the contraction, and the contracted hand is narrow, it may with advantage be divided by a pointed bistoury, introduced through a very small wound in the integument. The finger is then extended, and a splint is applied to preserve it in the straight position.

Division of aponeurosis.

Some time since, my nephew, Mr. Bransby Cooper, who was transacting my business during my absence from town, performed this operation for a Lincolnshire farmer, who, by this impediment, had been prevented following his avocations; and he perfectly recovered the use of his foot.

DISLOCATION OF THE THUMB.

These accidents are very difficult to reduce, on account of the numerous strong muscles which are inserted into the part.

The thumb consists of three bones:—its metacarpal bone and two phalanges. The metacarpal bone of the thumb is articulated with the os trapezium by means of a double pulley; that of the trapezium directing the thumb towards the palm of the hand, and that of the metacarpal bone directing it laterally. The metacarpal bone is connected with the trapezium by a capsular ligament, and

a very strong ligament joins the first phalanx to the palmar part of the trapezium, at its lower extremity. The metacarpal bone forms a rounded projecting articulatory surface, upon which the hollow of the first phalanx rests, both being surrounded by a capsular ligament, and strengthened by two strong lateral ligaments. There are eight muscles inserted into the thumb: two into the metacarpal bone, as the extensor and flexor ossis metacarpi; two into the first phalanx, the flexor brevis pollicis, and the extensor primi internodii; the abductor and adductor pollicis are also inserted into the first phalanx, through the medium of the sesamoid bones; the extensor secundi internodii and flexor longus pollicis are inserted into the second phalanx. These muscles necessarily offer great resistance to the reduction of dislocations, and therefore those of the thumb are amongst the most difficult to reduce, if any considerable time be allowed to elapse before the attempt be made.

DISLOCATION OF THE METACARPAL BONE FROM THE OS TRAPEZIUM.

Symptoms.

In the cases which I have seen of this accident, the metacarpal bone has been thrown inwards, between the trapezium and the root of the metacarpal bone supporting the fore finger; it forms a protuberance towards the palm of the hand; the thumb is bent backwards, and cannot be brought towards the little finger. Considerable pain, with swelling, is produced by this accident.

Mode of reduction.

For the facility of reduction, as the flexor muscles are much stronger than the extensors, it is best to incline the thumb towards the palm of the hand during extension; and thus the flexors become relaxed, and their resistance diminished. The extension must be steadily supported for a considerable time, as no sudden violence will effect the reduction. If the bone cannot be reduced by simple extension, it is best to leave the case to the degree of recovery which nature will in time produce, rather than divide the muscles, or run any risk of injuring the nerves and blood-vessels.

Compound luxation.

This bone is sometimes dislocated by the bursting of a gun, which produces compound luxation; in these cases it may be

returned without difficulty to its natural situation. The integuments being brought and confined over the bone by suture, a poultice is applied; and under common circumstances, where the degree of bruise has not been very considerable, a cure is perfected. Sometimes, however, the metacarpal bone becomes so much detached from the trapezium, and the muscles are so severely torn, that it is necessary to remove the thumb; in which case, it is best to saw off the articular surface of the trapezium. Such a case happened lately to a servant of Mr. Grover, of Hemel Hempstead; the metacarpal bone of the thumb was dislocated, and the muscles were so much lacerated that it became necessary to remove the thumb at the os trapezium: but the articular surface of the trapezium projected so far, that the integuments could not be brought over it; I therefore directed this surface to be sawn off, through the os trapezium; and a poultice being applied, the man recovered by the granulating process.

DISLOCATION OF THE FIRST PHALANX.

Diagnostic marks of simple dislocation of the first phalanx.

This accident may be either simple or compound. In the simple dislocation the first phalanx is thrown back upon the metacarpal bone; the lower extremity of the latter projects very much inward towards the palm of the hand, and the extremity of the phalanx projects backwards. The motion of that joint is lost, but that of the thumb, through the medium of the metacarpal bone and trapezium, remains free; so that as an opponent to the fingers its power of action continues: but with respect to flexion and extension, which are performed between the metacarpal bone and the first phalanx, they are destroyed by the dislocation.

Mode of reduction.

The extension is to be made by bending the thumb towards the palm of the hand, to relax the flexor muscles as much as possible; and the following is the general mode to be adopted in dislocations of the toes, thumb, and fingers. The hand is to be first steeped in warm water for a considerable time, to relax the parts as much as possible; then a piece of thin wetted leather, wash-leather for instance, is to be put around the first phalanx and as closely

adapted to the thumb as possible; a portion of tape, about two yards in length, is then to be applied upon the surface of the leather, in the knot which is called by sailors the *clove hitch*, for this becomes tighter as the extension proceeds. An assistant places his middle and fore fingers between the thumb and fore finger of the patient, and makes the counter-extension; whilst the surgeon assisted by others, draws the first phalanx from the metacarpal bone, directing it a little inward towards the palm of the hand.

The extension should be supported for a considerable length of time, and if success does not attend the surgeon's efforts, it is right to adopt the following plan. The leather and sailor's knot are to be applied as above, and a strong worsted tape is to be carried between the metacarpal bone of the thumb and the fore finger: the arm is then to be bent around a bed-post, and the worsted tape fixed to it: a pulley is then to be hooked to the tape which surrounds the first phalanx, and extension is to be made; this mode is almost sure to succeed. If, however, under the steadiest, best directed, and most persevering attention, the bone be not reduced, a disappointment which will sometimes happen in dislocations which have been neglected, then the surgeon's efforts must cease; no operation for the division of parts should be made, as the patient will have a very useful thumb after a time, even without reduction.

Treatment of compound dislocation of the thumb.

In compound dislocations of the first phalanx of the thumb, if there be much difficulty in its reduction, and the wound be large, it is best to saw off the extremity of the bone, rather than to bruise the parts by long-continued extension; they are to be healed by adhesion; and if passive motion be begun early, a joint will soon be formed, and a very useful member remain. In this case, lint, dipped in blood, is to be applied to the wound; a roller must be bound round, and the part kept cool by evaporating lotions for several days, until the wound be healed.

I very recently saw the following case of *compound dislocation*.

A gentleman came to my house, whose first phalanx had been

thrown upon the back of the metacarpal bone of the thumb by the bursting of a gun. The flexor muscles and the abductor were much lacerated just below the os trapezium: the extensors were not injured. I applied the tape to the first phalanx, and extending, easily reduced it: I then brought the edges of the integuments together by suture, directing a poultice to be applied, on account of the great contusion of the parts; and the recovery was very complete.

DISLOCATION OF THE SECOND PHALANX.

Simple. If this be a simple dislocation the best mode of reducing it is, for the surgeon to grasp the back of the first phalanx with his fingers, apply his thumb upon the fore part of the dislocated phalanx, and then bend it upon the first as much as he possibly can.

Compound. In compound dislocations of this joint, it is best to saw off the extremity of the second phalanx, taking care not to injure the tendon which is torn through; for when the bone is removed, the ends of the tendon may be readily approximated, and adapted to each other. The extremity of the tendon should be smoothed by a knife, the part bound up in lint dipped in blood, and confined by a roller: it should be kept quiet for two or three weeks, when passive motion may be begun.

DISLOCATIONS OF THE RIBS.

Authors describe different species of dislocations of the ribs: their heads are said to be thrown from their articulation with the vertebræ forwards upon the spine. If this accident ever does occur, it is certainly extremely rare, and must be very difficult of detection.

Heads of ribs. A person by falling on his back upon some pointed body, may, however, receive a blow upon his ribs, by which they may be driven from their articulations.

Symptoms. Such an injury would produce the usual symptoms of fracture

of these bones: their motions would be painful, and respiration necessarily difficult.

Treatment. The treatment which would be required, would also be the same as that which is pursued in fracture of the ribs: viz., the abstraction of blood, and the application of a circular bandage: the former to prevent inflammation of the pleura and lungs: the latter to lessen the motion of the ribs. Any attempt made to effect their reduction would be entirely fruitless.

Cartilages. The cartilages connecting the ribs with the sternum, frequently appear to have been dislocated from the extremities of the ribs, and sometimes from the sternum. Mothers have several times brought their children to me, saying, "My child has some time since had a fall, and see how the form of its breast is altered." The sixth, seventh, and eighth cartilages of the ribs are most frequently the subjects of this alteration of form; and when the ribs are carefully examined, it is found that their natural arch is diminished, their sides flattened, and, consequently, the extremities of the ribs, with their cartilages, thrust forward. The appearance which is thus produced is the result of constitutional weakness, and not of the accident to which it is attributed.

The termination of the cartilages at the sternum sometimes projects from a similar cause, giving rise to the same false impressions upon the minds of the parents, that the circumstance must have arisen from accident, and not from disease. Sometimes however, but very rarely, a cartilage is torn from the extremity of the rib, and projects over its surface; when this happens, a similar treatment is required as in fracture of the ribs. The patient is to be directed to make a deep inspiration, and then the projecting cartilage is to be pressed into its natural situation; a long piece of wetted pasteboard should be placed in the course of three of the ribs and their cartilages, the injured rib being in the centre: this dries upon the chest, takes the exact form of the parts, prevents motion, and affords the same support as a splint upon a fractured limb. A flannel roller is to be applied over this splint, and a

Cartilage forcibly separated.

Treatment.

system of depletion pursued, to prevent inflammation of the thoracic viscera.

INJURIES OF THE SPINE.

Dislocations very rare.

It has been generally stated by surgeons that dislocations of the spinal column frequently occur: but if luxation of the spine ever does happen, it is extremely rare; as in the numerous instances which I have seen of violence done to the spine, I have never witnessed a separation of one vertebra from another through the intervertebral substance, without fracture of the articular processes; or, if those processes remain unbroken, without a fracture through the bodies of the vertebræ. Still I would not be understood to deny the possibility of dislocation of the cervical vertebræ, as their articulatory processes are placed more obliquely than those of the other vertebræ. I must, however, observe that, from the vicinity of our hospitals to the river, sailors are often brought into them with injuries of the spine, by falls from the yard-arm to the deck; and as there is almost always an opportunity of inspection in these cases, a dislocation must be very unusual, since I have never met with a single instance of it, those injuries having all proved to be fractures with displacement.

I am well aware that respectable surgeons have described dislocations as occurring in the cervical vertebræ; but I wish to state my own experience, with no further reference to that of others.

The following short account of the structure of the spine, is given merely to revive the ideas which may have faded from the memory.

Structure.

The spinal column is composed of twenty-four vertebræ, which are divided into three classes; namely, the *cervical*, *dorsal*, and the *lumbar:* they are very strongly connected by four articular processes, and are firmly joined by an elastic substance, which proceeds from the broad surface of the body of one vertebra to that of the other. The spinous processes of many of the vertebræ, and particularly those nearest to the centre of the column, are locked together, one being admitted into a depression of the other.

Bones.

Intervertebral substance.

The bodies of the vertebræ are united by a ligamento-cartilaginous substance, extremely elastic, and composed of concentric lamellæ, connected by oblique fibres, which decussate each other, but in the centre become mucous, so as to form a pivot, which supports the central line of the vertebræ; whilst the elasticity and compressibility of the outer edge of this uniting medium, allows the vertebræ to move upon this centre in all directions. The

Anterior spinal ligament.

column is also further connected by an *anterior spinal* ligament, which proceeds from the second vertebra of the neck to the sacrum, and is united to all the bodies of the vertebræ, excepting

Posterior spinal.

the first. There is also a *posterior spinal* ligament, situated within the canal of the spinal column, and proceeding from the second vertebra; but it is also intermixed with the perpendicular ligament; and descending to the sacrum, it sends out lateral processes to the superior and inferior edges of the bodies of the

Intervertebral.

vertebræ. *Intervertebral* ligaments also pass in a crucial direction from vertebra to vertebra. The articular processes are united by

Capsular.

capsular ligaments, and the transverse processes have ligaments passing from the one to the other. Between the arches of the roots of the spinous processes is placed an elastic ligament, called

Ligamentum subflavum.

the *ligamentum subflavum*, which allows of considerable separation of the spinous processes; and, by its elasticity, approximates them, rendering muscular support for the erect position of the body less necessary. The vertebræ of the neck are united at their spinous

Ligamentum nuchæ.

processes by an elastic ligamentous substance, which is termed the *ligamentum nuchæ*.

Capsular.

The head is connected to the spinal column by *capsular ligaments*, enclosing the condyles of the os occipitis and the articular processes of the atlas, or the first vertebra.

Circular.

A *circular ligament* proceeds from the foramen magnum to the edge of the aperture of the first vertebra.

Perpendicular.

A *perpendicular ligament* passes from the anterior part of the foramen magnum to the dentiform process of the second vertebra.

Lateral.

Lateral ligaments proceed from the edge of the foramen magnum and first vertebra on each side, and are united to the dentiform

process of the second vertebra: these ligaments limit the lateral motions of the head.

The first vertebra of the neck is united to the second by means of a *transverse ligament*, which is also fixed to the first vertebra on each side, and passes behind the dentiform process of the second vertebra. Transverse.

The spinal column, from the two important purposes which it serves, namely, that of supporting the head and all that part of the body situated above the pelvis, and also from its containing and protecting the spinal marrow, upon which the volition and sensation of the extremities depend, is, by the number of its bones, the strength of its joints, and its connection with the bones of the chest, most carefully protected from external injury.

The effects which are produced by violence done to the spinal cord are very similar to those which are produced by injuries to the brain;—for example:— Effects of injuries.

Concussion.

Extravasation.

Fracture.

Fracture with depression.

Suppuration and ulceration.

CONCUSSION OF THE SPINAL MARROW.

When a person receives a very severe blow upon the spine, or, from any great force, has it very suddenly bent, a paralysis of the parts beneath will frequently succeed, in a degree proportionable to the violence of the injury; but after such an effect, the person, in general, gradually recovers the motion and sensation of the parts. Concussion.

A man was admitted into Guy's Hospital under the care of Dr. Curry, who had received a severe blow from a piece of wood, which falling upon his loins, knocked him down; and as he came to the hospital on the regular day of admission, and not immediately after he had received the injury, he was placed amongst the physician's patients. His lower extremities were in a great Case.

degree deprived of motion, and their sensibility was much diminished. When resting upon his back in bed he could slightly draw up his legs, but he could not bend them to a right angle with the thigh; and a considerable time elapsed before he could make the muscles of the lower extremities obey the effort of his will. As there was still the appearance of severe contusion and much deep-seated tenderness in the situation of the blow upon the loins, Dr. Curry ordered blood to be repeatedly drawn away by cupping, and the bowels to be acted upon by calomel; and when the pain and tenderness, in consequence of the contusion, had been removed, a blister was applied to the loins, and a discharge supported for three weeks by the application of the unguentum sabinæ. The liniment ammoniæ was ordered to be daily rubbed upon the lower extremities. In six weeks the motion and sensation of his legs had almost entirely returned, and he was then directed to be submitted to the influence of electricity. By this treatment, in ten weeks he completely recovered.

I lately attended a gentleman, who, by a fall from his gig, had received a severe blow upon his loins, and who had, at first, great difficulty in discharging both his urine and fæces; but he was relieved by fomentation and cupping.

EXTRAVASATION IN THE SPINAL CANAL.

Extravasation.

A very severe blow upon the vertebræ will sometimes produce extravasation upon the spinal cord, but more frequently upon the sheath in which it is contained. Of late years it has been our custom, in examining dead bodies, to saw off the spinous processes of the vertebræ, the more accurately to examine the spinal marrow: and under such circumstances, in cases of severe injury, blood has been several times found on the outer side of the spinal sheath; and, in one instance, it occurred upon the spinal marrow, just above the cauda equina.

Spinal marrow examined in dissection.

The case which best illustrates this subject, is one which I visited with Dr. Baillie, and Mr. Heaviside; and the particulars of which I have obtained from Mr. Heaviside, whom I have ever

found ready to make his beautiful anatomical collection useful to the profession.

Master ————, a fine youth, aged twelve years, in June 1814, was swinging in a heavy wooden swing, and, in just commencing the motion forwards, was caught by a line which had got under his chin, by which accident his head and the whole of the cervical vertebræ were violently strained; as however, the line slipped immediately off, he thought no more of it. Subsequently to the accident, for some months, he was not aware of any pain or inconvenience, but his school-fellows observed that he was less active than usual: instead of filling up his time by play, he would be lying on the school forms, or leaning on a stile or gate when in the fields. They were always teasing him on this account; and at last he was persuaded that he was weaker than he used to be. From this time he continued to decline both in strength and power. About the middle of May following, he came to London. His complaints were occasional pains in the head, which were more severe and frequent about the back of his neck (where a blister had been applied without relief) and down his back. The muscles at the back of the head and neck were stiff, indurated, and very tender to external pressure. He felt pain in moving his head or neck in any direction: added to these symptoms, there was a great deficiency in the voluntary powers of motion, especially in the limbs. Case.

May 18th. Two setons were made in the neck; and he was ordered various medicines, none of which proved useful.

May 29th. His complaints and the paralytic affection of his limbs were getting much worse; added to which he felt a most vehement hot burning pain in the small of his back. This, by the next day, was succeeded by a sense of extreme coldness in the same part. Some time after, the same pain occurred higher up in the back, and then disappeared. Pulse and heat natural.

June 3d. A consultation of Dr. Baillie, Dr. Pemberton, Mr. A. Cooper and Mr. Heaviside was held, and the application of mercury was determined on. The pil. hydr. was taken for a few

days; but as it ran off by the bowels, mercurial frictions were consequently preferred. He felt his limbs getting every day weaker, but his neck was less painful when moved, and he was more capable of moving it by his own natural efforts.

June 7th. His respiration became laborious; he passed a bad night. On the following day, all his symptoms increased; and at five in the afternoon he expired.

Dissection.

Dissection.

The whole contents of the head were carefully examined, and found perfectly healthy; but upon sawing out the posterior parts of the cervical vertebræ, the theca vertebralis was found overflowed with blood, which was effused between the theca and the enclosing canals of bone. The dissection being further prosecuted, this effusion extended from the first vertebra of the neck to the second vertebra of the back, both included.

The preparation only shews a small proportion of the effused blood which had become coagulated on the theca, because much of it, being fluid, escaped in the act of removal.

FRACTURE OF THE SPINE.

Produce symptoms of irritation on pressure.

These accidents, by admitting unnatural variations in the positions of the spinal column, produce very extraordinary symptoms, and sometimes sudden death, even when the bones retain their situation. Mr. Else, who preceded Mr. Cline as teacher of anatomy at St. Thomas's Hospital, used to mention the following case in his lectures.

Case.

A woman who was in the venereal ward at St. Thomas's Hospital, and who was then under a mercurial course, while sitting in bed, eating her dinner, was observed to fall suddenly forwards; and the patients hastening to her, found that she was dead. Upon examination of her body, the dentiform process of the second vertebra had been broken off; the head, in falling forwards, had forced the root of the process back upon the spinal marrow, which occasioned her instant dissolution.

At the time I lived with Mr. Cline as his apprentice, the following case occurred in his practice.

A boy, about three years of age, from a severe fall injured his neck; and the following symptoms succeeding the accident, Mr. Cline was consulted. Case.

He was obliged to walk carefully upright, as persons do when carrying a weight on the head: and when he wished to examine any object beneath him, he supported his chin upon his hands and gradually lowered his head, to enable him to direct his eyes downwards; but if the object was above him, he placed both his hands upon the back of his head, and very gradually raised it until his eyes caught the point which he wished to see.

If, in play with other children, they ran against him, it produced a shock which caused great pain; and he was obliged to support his chin with his hand, and to go immediately to a table, upon which he placed his elbows, and thus supporting his head he remained a considerable time, until the effects of concussion had ceased. He died about twelve months after the accident; and upon the inspection of his body, which was conducted by Mr. Cline, the first vertebra of the neck was found broken across, so that the dentiform process of the second vertebra had so far lost its support, that under different inclinations of the head, it required great care to prevent the spinal marrow from being compressed by it; and as the patient could not depend upon the action of the muscles of the neck, he therefore used his hands to support the head during different motions and positions.

Portions of the spinous processes are sometimes broken off, but these accidents do not usually affect the spinal marrow, unless when attended with considerable concussion. Mr. Aston Key, in dissecting a subject at St. Thomas's Hospital, found a spinous process loose, which he kindly brought to me, with the following account; "The fractured vertebra was the third dorsal; the cause of the accident I could not ascertain, as it occurred in a subject brought into the dissecting-room. There was a complete articulation formed between the broken surfaces, which had become Spinous process.

covered with a thin layer of cartilage. The synovial membrane and capsular ligaments resembled those of other joints, excepting that the former was more vascular. The fluid within the joint had the lubricating feel characterizing synovia."

Case. A boy was admitted into Guy's Hospital, who had been endeavouring to support a heavy wheel by putting his head between the spokes, and receiving its weight upon his shoulders. The wheel overbalanced him, and he fell, bent double. When he was brought into the Hospital, although he had been perfectly straight before, he had the appearance of one who had long suffered from distorted spine; yet this injury had not produced paralysis of the lower extremities. Three or four spinous processes had been broken off, and the muscles torn on one side, so as to give an obliquity to the situations of the fractured portions. The boy quickly recovered without any particular attention, and was discharged with the free use of his body and limbs; but he still remained deformed.

FRACTURE OF THE BODIES OF THE VERTEBRÆ, WITH DISPLACEMENT.

Displacement of the vertebræ. These fractures frequently come under our observation, producing displacement of the vertebræ. As the symptoms and result of the accident differ according to the situation of the fractured bones, these injuries may be divided into two classes; first, those which occur above the third cervical vertebra; and, secondly, those which occur below that bone.

These accidents fatal. In the first class, the accident is almost always immediately fatal, if the displacement be to the usual extent. Death, in the second class, occurs at various periods after the injury. The origin of the phrenic nerve, from the third and fourth cervical pairs, is the reason of this difference; for as the parts below are paralyzed by the pressure upon the spinal cord, if the accident be below the fourth cervical vertebra, the phrenic nerve retains its functions, and the diaphragm supports respiration; but if, on the contrary, the fracture be situated above the origin of this nerve,

death immediately ensues. It is true, that a small filament of the second cervical nerve contributes to the formation of the phrenic, but is in itself insufficient to support respiration under fracture of the third vertebra.

Displacement below the phrenic nerve.

Lumbar vertebræ.

The effects which arise from fracture and displacement of the spine, below the origin of the phrenic nerve, depend upon the proximity of the accident to the head. If the lumbar vertebræ be displaced, the lower extremities are rendered so completely insensible, that no injury inflicted upon them can be perceived by the patient. Pinching, burning with caustic, or the application of a blister, are alike unfelt. The power of volition is completely destroyed, not the smallest influence over the muscles remaining. The sphincter ani loses its power of resistance to the peristaltic motion of the intestines, and the fæces pass off involuntarily. The bladder is no longer able to contract, and the urine is retained until drawn off by a catheter; and yet the involuntary powers of the limbs remain nearly the same as before. The circulation proceeds, although perhaps somewhat more languidly, but sufficiently to preserve their heat; and local inflammation can be excited in them. A blister applied upon the inner part of the thigh or leg, of which the patient is wholly unconscious, will still inflame, vesicate, and heal; shewing that the involuntary functions may proceed in parts which are cut off from their connection with the brain and spinal marrow *. The penis, under these circumstances, is generally erect. Patients die from this injury at various periods, according to the degree of displacement of the vertebræ. In general, in fractures of the lumbar vertebræ, the patient dies within the space of a month or six weeks after the injury; and usually for some time before death, the urine passes off involuntarily, from extreme debility. I remember a patient of Mr. Birch, in St. Thomas's Hospital, who lived more than two years after this accident, and then died of gangrene of the nates.

* I have always thought, that although sensation and volition depend upon the brain, the spinal marrow, and the nerves, yet the involuntary functions depend principally upon the nerves.

Displacement of the dorsal vertebræ.

In fractures and displacement of the dorsal vertebræ, the symptoms are very similar to those described in fractures of the lumbar; but the paralysis extends higher, and the abdomen becomes excessively inflated. I remember one of our pupils saying, when a patient was brought into Guy's Hospital who had suffered from injury to the dorsal vertebræ, "Surely this man has ruptured his intestines, for observe how his abdomen is distended." But the first fæcal evacuation relieved this state, and proved that it had merely arisen from excessive flatulency. This symptom proceeds from diminished nervous influence in the intestines*; for although their peristaltic motion can proceed independently of the brain and spinal marrow, yet it is quite certain that the involuntary functions of the intestines, like those of the heart, can be influenced by the brain and spinal marrow; for we see even states of the mind producing affections of the intestines: one state rendering them torpid, and another irritable; as we see the heart leaping with joy, and depressed by disappointment. We also observe pressure on the brain rendering the intestines very difficult of excitement, even through the influence of the strongest aperients. From displacement of the dorsal vertebræ, death sooner succeeds than in similar injuries to the lumbar, the patient usually surviving the accident not more than a fortnight or three weeks; but still I knew a case of a gentleman in the city, who met with this accident, and who lived rather more than nine months. The period of existence is short or protracted, as the injury is near to or distant from the cervical vertebræ, and as the displacement is slight or considerable; it depends also upon the degree of injury which the spinal marrow has sustained.

Fractures of the cervical vertebræ.

Fractures of the cervical vertebræ, below the origin of the phrenic nerve, produce paralysis of the arms, as well as of the lower parts of the body; but this paralysis is seldom complete. If it occurs at the sixth or seventh vertebra, the patient has some feeling and powers of motion; but if at the fifth, little or none.

* Preceding dissolution, in almost all diseases, a great evolution of air into the intestines is observed, and from the same cause.

Sometimes one arm is much more affected than the other, when the fracture is oblique, and the axillary plexus of nerves is, in consequence, partially influenced. Respiration, in these cases, is difficult, and is performed wholly by the diaphragm, the power of the intercostal muscles being destroyed by the accident. The abdomen is also tumid from flatulency, as when the dorsal vertebræ have sustained injury. The other symptoms, in regard to the lower extremities, the bladder, and the sphincter ani, are the same as in fractures of the vertebræ below the cervical. Death ensues in these cases in from three to seven days, as the disease happens to be seated in the fifth, sixth, or seventh vertebra. I have scarcely known the subject of this injury to live beyond a week, and but rarely to die on the second day, although they sometimes die so early if the fifth cervical vertebra has sustained the injury. I have already stated, that in fractures and displacements above the fourth cervical vertebra, death almost instantaneously follows. The longest life I have known after such an accident has been ten months.

Dissection.

In the dissection of these cases, the following appearances are found:—The spinous process of the displaced vertebra is depressed; the articular processes are fractured; the body of the vertebra is broken through; for it but rarely happens that the separation and displacement occur at the intervertebral substance. The body of the vertebra is usually advanced from half an inch to an inch. Between the vertebræ and the sheath of the spinal marrow blood is extravasated; and frequently there is extravasation of blood on the spinal cord itself. The spinal marrow is compressed and bruised in slight displacements, and is torn through when the injury has been very extensive; but the dura mater remains whole. A bulb is formed at each end of the lacerated spinal marrow, which laceration is usually produced by the bony arch of the spinous process.

A most interesting case of this accident has been published by Mr. Harrold, an intelligent surgeon at Cheshunt; and a prepara-

tion made from the case is preserved in the Museum at the Royal College of Surgeons.

The outline of the case is as follows—

Case. A man, twenty-eight years of age, was knocked down by a quantity of chalk, which, falling upon him, broke his spine at the lower part of the dorsal, or the beginning of the lumbar vertebræ.

The principle upon which Mr. Harrold proceeded was, to produce union of the bones, by preserving the spine perfectly at rest; and to effect this object the patient was placed in a fracture-bed, which permitted him to evacuate his bowels without disturbance. The urine was drawn off daily by the catheter for several weeks; after which time he was able to retain from a pint to a pint and a half, and to discharge it when he pleased. A wound was produced upon the sacrum, from the constant pressure of his body upon the bed; and although he was insensible of it, the sore gradually healed.

Symptoms. At the end of six months, his state was as follows:—His back was straight, flexible, and apparently as strong as ever. He retained and passed his urine, but probably he discharged it more by the action of the abdominal muscles than by any contraction of the bladder. He had a stool once in three or four days. His health and spirits were good, but he had neither sensation nor volition in the lower extremities. He dressed himself entirely; he let himself down stairs step by step. He died after the lapse of twelve months (wanting nine days) from the accident, owing to a sore on the tuberosity of the ischium, and to disease of the bone.

Examination. I carefully examined the preparation, which is preserved in the Museum of the College, and found the following circumstances.

The bodies of the first and second lumbar vertebræ had been fractured; the first had advanced, and the second had been forced backwards.

The fracture had united by ossific matter, which had been spread over the fore part of both vertebræ to a considerable extent, and a little had been deposited upon the dorsal vertebræ.

The spinal canal had been much diminished by a portion of bone forced into it from the first vertebra of the loins; this portion of bone had split the theca vertebralis into two, and divided the spinal marrow almost entirely; a bulbous projection of the spinal marrow appeared above and below the bone, formed by its divided extremities, which were separated nearly an inch from each other.

.Mr. Brookes also had a preparation in his late excellent anatomical collection, of fracture of the spine at the seventh and eighth dorsal vertebræ. The person had lived sufficiently long for a great deposit of ossific matter to have formed upon the anterior and lateral parts of the fractured vertebræ. The spinal marrow was almost entirely torn through, but the spinal sheath remained. Mr. Brookes could not learn how long the person had survived the accident. Ossific matter.

As to the treatment of these cases, I fear that whatever may be done, the majority of them will prove fatal.

To bring the spine into its natural form by extension would be impossible, if it were attempted; and even if that object were attained, it would scarcely be practicable to preserve it in its situation, as the least motion would again displace it. Rest will be essential to ossific union; but ossific union will not save the patient if the pressure upon the spinal marrow be not removed.

Mr. Henry Cline was the only person who took a scientific view of this accident. He considered it to be similar to fracture with depression of the cranium, and to require that the pressure should be removed; and as the cases had proved so uniformly fatal, he thought himself justified in stepping out of the usual course, with the hope of preserving life. He made an incision upon the depressed bone, as the patient was lying upon his breast, raised the muscles covering the spinal arch, applied a small trephine to the arch, and cut it through on each side, so as to remove the spinous process and the arch of bone which pressed upon the spinal marrow. The only case in which he tried it, did not succeed; and unfortunately he did not live to bring his opinion sufficiently to Operation by Mr. H. Cline.

the test of experiment, to warrant a decided judgment. He was blamed for making this trial. I am not sure that he would have been ultimately successful; but in a case otherwise without hope, I am certain that such an attempt was laudable*.

In those cases in which the first and second cervical vertebræ have been broken and displaced, death, from obstructed respiration, is too sudden to allow time for any surgical relief.

INFLAMMATION AND ULCERATION OF THE SPINAL MARROW.

The only case which I could determine to be of this nature by dissection was the following:—

Case. A gentleman who resided about eight miles from London, had, by a fall, received a severe blow upon the spine; but as it produced no immediate ill effect, he thought very lightly of it. In going down to his country house, he was exposed to the inclemencies of the weather; and he was on a sudden seized with a pain in his back, and paralysis of the lower extremities, retention of urine, and an involuntary discharge of fæces. I was requested to see him on account of the retention of urine, and went daily for a length of time to Wimbledon Common, where he resided, to make use of the catheter. For several weeks his symptoms remained unchanged, excepting that now and then the integuments of the sacrum gave way, and required great attention to prevent a dangerous sore. Towards the close of his existence he complained of a sense of uneasiness and distention at the upper part of the abdomen. His appetite failed him; he rejected his food and had a great deal of fever, with quick pulse and profuse perspiration. He sunk gradually, worn out by irritation.

I removed the spinal marrow, and have it preserved in the collection at St. Thomas's Hospital. Upon opening the spinal sheath, a milky fluid was found within it, just above the cauda equina;

* I beg the reader to observe that this operation is not mine; that I have expressed some doubts of its ultimate success: but I wish the trial to be made, as the only means of deciding positively on its utility; and if it saves only one life in a hundred, it is more than I have yet seen accomplished by surgery.

and higher than this, for the space of three inches, the spinal marrow was ulcerated to a considerable depth, and was in the softened state which the brain assumes when it is rendered semi-fluid by putrefaction. All the other parts of the body were healthy, excepting the bladder, which was considerably inflamed, and exceedingly extended by the long-continued retention of the urine.

In a case similar to this, it will be necessary to make use of precautions to prevent inflammation, by cupping or by leeches. Blisters should be applied; and if the fever still continues, a seton should be made, or issues be opened, to prevent the continuance of inflammation, by producing and supporting external irritation.

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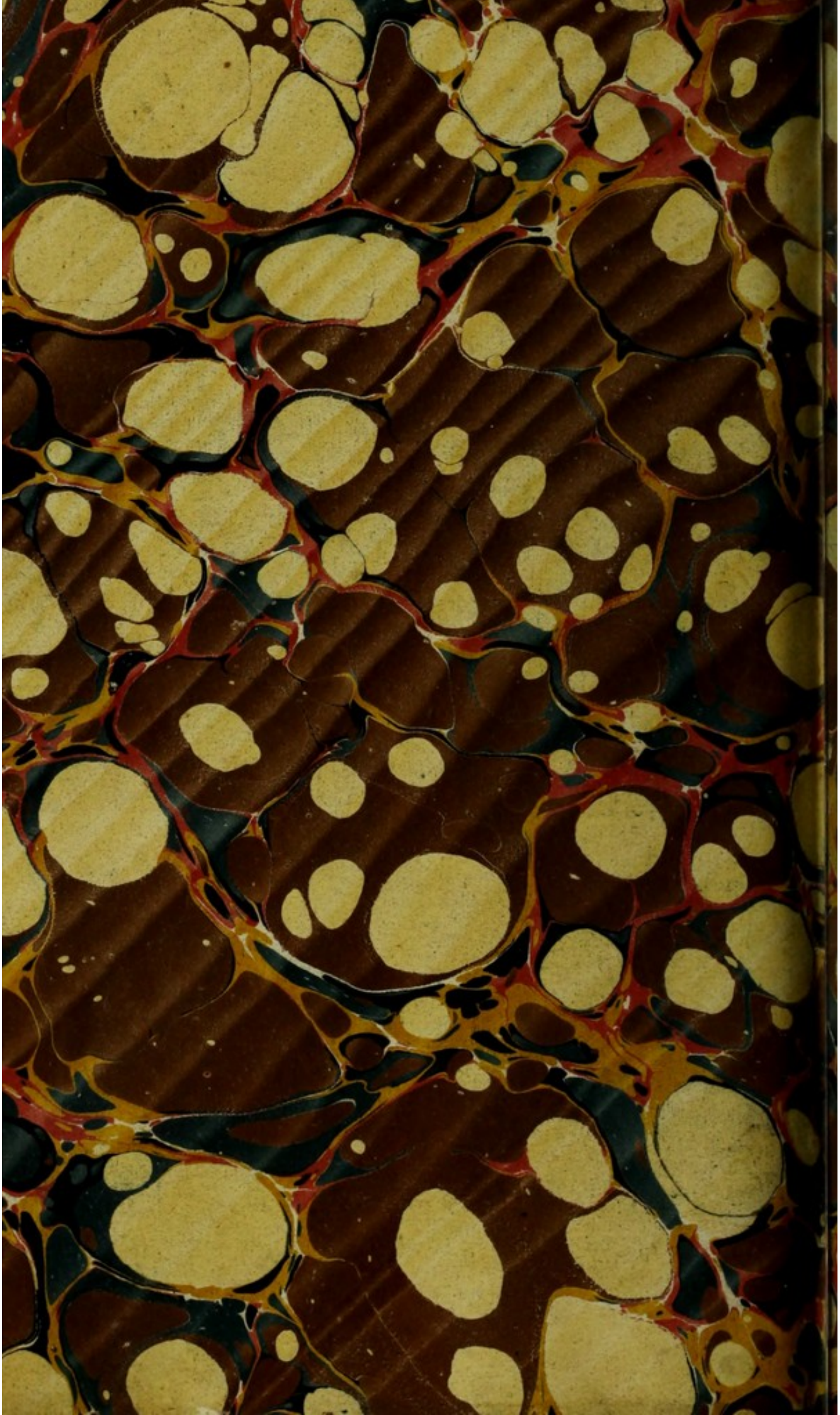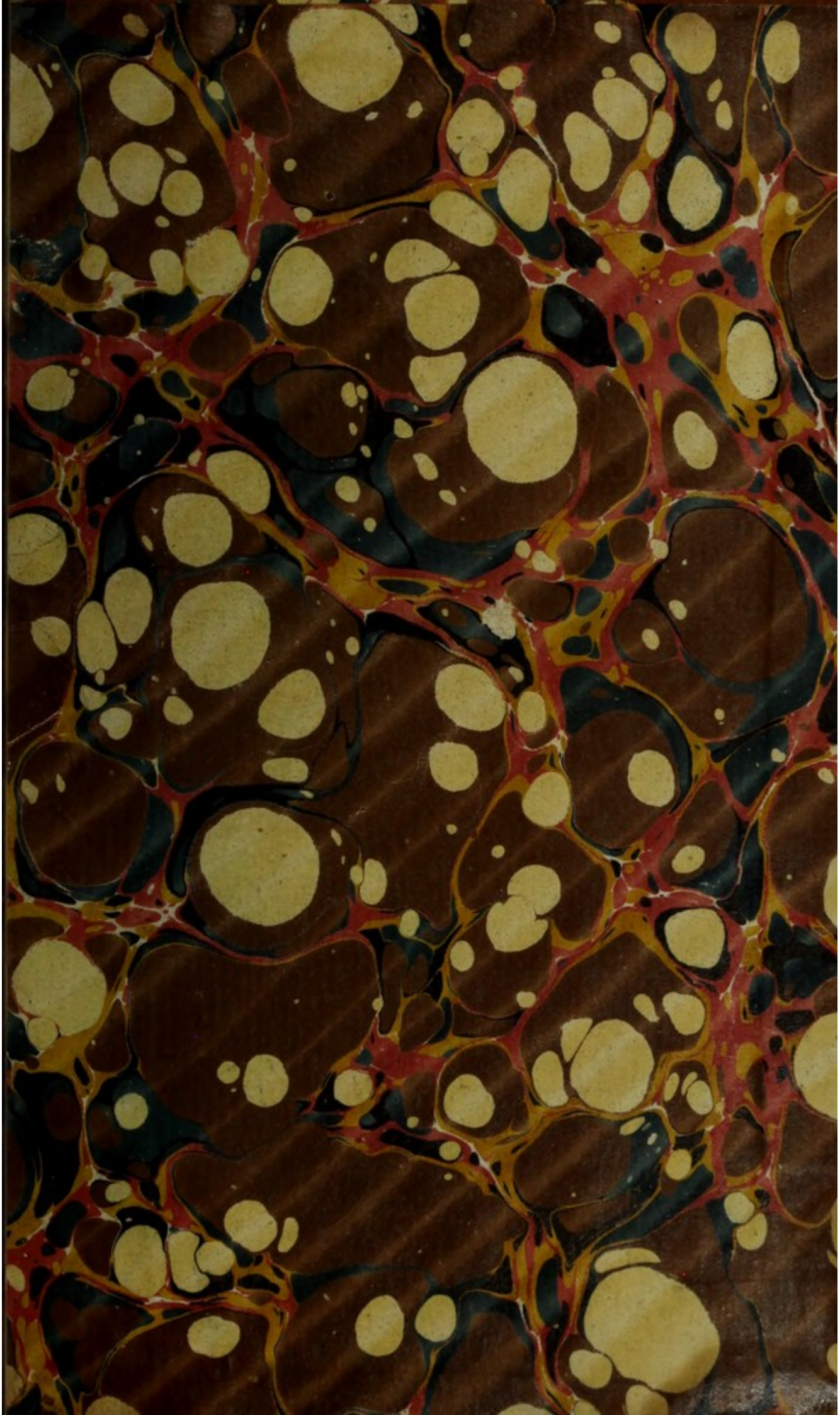
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