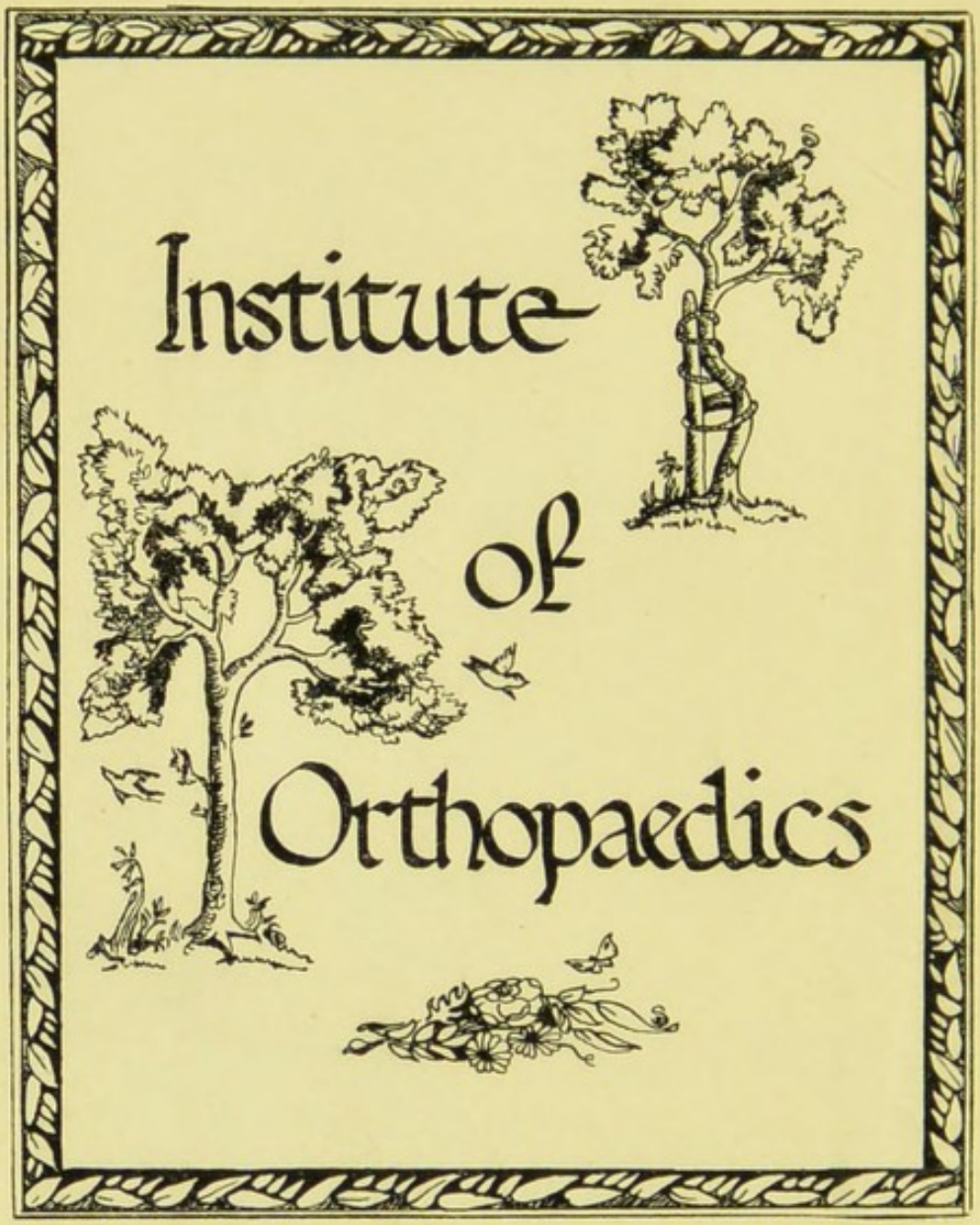
Diseases of the joints and spine / by Howard Marsh.



DISEASES

OF THE

JOINTS AND SPINE

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BY

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NEW AND REVISED EDITION

WITH SEVENTY-NINE ILLUSTRATIONS

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To

SIR JAMES PAGET, Bart., F.R.S.,

SERJEANT-SURGEON TO THE QUEEN, ETC. ETC.,

MY MASTER IN SURGERY FOR MORE THAN TWENTY YEARS,

MY EXAMPLE IN ALL THE HIGHEST RULES OF CONDUCT,

MY EVER KIND FRIEND AND READY ADVISER,

I DEDICATE THIS BOOK WITH THE DEEPEST

GRATITUDE, AFFECTION, AND

RESPECT.

PREFACE TO THE NEW AND REVISED EDITION.

In the nine years which have elapsed since the first edition of this work was published, considerable additions have been made to our knowledge of the subject of "Diseases of the Joints." This new material I have endeavoured to introduce, and thus many of the chapters have been in great part re-written. The space prescribed has obliged me to write as concisely as possible, and also to omit reference to the works of authorities who have, in many instances, afforded valuable information, or confirmed me in the facts as I have stated them. In the main, however, the views expressed are those which I have formed as the result of direct personal experience. I have added a short account of the principal diseases of the spine, treating this subject almost entirely from a clinical point of view.

In the preparation of the volume I have received very valuable assistance from Mr. D'Arcy Power, who has also prepared a copious index.

I must repeat my thanks to my colleagues at St. Bartholomew's Hospital and the Hospital for Sick Children for permission to make use of cases under their care.

30, *Bruton Street, Berkeley Square.*
July, 1895.

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Part I.

DISEASES OF THE JOINTS.

CHAPTER I.

INTRODUCTORY REMARKS.

It is natural for any one interested in the study of diseases of the joints to inquire whether, in the last thirty or forty years, an amount of progress has taken place in this department at all commensurate with that which has been reached in other branches of surgery. I shall endeavour to show that this question admits of a satisfactory answer, by alluding briefly to some of the chief improvements that have been introduced. One important result of such a review, however, will be to emphasise the fact that all surgery is one; that the same general principles are common to every department; that any advance in one part tells on every other part; and that he will best succeed in the diagnosis and treatment of diseases of the joints who has gained the clearest insight into the laws which regulate practice in other sections of the common whole.

It was in 1850 that Brodie published the last edition of his book on "Diseases of the Joints," a work which

gave to the study of this important, but previously little cultivated subject, an impetus, the effect of which has been felt down to the present time, and which contained the germ of much that has since been accomplished. Since Brodie's day our knowledge has been largely increased by the study of surgical pathology, especially in the department of microscopic anatomy. The changes that occur in the synovial membrane, the ligaments, the articular cartilage, and the periarticular tissues, have been defined and explained. The morbid anatomy of many diseases has been worked out, and the opinions founded on clinical observation and inference have been examined from the independent standpoint of pathological research in such cases, among many others, as tuberculosis, syphilitic disease, and those affections which are secondary to morbid conditions of the spinal cord. The appointment of Demonstrators of surgical pathology in the medical schools has ensured the same critical study of surgical cases in the post-mortem room as was formerly bestowed on medical cases only, and the exhibition of rare forms of disease at the various societies, and their examination by special committees, have been productive of a wide diffusion of accurate information.

Another great advance has been in the direction of diagnosis, a department which has been largely indebted to the cultivation of correct diagnosis in other divisions of surgery. We can scarcely realise the time when limbs were amputated for "neuralgia," sometimes due, as Brodie, in one of his happiest discoveries, taught us, to a condition so easily dealt with as a circumscribed abscess in the end of one of the bones. Since Brodie's time the true pathology of tuberculosis has been discovered, syphilitic affections of the joints have been recognised, and the connection between certain morbid conditions of the joints and lesions of the nervous system has been pointed out; and among the most interesting examples of these, besides Charcot's disease and

syringo-myelia (page 93), are the cases lately described by Mr. Bowlby of anchylosis of the joints of the fingers following division of the nerves of the fore-arm. Since Brodie's time, also, the fact that joint disease is often secondary to mischief originating in the growing ends of the bones has attracted attention, and the necessity of treating the primary bone lesion before it has extended to the joint which it is threatening has been fully recognised; and owing to the observations of Sir W. Jenner and Dr. Wickham Legg, the same may be said of the joint affections met with in the course of hæmophilia.

In the field of treatment, the influence of rest in staying the progress of disease in its early period, so emphatically taught by Brodie, Hilton, and Sir James Paget, has met with gradually increasing recognition, and the fact has now been fully established that tuberculous affections of the joints, when persistently treated from their commencement by this method, very seldom reach a formidable stage, and generally end in recovery with very slight impairment in the use of the limb. The development of the aseptic treatment of wounds, so largely due to the labours which must perpetuate the name of Lister in the annals of surgery, has produced results the value of which can scarcely be exaggerated in the operative treatment of joint disease. It is now well known that the synovial membrane of the joints is as tolerant of interference as the peritoneum or the pleura—provided, of course, that strictly aseptic methods are employed; and the safety of opening the large joints, for the purposes of treatment, or even as a means of diagnosis, is a matter of common experience. Moreover, the surgeon of to-day is no longer content with the mere evacuation of an articular or periarticular abscess. He aims at the complete removal of the abscess wall, and the removal or destruction of septic organisms, so that the wound shall be left in an aseptic condition, favourable to immediate healing. And this

result is now frequently attained: for instance, primary union of abscess-cavities connected with hip disease is a matter with which every surgeon is familiar. These results are more far-reaching than at first sight they appear to be; for when disease can thus be checked at its outset, and when, should suppuration occur, the complications formerly so constantly met with in connection with large collections of matter can be averted, diseases of the joints become in their whole aspect much less formidable, they extend over much shorter periods, they lead to no material deformity or impairment of function, they cause comparatively little suffering, and they inflict but little injury on the general health, while such mutilations as excision and amputation are falling more and more into disuse.

The removal of loose bodies from the joints—an operation which, in Brodie's time, was frequently fatal—is now, when carefully performed, attended with scarcely an appreciable risk. In many cases, again, osteotomy is employed for the correction of deformity, both with safety and with great advantage to the patient.

The introduction of anæsthetics into general use in surgery has led to an important improvement in the treatment of joints that have been left stiff after injury of the surrounding soft parts, or as the result of inflammation occurring in connection with fracture of the ends of the bones. For when gas or ether has been given, and all muscular resistance is thus abolished, adhesions can be ruptured by the use of an amount of force which is so slight that no risk whatever is incurred to either the blood-vessels or any of the other structures of the limb. The practice of using manipulation for the purpose of relieving pain and restoring motion in carefully selected cases is one of the greatest advances that have lately been made in the department of minor surgery.

CHAPTER II.

SYNOVITIS AND ARTHRITIS.

Simple synovitis.—By simple synovitis is understood an inflammation of the synovial membrane, which is not dependent upon any constitutional disorder or cachexia, and is not set up by any disease of the contiguous structures.

Simple synovitis is conveniently divided into (1) acute, (2) subacute, (3) chronic.

1. **Acute synovitis.**—The most common cause of this form of synovitis is some mechanical injury, such as a contusion, or a wrench, or the pinching of an indurated synovial fringe, a loosely attached semilunar cartilage, or a loose body, between the articular surfaces. By some observers exposure to cold and wet is mentioned as a cause. But this seems open to question. Few now entertain the old view that peritonitis is excited by the local action of cold, and although some instances have been recorded which seem to suggest it, many hesitate to believe that pleurisy is caused in this manner. A similar doubt must be expressed in regard to the joints; for generally either some slight injury can be detected, or the patient is found to be the subject of rheumatism, in a more or less acute form.

The changes which take place in the synovial membrane are in all respects similar to those met with in inflammation of any of the connective tissues. The membrane in acute cases becomes intensely vascular, and assumes a bright red tint, which appears at first sight to be uniform, but on closer inspection is seen to be due to the presence of a collection of innumerable turgid blood-vessels. Later, the surface presents here and there patches of

extravasated blood, each indicating the site at which an over-distended vessel has given way. The appearance of the synovial membrane in this stage is very striking, for its bright red colouring is set off by the pearly white of the articular cartilage. Very soon after the vascularity commences, the membrane swells and becomes soft, succulent, and juicy. The swelling is greatest in the situations of the normal folds, where the membrane passes from one articular surface to another, and by the swelling in these situations the edges of the cartilages are encroached upon and overlapped to a greater or less extent.

Microscopically examined, the changes that are seen correspond with those already described as visible to the naked eye. The blood-vessels dilate, and fresh capillaries are formed. Exudation occurs into the perivascular spaces, and these become distended by the excess of serous fluid with which they are soaked. Leucocytes escaping from the dilated vessels, and collecting in the soft connective tissue beneath the endothelium, penetrate between the endothelial cells and reach the internal surface of the joint. Here and there a vessel gives way and allows the escape of its contained blood. In many cases the fibrin-forming elements do not leave the vessels, and the fluid exudation is simply serous ; but in cases of greater intensity a plastic exudation takes place, and, the fibrin coagulating in the sub-synovial tissue, the inflammation assumes a plastic character.

The endothelial cells also take part in the general cellular activity. They multiply with more than usual rapidity, and in many cases are cast loose into the joint. When the multiplication of cells is rapid none of them attain their full size and development before they are displaced to make way for fresh cells, which are constantly being pushed to the surface from below.

Changes in the synovial fluid.—The changes in the synovial fluid are in proportion to those which occur in the membrane itself.

At first the fluid is simply increased in amount, but the synovial secretion rapidly becomes diluted with the products of inflammation, so that the joint is distended with a mixture of synovia and serous exudation. This fluid is quite clear in the early stage, but as the inflammation progresses flakes of fibrin make their appearance, and in many cases a membranous layer is deposited upon the synovial surface, giving it an opalescent or cloudy hue.

Mingled with this fibrinous exudation are the cast-off endothelial cells, and the leucocytes which have penetrated to the joint cavity; these cells are not always to be distinguished from one another, but the endothelial cells are, at any rate in the earlier stages, much the larger, and contain many nuclei.

In all acute inflammations the synovial fluid is coloured to a greater or less extent by extravasated blood, and red blood corpuscles are found on microscopic examination.

As to its physical characters, synovial fluid, from a case of acute synovitis, is red, sticky or viscid, and opalescent.

It should be mentioned that, in cases of injury, a definite extravasation of blood is not infrequent at the time of the accident. In most cases this effused blood is rapidly mingled with synovial fluid and with the products of inflammatory exudation, and it does not coagulate for some time, if at all.

If a simple acute synovitis undergoes resolution, the cell-proliferation ceases, the exudation-fluid is absorbed, the newly formed vessels shrink and disappear, the softened and infiltrated tissues resume their natural appearance, and the membrane and its secretion again present entirely normal characters.

2. **Subacute synovitis.**—Subacute synovitis is due to the same causes which induce the acute variety. In its course it presents no material points of difference from the latter; all the changes being less marked and of lower intensity, but in other respects identical.

3. **Chronic synovitis.**—This may be produced by the same causes that lead to acute or subacute synovitis, but it is usually the outcome of one or other of these forms, which, in the absence of appropriate treatment, has not entirely cleared up.

The appearance of the synovial membrane when acute synovitis merges into the chronic form, is but little altered from the normal, the only marked change being that, on account of the excess of fluid in which it is bathed, the membrane is swollen and succulent.

Microscopically, in chronic synovitis there is seen to be some cell-exudation, but this is at all times slight. There is generally some increase of vascularity, though this is never a marked condition. As time goes on, further changes may ensue, and the synovial membrane may become thickened and indurated by the gradual formation in its substance of fibrous tissue developed from the cells already mentioned. In the majority of cases, however, of simple chronic synovitis recovery will finally result.

The changes that occur in the synovial fluid are not of a very marked nature. The amount is increased by the addition of a large quantity of serous exudation; this fluid is not opalescent, for there is little or no cell-exudation; and no fibrinous coagula, such as are met with in acute synovitis, are present. It generally contains albumin in considerable quantity. As its name implies, the process at work is a chronic inflammation of the synovial membrane, and the gradual thickening of tissue and the increase of fluid are changes analogous to those which occur in other chronically inflamed parts.

Simple purulent synovitis.—In some instances, although with extreme rarity, a simple acute synovitis, following a severe wrench or other mechanical injury, and occurring in a patient of feeble general health, may go on to suppuration and the distension of the joint with pus. A man of twenty, while training for a boat race, developed synovitis of his left elbow. The joint, on the morning of the race, was hot, painful, and stiff. The contest proved severe, and a few hours later the joint became much swollen and intensely painful. In four days it suppurated. The appearance of the synovial membrane in such cases does not differ materially from that already described as typical of acute serous synovitis. In most cases, indeed, the pus in the joint is derived rather from the vessels near the *surface* than from those of the deeper parts of the membrane, or of the bone or other subjacent structures. It is in this *superficial* character of the suppuration that the chief pathological difference between "simple purulent synovitis" and "acute suppurative arthritis" (page 14) is to be found.

Symptoms.—Simple acute synovitis is often met with in a characteristic form after contusion or over-exertion. The patient is attacked with pain in the joint. At first only moderate, this rapidly becomes severe, especially at night, and is of a tense, bursting character. The joint, placed in a posture of "greatest ease" (page 11), becomes fixed in this position, and any attempt at either active or passive movement causes severe suffering. The swelling varies in amount, but is usually considerable. It takes the general shape of the joint, the synovial cavity of which becomes distended, and clearly marked out in such superficial articulations as the knee and elbow. Bulging, however, is most distinct where the capsule is thin, as in the intervals between the tendons and ligamentous expansions which traverse the surface. Heat is a very important symptom in the case of the elbow

wrist, knee, and ankle; it is not, however, available in the instances of the shoulder and hip, as these joints are so thickly covered with soft parts. Heat may be gauged by comparing the temperature of the suspected joint with that of its fellow, under similar conditions of exposure, either by placing the hand flat on the surface, or by the more exact method of using the surface-thermometer. In slight cases an increase of temperature may be the most distinct evidence that synovitis is present; while, on the other hand, if a joint is perfectly cool, this circumstance is of itself enough to show that no acute inflammatory action is in progress. Redness of the superjacent skin is present in severe cases, but it is generally slight, and often entirely absent. Tenderness is frequently so great that the weight of the bed-clothes or the slightest pressure cannot be borne. Fluctuation, when effusion has taken place, is readily detected, and in the knee riding of the patella can be felt. Muscular wasting quickly becomes well marked.

In *subacute synovitis* the symptoms are similar to those just described, though they are less pronounced. They are aggravated by exercise. Especially is this the case with swelling, surface-heat, and stiffness.

Chronic synovitis is accompanied in some instances by the additional symptom of a large increase of effusion into the joint cavity, so that the case presents the features of hydrarthrosis (page 76); in others, considerable fibroid thickening of the synovial membrane takes place; in others, again, a creaking sensation on movement may be felt (page 443).

Prognosis, in cases of simple synovitis, in which judicious treatment is adopted, is generally quite favourable. In healthy subjects, joints, like other parts, may be depended upon to evince a strong tendency to repair when favourable conditions are secured. It may be useful to emphasise this, for it is not rare to see a knee, for example, after an injury

kept in a fixed position, or carefully strapped, or enveloped in a firm bandage or a knee-cap, after all the evidences of inflammation have disappeared. This treatment is employed under the impression that a joint, when once injured, is likely, for a long period, to resent even moderate use. Experience, however, will show that recovery is promoted—when the heat and swelling have subsided—by moderate exercise combined with douching and massage; while prolonged rest and compression impair nutrition, induce muscular wasting, and render the joint weak and irritable. Even if exercise is followed by a slight return of heat and swelling—provided, as will usually be the case, these symptoms disappear after a night's rest—moderate exercise and massage will still be right, and need be interrupted only when swelling and heat do not readily pass off.

Treatment of simple acute synovitis.—The first and most important step is to place the joint in good position, and to keep it at complete rest by means of some comfortable appliance. (*See* the various joints under their respective headings.) When attacked with inflammation the joints are instinctively placed in the position of "greatest ease:" thus, when the shoulder is affected, the arm remains at the side; the elbow, wrist, and knee are fixed at an angle of 140° to 120°; the hip is flexed, abducted, and slightly rotated outwards; the ankle is slightly extended. When the injury has been severe these positions must be, without delay, so far amended that the limb is brought into such a posture that it will still be useful should the joint become permanently fixed. This change must be very gently effected, and to accomplish it, it may be advisable, both in order to save pain and to secure muscular relaxation, to employ an anæsthetic, especially in the case of children. In slight cases, however, it is unnecessary to make any immediate attempt to alter the position of the limb. It will be enough to enclose it in well-fitting splints in the posture to which the disease has brought

it. For, with a few days' rest, muscular rigidity will pass off, and the limb can easily be brought, or will naturally subside, into a good position.

The elbow and wrist can be satisfactorily supported in a carefully-moulded leather or poroplastic splint and a sling; but whenever one of the large joints of the lower extremity is acutely inflamed the patient must be kept in bed, and the limb maintained at rest by some suitable apparatus. To relieve hyperæmia, and thus reduce tension and pain, an evaporating lotion or an ice-bag will be useful. When synovitis is very acute in a strong person, leeches may be applied with advantage. Should the joint be tensely distended, the fluid should be drawn off with a carefully-sterilised tubular needle connected with an exhausting syringe. The removal of two or three drachms of fluid will often give marked relief.

The general treatment consists in the use of an aperient, and subsequently, if vascular disturbance is marked, of tincture of aconite cautiously given in doses of one minim every half-hour or every hour, or of the salicylate of soda in ten- to twenty-grain doses every six or eight hours, till the pulse-rate and the temperature have been reduced. Pain must be relieved by morphia, either in the form of a draught or of a hypodermic injection, or from five to ten grains of Dover's powder may be given at bed-time, or more often if required.

Treatment of simple chronic synovitis.—Here, as in the acute form, the first indication is to secure complete rest. The joint must be fixed in a well-fitting splint. (*See* under the various joints.) Blisters, about an inch and a half square, are very serviceable. They should be used in succession, at intervals of three or four days, one healing before the next is applied. In obstinate cases they should be continued in a series for two or three weeks. When fluid remains in any quantity after the blisters have been used it may often be got rid of by uniform pressure, best obtained by Martin's

elastic rubber bandage, which, however, must be very carefully applied to prevent undue pressure. The joint may be covered with the unguentum hydrargyri compositum (Scott's ointment), the unguentum hydrargyri, or an ointment of oleate of mercury, five or six grains to the ounce, spread on lint. It should be then strapped with narrow pieces of soap plaister, and over this Martin's bandage may be applied.

The period during which rest is necessary varies in different cases, but it must be continued as long as there is either heat or pain in the joint, or while either of these symptoms or an increase of stiffness is produced in any marked degree by exercise. As recovery advances, the joint may be douched with hot salt water, and passive movements, slight at first, and gradually increased, may be combined with massage; but these must be closely watched, and they should be discontinued if either pain or heat that does not quickly subside, or increased stiffness, is observed. The question of endeavouring to restore movement in joints that have been inflamed is discussed at page 240 *et seq.*

The amount of repair which, under the influence of prolonged fixation, will gradually take place in a joint which has long been the seat of simple chronic synovitis, may be illustrated by the following typical case:—A tall man of 32, who weighed upwards of sixteen stone, had suffered with chronic synovitis of his knee—following injury—for nine months. The joint was considerably enlarged, and the synovial membrane thickened; movement was much restricted; exercise was followed by increased stiffness, heat, and deep-seated pain lasting many hours; on movement a large amount of grating from roughening of the cartilages, and creaking from rubbing together of enlarged synovial fringes (page 57), could be felt. The joint was enclosed in leather splints, so that the patient, using it as little as possible, walked with the limb fixed in the straight position. Blisters were applied from time to time. Gradual

improvement followed. The splints were worn uninterruptedly for twelve months. At the end of this time the pain, swelling, grating, and creaking had almost entirely disappeared, and movement was scarcely at all impaired. Three months later the patient returned to the active use of the limb, and has, in the two years that have now elapsed, had no further trouble.

Acute suppurative arthritis.—By this term is meant acute inflammation involving all the structures of a joint and leading to the rapid development of suppuration. This formidable condition may be produced in various ways.

1. The most common cause is a wound which opens the articular cavity and allows the entrance of septic agents. An injury, however, which does not at first open the joint may, in rare instances, subsequently do so by the sloughing of the soft tissues to which it gives rise.

2. As the result of pyæmia, puerperal fever, or, though very rarely, gonorrhœa.

3. By the spread of inflammation from surrounding parts —*e.g.* from suppurating bursæ, communicating with the joint, or from tuberculous periostitis or osteo-myelitis of one of the neighbouring bones. (*See* page 97.)

4. A very severe and destructive form is often met with as a complication of the infective diaphysitis of children and young adults (page 21). In this affection pus may quickly collect under the periosteum, and form a large subperiosteal abscess. Thus situated, matter is usually prevented from reaching the neighbouring joint by the firm attachment of the periosteum to the bone at the junction of the epiphysis and the shaft, but in some instances this barrier gives way, and, still burrowing under the membrane, pus enters the articulation, and acute suppurative arthritis is produced; or when osteo-myelitis is present, pus formed in the medullary canal may break down the structure of the epiphysis and burrow into the joint.

In whatever manner the affection has been brought about, the changes that occur in acute suppuration of a joint are tolerably uniform. The chief differences depend on the rapidity and severity of the inflammation. In a simple case, caused, for example, by a punctured wound, through which infective material has gained an entrance, the synovial membrane is the tissue most evidently affected in the early stage. This becomes so vascular that it assumes a bright red colour, swells, and presents a soft, succulent and gelatinous appearance on section. The endothelial surface is dull and opalescent; it gradually loses its smooth, polished aspect, and becomes covered with shreds of fibrin; subsequently it becomes converted into granulation tissue. The synovial fluid is increased in quantity, and rapidly becomes opalescent from admixture of flakes of fibrin. Very shortly it acquires a milky appearance, from the presence of pus cells, and finally it assumes a distinctly purulent consistence: in the more acute cases it is often blood-stained, as the result of minute hæmorrhages from the intensely injected synovial membrane.

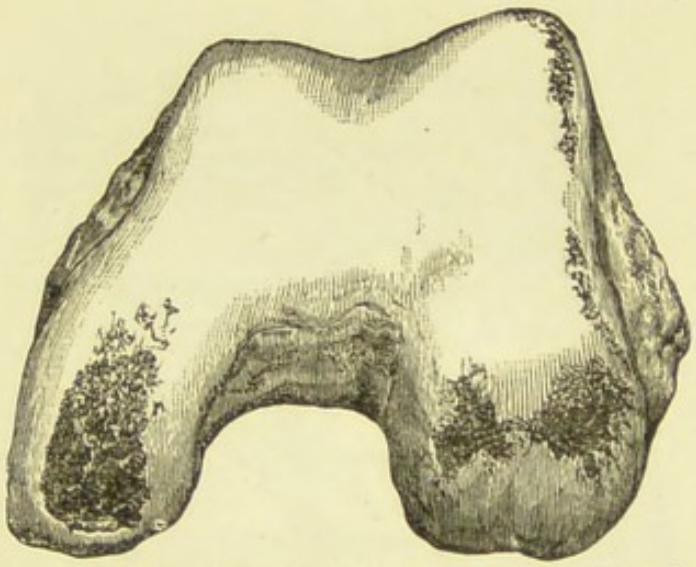

Fig. 1.—Ulceration of Cartilage, exposing the subjacent Bone in Acute Suppurative Arthritis. (From a specimen No. 584, in the Museum of St. Bartholomew's Hospital.)

The cartilages lose their pearly-white colour, and present a bluish tint. Soon they become permeated with blood-vessels, and ulcerated in patches, so that the subjacent bone is extensively exposed (Fig. 1). Here and there flakes of cartilage undergo necrosis, and are cast off as

loose shreds into the articular cavity. The ligaments become infiltrated and eroded, and soon completely give way, so that the joint surfaces undergo displacement. The articular ends of the bones are, like the other structures, inflamed and are more or less extensively destroyed by ulceration. The periarticular tissues share in the general inflammation. Abscesses rapidly form in them, and frequently, from the first, communicate with the cavity of the joint. These collections of pus are often very large, and tend to burrow widely among the surrounding muscles, so as to make their way, when *e.g.* the knee is the joint affected, both upwards in the thigh and downwards in the leg for a considerable distance. Suppuration in cases of acute arthritis is profuse, and the tendency of matter to track its way in the intermuscular spaces rather than to approach the surface is a marked and important feature.

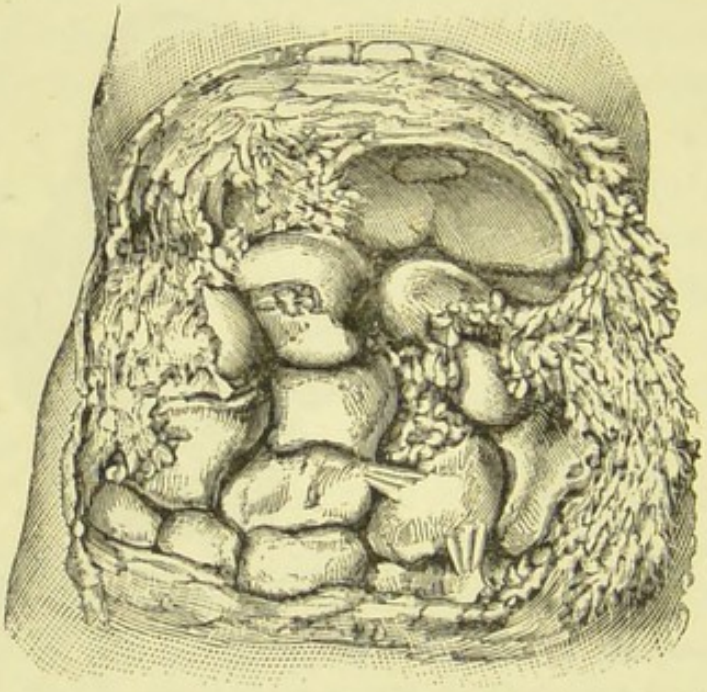

Fig. 1A.—Acute Suppurative Arthritis of the Wrist Joint. (From a specimen, No. 569A, in the Museum of St. Bartholomew's Hospital.)

The destructive effects of this condition are shown in the accompanying figure (Fig. 1A). The patient, a man, aged 58 years, had pricked his finger two months previously. The carpal bones are as denuded of cartilage as if they had been macerated.

The progress of a case of acute suppurative arthritis, unless energetic treatment is at once adopted, is generally

from bad to worse, and (when a large joint is affected) the patient will probably succumb either to exhaustion, consequent on traumatic fever and profuse suppuration, or to some form of blood poisoning. When adequate treatment is adopted sufficiently early, life may generally be preserved, provided the patient is not already exhausted by some grave constitutional disorder, such as pyæmia or one of the specific fevers. As far as the joint is concerned, the usual result, when recovery ensues, is the formation of bony or close fibrous anchylosis. This is brought about as follows :—The intensity of the inflammatory process subsides, and the production and multiplication of cells become limited; while the cells which remain in the various structures, whether bone, ligament, cartilage, or synovial membrane, become gradually developed into fibrous tissue, in which, where it is in contact with osseous tissue, bone salts are subsequently deposited. The new blood-vessels shrink and disappear, the fibrous tissue which is not ossified contracts, and the joint, as such, ceases to exist, its cavity being entirely obliterated. In instances, however, in which treatment is adopted early, and in which the bones have not become exposed and carious, a more or less movable joint is left. While should the secreting surface of the synovial membrane not have been destroyed, and should the cartilage and ligaments be yet intact, the patient may preserve a useful and movable articulation, although some thickening and weakness remain.

Symptoms.—In a typical case, one of punctured wound of the knee being the example selected for description, a few hours after the injury the joint is the seat of pain, which soon becomes intense, especially on any attempt at movement, and of quickly increasing swelling. The temperature rises to 102° or 104°; the pulse to 110 or 120, and the patient feels ill and depressed. Sometimes a distinct rigor occurs. Very soon the joint is distended, exquisitely tender, hot,

and covered with a distinct blush. Constitutional disturbance is very marked, the temperature remains high, rigors perhaps are repeated, the patient loses his appetite, and can obtain no sleep unless sedatives are given. In the course of two or three days, or even still more quickly, the occurrence of suppuration is indicated by increased constitutional disturbance, and by general illness and weakness, a further rise of the temperature and pulse, increased tension and pain of the joint, a deeper blush on the surface, and by œdema of the surrounding soft parts, often involving the limb for a considerable distance above and below the joint. Should the case be allowed to take its course the local mischief increases, matter bursts through the distended joint-capsule, and is extravasated into the limb; the patient rapidly wastes, and becomes feeble and prostrate; the tongue is dry and brown, delirium comes on, and death occurs by exhaustion, perhaps accelerated by general blood poisoning.

The following case illustrates many of the characters of this grave condition:—

A pale, delicate-looking girl, aged 16, was admitted into St. Bartholomew's Hospital in September, 1885, under the care of Mr. Cripps. On the morning of the 19th of September she woke with pain in the vicinity of the left knee, but was able to take a long walk. In the evening she felt very ill. Her condition growing daily worse, she was brought to the hospital on the 24th. Her temperature was high, and she was in a very feeble condition. The knee was swollen, hot, intensely painful, and evidently contained fluid: the leg and thigh were already œdematous, and there was considerable thickening around the lower end of the femur. On the 25th free incisions were made into the joint, and a large amount of purulent synovial fluid was evacuated. During the next two weeks there was profuse discharge and a persistently high temperature; and then

vomiting and rigors set in. On October 17th amputation was performed at the junction of the lower with the middle third of the thigh. In spite of pyæmic inflammation of other joints the patient ultimately recovered. An examination of the amputated limb showed extensive necrosis of the lower third of the femur on its posterior surface, which was entirely denuded of periosteum. The synovial membrane was of a bright red tint, and contrasted strongly with the pearly white appearance of those portions of the articular cartilage which still remained. The cartilage was, however, in great part destroyed, while portions of it hung as loose shreds upon the subjacent carious bone. The ligaments were, for the most part, destroyed by ulceration.

Treatment.—On the slightest suspicion that acute suppurative arthritis is about to set in, the joint must be immediately placed (for every hour is of importance) on a splint which maintains it at absolute rest, and which will be convenient for the treatment that may be necessary should suppuration occur. The knee, for example, should be arranged on a back splint, with interrupted side splints, and be swung beneath a cradle. The attempt to treat these cases without a splint, by supporting the limb on a pillow, may be confidently expected to end in disaster. The joint should be covered with a cold evaporating lotion, or an ice-bag may be used—suspended so as not to press heavily on the surface. The question of using leeches is important. I have seen many cases in which, in the early stage, leeches appeared to be very useful. In a strong adult ten or twelve may very well be applied. As soon as fluid is detected the joint must be aspirated with a sterilised needle, not too small. Even if the fluid is serous, its early removal will relieve tension, and, by diminishing irritation, will tend to arrest suppuration. If pus is found the joint must be freely opened by an incision on either side of the patella, and be copiously irrigated either with perchloride of

mercury (1 in 2,000) or with carbolic lotion (1 in 40); a drainage tube should be introduced into each incision, and the joint dressed antiseptically. If symptoms continue to be acute, the joint must be freely irrigated—so that no pus remains in any part of its cavity—every six hours with a saturated solution of boric acid in water; or, as some prefer, with iodine water (1 in 400). Once in the twenty-four hours the perchloride solution may be used. If this treatment is adopted at once, and is energetically carried out, the suppurative process is in many instances arrested, and the case takes a favourable turn: pain diminishes, suppuration declines, the temperature falls, the general health improves, and at last recovery, usually with anchylosis, takes place. Should the progress of the case, however, be unfavourable, so that the joint has evidently become disorganised, and matter has burrowed widely in the limb, the question of performing amputation must be considered. The danger is that this proceeding may be so long delayed that the patient has become too weak to bear it. The operation should not be postponed if, while the joint is the seat of profuse suppuration, the general health is giving way, and the patient, with high temperature, and loss of appetite and sleep, is daily losing flesh and strength. The effect of the amputation is often very marked. There is an immediate improvement in every respect, and convalescence rapidly advances.

But in some instances, when the arthritis has resulted from puerperal fever, or from general blood-poisoning, or when the patient is suffering from serious organic disease, especially of the kidneys, or from diabetes, the danger of leaving the joint may be less than that incurred by amputation, and the operation must, therefore, not be ventured upon till all the features of the case have been fully taken into account. It may be best to wait, in the hope that an opportunity may occur at a later date for amputation in

more favourable circumstances. In a case of acute arthritis, should blood poisoning (always a probable result) become established, the treatment to be pursued is that described at page 29.

Acute suppurative arthritis of the hip is occasionally produced by the bursting of a psoas abscess into the joint.* In two instances it was apparently caused by the tunnelling of pus under the periosteum, and its entrance into the articulation, from a subperiosteal abscess situated at some distance down the femur. In one an abscess, due to tuberculous periostitis at the junction of the uppermost with the middle third of the femur, in a boy of nine, was opened, and soon healed, and the boy left the hospital apparently quite well. A fortnight later he was re-admitted. The abscess had refilled, and a few hours previously he had been seized with acute pain in the hip. Profuse suppuration followed, the joint became disorganised, and he ultimately died of exhaustion. A boy of thirteen had an abscess in the middle third of the thigh, connected with a circumscribed tuberculous deposit in the shaft of the femur. The abscess was opened and the cavity scraped, and the boy left the hospital convalescent. Six weeks later he returned. The abscess had refilled, and he now had intense inflammation of his hip. Free suppuration occurred. Some weeks later the head of the femur, which had necrosed and become a loose sequestrum, was removed from the cavity of a large abscess. He recovered, but the joint remained permanently stiff.

For a notice of acute suppurative arthritis following disease in the growing end of one of the bones forming the joint, *see* page 125.

Arthritis following the exanthemata and other acute specific diseases.—Arthritis may occur as an early sequela of such of the exanthemata as

* Museum of St. Bartholomew's Hospital, No. 564.

typhoid, scarlet fever, variola, and measles, and also after influenza, mumps, dysentery, and diphtheria. In *typhoid fever* the hip is of all the joints most commonly involved, the most frequent condition being synovitis attended by rapid effusion into the capsule, not unlikely to be followed by spontaneous dislocation of the femur on the dorsum ilii. In some instances the affection consists of subacute but persistent synovitis, which, when it at length subsides, leaves the movements of the joint much impaired and the surrounding muscles atrophied and weak. I have never met with suppuration in this condition. In the following case anchylosis occurred in a position of great deformity. Henry P., aged 14, was admitted into St. Bartholomew's Hospital in October, 1885, with hip disease. Six months before, he had suffered from typhoid fever, and this had been followed by pain in the hip and gradually increasing stiffness of the joint. On examination the right thigh was found to be flexed at an angle of 140°, and everted, and there was an inch shortening of the limb. There had been no suppuration. There was no motion at the joint, and forcible attempts under an anæsthetic failed to improve the position of the limb. Mr. Willett therefore performed osteotomy below the great trochanter, and placed the limb in a good position. The boy made a favourable recovery and left the hospital able to walk on the limb, at the end of about nine weeks. The joint affection seems to develop generally in the later stage of the fever, or during the early weeks of convalescence. It is usually discovered only when serious deformity has already taken place. The possible occurrence of this complication should always be borne in mind.

The arthritis met with as a sequel of scarlet fever has been carefully studied by Ashby,* who describes a serous synovitis, appearing within ten days of the onset of the disease, and

* *Brit. Med. Journ.*, 1886, i. p. 970. *See also* Mauclaire, *Arch. Gén. de Méd.*, 1894-5.

involving most frequently the wrists and finger-joints, the sheaths of the flexor and extensor tendons of the fore-arm, the knees, ankles, and the joints of the cervical spine. The hip and shoulder commonly escape. The joints are painful and tender, but rarely red or much swollen. During the desquamative stage serous arthritis may, according to Dr. Archibald Garrod, occur. The purulent arthritis met with after scarlet fever is either purulent from the first, or it may be at first merely serous—the form described by Corrigan and Trousseau.

Urethral arthritis (gonorrhœal rheumatism, gonorrhœal synovitis).—Arthritis, sometimes of a severe type, may be developed in the course of gonorrhœa. It may also follow simple purulent urethritis, such as is, for instance, occasionally provoked by the use of catheters, or by contact with secretions in which no gonorrhœal element is present. This is well illustrated by the following case, recorded by Dr. W. Ord :—"I have recently seen a gentleman suffering from a third attack of inflammation of his joints. He is gouty, lives temperately, but works very hard. On three occasions he has had severe purulent urethritis, which, he asserts, is absolutely unconnected with any gonorrhœal infection. This is followed by sharp arthritis, and sometimes by gouty inflammation of the toe, lasting until the discharge, which is very obstinate, is checked." Brodie, Fuller, and others have also recorded cases in which a urethritis, apart from gonorrhœa, has been followed not only by arthritis but by conjunctivitis and sclerotitis.

In this affection (for which *Urethral Arthritis* is a better name than either of the old terms "gonorrhœal rheumatism" or "gonorrhœal arthritis") several joints may be involved; frequently, however, only one joint, and that a large one, is attacked. The knee most often suffers, but no joint is exempt. Even those of the fingers and of the spine may be involved. A very troublesome form is that which sometimes invades the ankle and contiguous tarsal

joints, and in which the inflammatory process extends itself to the fibrous structures of the sole, and leads to an aggravated degree of flat foot.*

The disease begins in the synovial membrane. Sometimes it is developed suddenly and takes an acute course, attended with rapid and large effusion, a temperature of 102°. Suppuration, though rare, is occasionally met with. In other, and more common cases, it is subacute, the effusion is only moderate, the inflammation is plastic in character, and the temperature is but little raised. Effusion may, however, be considerable and persistent. In some instances the surrounding structures are œdematous and the skin is red, as if suppuration had occurred, or they may be brawny and firm and the skin natural. Pain is usually severe—often intense, especially on movement—and very persistent. The affection often runs a chronic and tedious course, extending over several months. In mild cases complete repair, with restoration of free movement, may take place. But in many instances the inflammation assumes a plastic character and leads to firm fibrous, and occasionally even to complete bony anchylosis. A man, aged 26, was under my care at St. Bartholomew's Hospital in 1885, whose right knee had become flexed at an angle of about 110°, and stiff, after gonorrhœa contracted nine months previously. Movement could not be detected till he was under the influence of ether, and then it was scarcely perceptible. As the knee could not otherwise be straightened, I performed excision. During the operation the patella was found to be united by fibrous tissue to the condyles of the femur, and the tibia and femur were joined by firm fibrous anchylosis. At two points the external condyle was united by bone to the corresponding facet of the tibia. The cavity of the articulation was entirely obliterated. Urethral arthritis may occur either within a few days of the commence-

* St. Bartholomew's Hospital Reports, vol. xviii. p. 34.

ment of the discharge, or it may be delayed till only a slight gleet remains. The attack may be preceded by an increased discharge; often, however, no change in this respect is observed, while sometimes the discharge is considerably diminished or entirely arrested. The disease is irregular in its course, and periods of improvement are often followed by a severe relapse. When several of the large joints are invaded the patient may be much crippled, and instances have been met with in which, in the course of repeated attacks, almost every joint in the body has become fixed. The disease is rare; that is to say, its percentage among cases of gonorrhœa is very small. Though met with in the female subject in association with gonorrhœa, and also with purulent discharge from the vagina of simple character, it is chiefly confined to the male sex. It is remarkable that in some individuals this form of arthritis occurs with every attack of gonorrhœa. Sir Astley Cooper and later writers have described examples of this kind. The affection appears to be most common in gouty and rheumatic subjects.

The researches of Neisser* have enabled us to place gonorrhœal arthritis definitely amongst the infective diseases of joints. He has demonstrated the presence of the gonococcus in joints affected with this form of disease, and has shown that the pathological conditions can be reproduced by artificial inoculations of cultures of gonococci. Cases have also been recorded in which the inoculation of gonorrhœal pus for the cure of granular lids has been followed by symptoms of arthritis. Mr. Clement Lucas† has drawn attention to the relationship which sometimes exists between ophthalmia neonatorum due to gonorrhœa, and synovitis of septic origin. In the cases of this affection which have come under his notice the children were affected with a synovitis about fourteen days

* *Centralblatt f. die med. Wiss.*, 17, 1879, p. 497.

† *Brit. Med. Journ.*, 1885, vol. ii. p. 58.

after birth, and whilst they were being treated for a purulent conjunctivitis. The knees were most often the seat of inflammation, though it was also seen in the wrists. The synovitis was transient and left no after-effects. In these cases Mr. Lucas was careful as far as possible to eliminate synovitis depending on syphilis.

Diagnosis.—It is very important in practice not to overlook the fact that arthritis may depend on gonorrhœal or other form of urethral discharge; for the treatment of the original malady is a necessary step in the management of the secondary affection. The danger is that urethral arthritis may be mistaken for an attack of ordinary rheumatism. The symptoms are in no way characteristic, and error can only be avoided (1) by remembering the possibility that inflammation either of a single joint, or of several, resembling rheumatism, and coming on without obvious cause, may depend on urethral mischief, and (2) by ascertaining whether any discharge is present.

Treatment.—This always presents two main points: the arrest of the urethral discharge, and the management of the arthritis. For the former the reader should consult some good authority on venereal disease, such as Hutchinson, Alfred Cooper, or Bumstead, whose works contain full directions for the treatment of all the stages of urethral discharge. As to the joint, this must be kept at complete rest on an efficient splint, so that no displacement is allowed to occur, and if there is increased heat or pain, an evaporating lotion or an ice-bag should at first be employed. A succession of blisters, about two inches square, should then be applied at intervals of three or four days, or as they severally heal. There can be no doubt that blisters have a most markedly beneficial effect in promoting the absorption of inflammatory products, thus restoring movement in these cases. Subsequently, any swelling that remains may be reduced by a Martin's bandage. At a still later

stage, the hot douche, or hot vapour bath, combined with shampooing and friction, will be useful; or the joint may be strapped with the unguentum hydrargyri or with the unguentum hydrargyri compositum, and covered with an indiarubber bandage. When effusion is considerable and chronic, the joint may be aspirated with a carefully sterilised needle. Salicylate of soda, in doses of fifteen grains every six hours, will often remove even severe pain. In the chronic stage iodide of potassium or sodium (page 162) will be beneficial. Iron or quinine should be ordered if the patient is anæmic; while if he is gouty, the remedies mentioned at page 41 will be required. In cases in which the joint has become fixed, the adhesions must, when all inflammatory action has ceased, be cautiously broken down while the patient is under the influence of chloroform. Daily passive movements, with hot fomentations or the vapour bath, must also be perseveringly employed, provided no swelling or heat that does not soon subside is produced. The result of this treatment will depend upon the case. When the adhesions are, fortunately, in the main, outside the joint, motion will be restored; but when synovitis has been followed by fibrous adhesions within the articular cavity, although free movement is produced at the time, stiffness will show a strong tendency to recur (pages 236, 258).

Pyæmic arthritis.—Pyæmia is, fortunately, at the present day very rarely seen. Yet as there are various conditions in which it may be occasionally met with, it still demands description. In its course the joints are frequently attacked. In acute cases the tendency is for many articulations to be affected in rapid succession, so that in two or three days several may be implicated, while in the more chronic cases several may become involved, though at longer intervals. The most common form of arthritis in pyæmia is a synovitis characterised by the rapid development of a considerable collection of pus, unattended, however, in its

early stage by the pathological signs which are usually met with in acute inflammation. In *post-mortem* examinations of the joints in recent pyæmia there is found no material reddening or swelling of the synovial membrane, and the cartilages, ligaments, and the ends of the bones when they have been washed, present no abnormal appearance. The articular cavity is filled with pus which is of a distinctly yellow colour, or of a red tint from admixture of blood, and which is thin, flaky or curdy in consistence, and sometimes very fœtid. Mixed with the pus is a varying amount of synovia.

The course taken by cases of pyæmic arthritis is very variable, and cannot safely be predicted. In many instances the patient dies before any obvious structural change has taken place. Should life be prolonged, the whole of the fluid in the joint may be absorbed, and the articulation may entirely recover. Sometimes, however, considerable stiffness is produced by the development of fibrous adhesions, and frequently the joint becomes firmly anchylosed. In other instances the capsule of the joint becomes, often in a few hours, considerably distended, and the seat of obvious fluctuation. The swelling is usually flaccid, rather than firm and tense, the outline of the synovial membrane is distinctly mapped out, and the fluid in the joint conveys the sensation of being near the surface. The skin is either natural in appearance, or presents a faint blush, often limited to some part of the surface. There is in many instances so little pain at first, that the condition of the joint may escape notice. As the disease advances the distended capsule gives way, and pus becomes widely extravasated into the surrounding parts: the ends of the bones, as the result of the destruction of the ligaments, undergo displacement, and disorganisation of the joint becomes complete.

Treatment.—Owing, in the less acute cases, to the large amount of effusion which takes place, and in the more

severe cases to the rapid disorganisation of the joint, there is a strong tendency to the displacement of the ends of the bones. This is especially the case in the hip, the knee, and the wrist. In the hip dislocation of the femur on the dorsum ilii is apt to occur. Moreover, in the advanced stage pain becomes very severe, especially on movement of the joint. It is necessary, therefore, that the limb should be at once supported and kept at rest. The hip is best treated by weight-extension, and sandbags; or by a Thomas's splint. Sometimes the two methods may be advantageously combined. The knee must be placed on a back splint, padded so as to prevent dislocation of the tibia backwards. Suitable splints must be used for the other joints. Should pus accumulate so that the joint capsule is distended, a free incision should be made, and the joint should be copiously irrigated with carbolic, or perchloride of mercury lotion, drained and enclosed in a thick covering of antiseptic dressing. The result is often unexpectedly favourable. No further suppuration may occur, and the joint—if the patient's general condition is satisfactory—may quickly recover. If the patient is much exhausted, or if several joints are involved, it will be best merely to aspirate, repeating this if necessary. The main point is to evacuate matter early, so as to protect the structures from erosion, and also prevent the diffusion of pus into the deep parts of the limb. If mischief advances, and it is found that the joint is destroyed and there is no prospect of anchylosis, the question of amputation will arise. The propriety of this operation must be determined by a full consideration of all the facts of each particular case. Usually it is inadmissible, owing to the general condition of the patient. If, however, while the symptoms of constitutional disturbance are declining, and while the general strength is maintained, the joint is a source of pain and exhausting discharge, and there is no other serious local

affection, amputation should be performed—except in the case of the hip. In this instance amputation is seldom justifiable.

Puerperal inflammation of the joints.—In puerperal fever, or, as it is now more commonly termed, puerperal septicæmia, the joints are often involved. In such cases, as in other instances of septic infection, great differences are met with. Sometimes the attack is acute, and one or more of the joints become rapidly disorganised. In other instances infection is of slight intensity, and the joint disease runs a mild though a prolonged and tedious course, ending at last in fibrous anchylosis. Often only the knee is attacked. Puerperal arthritis does not call for any detailed description. All the main points concerning it, and the treatment required, are alluded to under the head of pyæmic arthritis. I need only add that the interior of the uterus must be maintained, as far as possible, in a healthy condition, so that no further absorption of septic material may occur; boric acid lotion, and a weak solution of iodine, one part of the tincture in two or three hundred parts of water, being perhaps the best and safest injection that can be employed for this purpose. With this or some other disinfectant, the uterus should be irrigated twice or three times a day.

Arthritis after influenza.—Cases that I have seen make me believe that arthritis is not rare as a sequel of influenza. The hip has been the joint most often attacked. The affection begins as a synovitis, attended with stiffness and swelling, soon followed by marked muscular wasting. In one instance, in a man of 32, there was considerable brawny thickening about the joint, combined with flexion and two and a half inches of apparent shortening. Severe pain in the joint and down to the knee has been a very marked symptom. In one case there was also severe sciatica. The temperature may be as high as 102°.

In another instance the patient had bad nights, sweated profusely, and became much emaciated; but he quickly improved when weight-extension was employed. I have not seen suppuration. In one case the condition was at first regarded as tuberculous; but it subsided in two months, and, though the joint became stiff, the patient resumed active work upon the limb, and there has been no relapse. The cases have been treated by rest, weight-extension, and blisters. In two instances patients were suffering, the one six months and the other nine months after the original illness, from arthritis, which was indistinguishable from tuberculosis disease.

CHAPTER III.

GOUT.

Gout is a constitutional malady, in which the joints are attacked by a form of inflammation associated with the deposit of urate of soda. These gouty inflammations may be either acute or chronic; they are generally chronic, with acute and severe exacerbations.

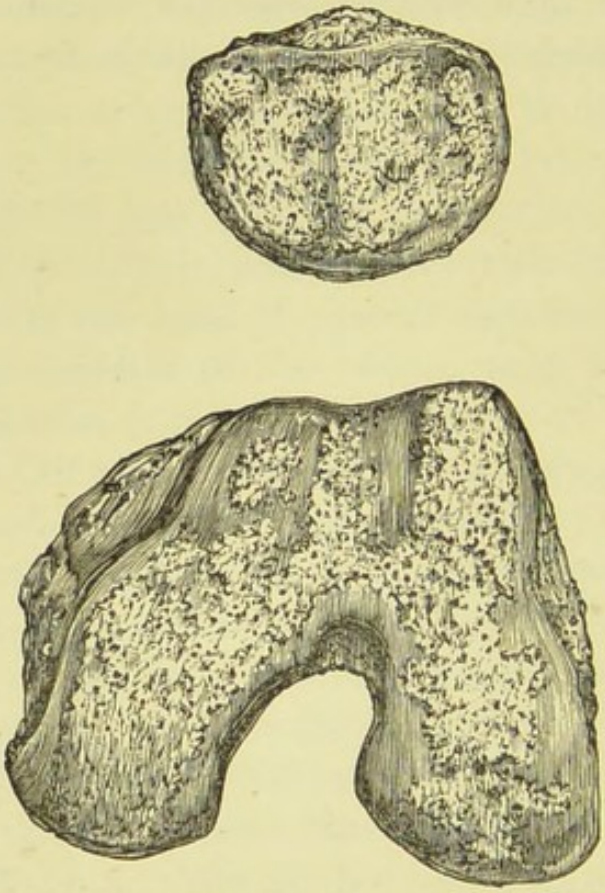

Fig. 2.—Irregular Deposit of Urate of Soda on the Condyles of the Femur and on the Patella. (From specimen, No. 708, in the Museum of St. Bartholomew's Hospital.)

The changes that take place in the articulations are briefly as follow:—In any acute attack, the synovial membrane presents appearances identical with those of acute synovitis, and the synovial fluid is similarly altered in character and consistency.

The articular cartilages become inflamed, their cells multiply, and their matrix fibrillates. In the substance of the cartilage and upon its free surface, a remarkable white deposit, consisting of urate of soda, occurs either irregularly or as a uniform layer (Figs. 2, 3). Gradually the diseased cartilage is removed by erosion, and the articular ends of the bones are

exposed. These, in turn, become the seat of inflammatory changes, attended with a similar deposit of urate of soda (Fig. 4). The ligaments, synovial membrane, periarticular connective tissues, and bursæ, are all affected in a similar manner, and in some cases complete synostosis occurs. This, however, is rare. I have seen it only in the metatarso-phalangeal articulations of the great toe and in the small joints of the hand and foot.

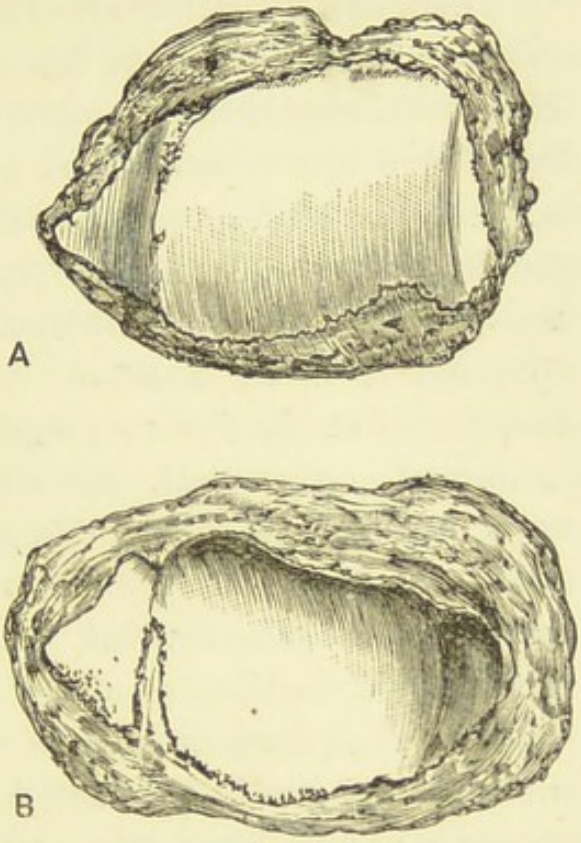

Fig. 3.—Deposit of Urate of Soda in a smooth, uniform layer, on the Articular Cartilage of (A) the Astragalus, and (B) the lower end of the Tibia. (From preparation, No. 709*b*, in St. Bartholomew's Hospital Museum.)

But little need here be said as to the pathology of gout. By most authors the original departure from the normal condition is held to be an increase of uric acid in the blood; and, in respect to the joints, it is supposed that this is simply deposited from the blood, combined with soda in the form of urate, and by its presence induces the inflammations typical of gout.

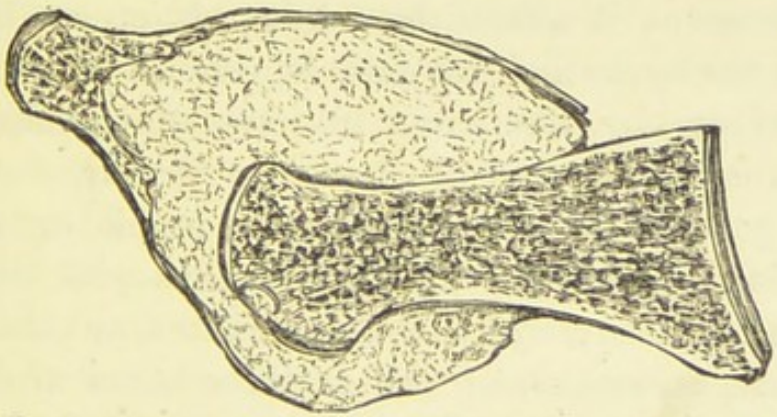

Fig. 4.—Section of a Great Toe, showing deposit of Urate of Soda in the bones and surrounding soft parts. The distal phalanx is in great part destroyed. (From a preparation in St. Bartholomew's Hospital Museum. No. 711.)

There can be little doubt that in gout there is a generally unstable condition of the tissues, that an excessive amount of waste is continually occurring, and that these waste products give rise to an excess of uric acid in the blood. It is, however, quite possible that the urate of soda found in the joints is produced *in loco*, and is not brought to the articulations from a distance. For, contrary to the stated opinions of many authors, it is a fact, according to Mr. Bowlby, that, in a very large proportion of cases of gout, examined *post mortem*, the cartilages are eroded and fibrillated, and it is in such cartilages that urate of soda is most likely to be found. Further, the gouty deposit occurs rather in the more central than in the peripheral parts of the affected cartilage, and it seems, on the whole, highly probable that some at least of the urate of soda is formed in the cartilage itself, and that it tends to remain in the part simply because there are no blood-vessels to convey it away, as there are in the more vascular tissues. Such a theory finds support in the commonly acknowledged fact that it is in non-vascular tissues, such as tendons, fasciæ, etc., that gouty deposits are found when they occur in parts other than the articulations.

There is no space here for a full clinical description of gout, and the account now to be given will have reference mainly to the disease as it affects the joints. It occurs in two chief forms : the acute and the chronic, connected with each other, however, by numerous intermediate grades. The following is a typical case of the acute variety :—A patient who has gone to bed, as he believes, in his usual health, or who has perhaps suffered for a few days with loss of appetite, flatulence, heartburn, and slight nausea, or other signs of dyspepsia, is awakened two or three hours after midnight with an uneasy sensation or sharp pain in the metatarso-phalangeal joint of the great toe, accompanied by a feeling of chilliness, or even by a distinct rigor, soon

succeeded by heat and perspiration. The pain increases until it is almost unbearable, and is of a grinding, wrenching, or burning character, as if a hot iron were being forced into the joint. According to Sir Thomas Watson, a humorous Frenchman thus described its intensity: "Place your joint in a vice, and screw the vice up until you can bear it no longer; that may represent rheumatism. Then give the vice another twist, and you will obtain a notion of gout." The toe is exquisitely sensitive, so that the patient cannot bear the weight of the clothes upon it, or even the jar of a heavy footstep in the room; and, while he is unable to keep the limb in one position, every movement tends to increase his suffering. The whole toe becomes stiff, swollen, hot, and suffused with a bright red, or sometimes with a more dusky tint; the veins in the surrounding skin are distended and prominent, and the subcutaneous tissue is œdematous, and pits on pressure. To hang the foot down produces at once an agonising feeling of tension or bursting. After a few hours the swelling increases, the pain moderates, and the day is passed in less distress; but at night the attack renews itself in all its first intensity, and the patient feels feverish, restless, and miserable. Towards morning, however, perspiration comes on and he falls asleep; and when he awakes he finds that the symptoms of local inflammation have considerably moderated, and he is able to move, and bear pressure on, the joint. These phenomena of subsidence during the day, and exacerbation at night, continue for two or three days or more, and then pass off, and are followed by desquamation of the cuticle, attended with troublesome itching. Suppuration, though some observers have reported its occurrence, is extremely rare.

Left to itself, the attack lasts for a week or ten days, sometimes even for three weeks, but when adequate treatment is adopted it usually subsides within three or four days. Although the ball of the great toe is the most

common seat of a first attack, the original seizure may involve any of the other articulations. As the affection declines in one joint, it is very likely to appear in some other, often in the corresponding joint of the opposite foot. or in a knee or an ankle, where it runs much the same course as that just described, although it is generally less severe and of shorter duration. All the joints are liable to attack, but the hip and shoulder usually escape. In patients of weak health, especially women, gout assumes an asthenic character, and the pain, heat, redness, and swelling are much less marked. In these cases, however, the affection is apt to be very tedious, and the joints are often left in a weak and crippled state. At first, a joint, when the gouty attack has subsided, regains its former strength and mobility, but when it has been several times affected it is liable to considerable permanent weakness and stiffness. Complete bony anchylosis, though rare, is, as already mentioned, occasionally met with.

An acute attack of gout may be induced by a variety of causes: by an indiscretion in diet, especially the free use of malt liquors or wine, or the admixture of different kinds of wine; by mental excitement, or by excessive fatigue; or by external injury, as a fall from a horse, or even a slight sprain. I have seen sharp outbreaks after surgical operations, such as the removal of tumours, ligature of hæmorrhoids, etc. In one case, in a man of fifty, acute gout followed vaccination, while Heberden states that he has witnessed the same result after so small an injury as a flea-bite. As the acute passes into the chronic form, though the attacks become somewhat less severe, they are apt to be more frequent and more prolonged, and to involve a larger number of the joints, especially those of the hands and lower extremities. After repeated attacks the joints become weak, stiff, painful, and distorted by enlargement and alteration in the shape of the articular ends of the bones, and eventually completely

crippled. In some cases of chronic gout, the deposition of urate of soda occurs in such large quantities as to produce tophi, or chalk stones. Watson mentions a namesake of his own, who was accustomed when playing cards to score the game upon the table with the chalk stones which protruded from his gouty knuckles. When these concretions attain a large size, they may lead to suppuration and the formation of tedious abscesses, discharging sanious pus, with a copious admixture of chalky urate of soda. As many as five or even more of such abscesses may exist in the same hand. These abscesses usually cause very little disturbance, but they are liable to remain open for many weeks, or even months together.

Diagnosis.—The recognition of the fact that a particular joint-affection is of a gouty character, is a matter not only of great clinical importance, but often of much difficulty. In forming a diagnosis the following points must be taken into consideration:—The presence or absence of gout in the parents, or other blood relations of the patient; the patient's age (gout is very rare before puberty, and does not usually occur before the age of thirty-five or forty; it is common through all the later periods of life, up to very old age); the fact that the disease is much more common in the male sex than in women, in whom it is rare after menstruation has ceased. A full meat diet, combined with a free use of malt liquors or wine, especially when little exercise is taken, strongly promotes gout, while the inability to assimilate beer or wine may in itself be a sign of the disease. The nature of any previous attack, or of the present seizure if it be the first, must be considered, suggestive points being the sudden onset, affecting most frequently the ball of the great toe, the intensity and paroxysmal character of the pain, the exquisite tenderness of the surface, a cutaneous blush, œdema, distended veins, nocturnal exacerbations, slight constitutional disturbance, and the fact, often to be elicited, that previous and similar attacks have been separated by

intervals of good health. It should be observed whether there are deposits of urate of soda in the ears, fingers, or any of the various bursæ. The urine should be examined for albumen, often present in chronic gout. Great caution, however, in forming a diagnosis is required. Sir James Paget has recorded a case in which, after the ligature of hæmorrhoids, acute inflammation of the great toe joint, dependent on pyæmia, was at first ascribed to acute gout. Sir Alfred Garrod mentions a similar case, and points out that the constitutional disturbance was from the first much greater than is met with in gout.

In his "Clinical Lectures and Essays," which it was my good fortune to edit, Sir James Paget, in his chapter on gout in some of its surgical relations,* points out the following as minor signs of the disease :—

In the hands and feet.—Darting and aching pains, and stiffness in the knuckles, especially after faults of diet, or when the patient wakes in the morning ; burning palms or soles, pain and tenderness of the substance of the heel, or in the tendo Achillis, which may be thickened ; numbness and tingling of one or more of the fingers or toes. The knuckles are enlarged, flattened, or spheroidal and stiffish ; and the skin over them is smooth, glossy, and often tense and warm. Later, the joints become more deformed, and the metacarpus and fingers are everted, the fingers are sloped downwards (somewhat flexed), and towards the ulnar side of the hand. Often over one or more of the finger joints there is either a subcutaneous bursa, or a thickening of the connective tissue, forming a disfiguring lump ; or a little cyst may be developed over a finger or a toe joint, filled with a pellucid, yellowish, tenacious fluid. Many gouty persons have thickening and contraction of the palmar, or more rarely of the plantar fascia, which becomes seamed and knotted, and tends, as it contracts, to draw down the

* Second edition, p. 353.

fingers towards the palm. The ring finger and little finger are those most usually affected. (This condition constitutes one of the forms of "Dupuytren's contraction.")

In the mouth and pharynx.—Attacks of pain and tenderness of the teeth, which become very sensitive to pressure, and feel as if they were raised out of their sockets and slightly loose; psoriasis of the tongue, very like the squamous syphilide, in the form of bald purple, or opaque white patches of thickened epithelium, like snail tracks. Other minor signs in the tongue are burning and aching, or neuralgia, alarming people with fears of cancer. The uvula is often elongated, and a source of troublesome coughing, or even of retching. Some gouty persons suffer from chronic pharyngitis, in which all the mucous membrane covering the pharynx and pillars of the fauces is smooth, thickened, œdematous, glossy, and dull-coloured; others from pain in the palate, as if in some part of a single muscle, provoked by swallowing, and often shifting its place, or there may be a sensation of tickling in one small spot, as if a crumb were irritating the part.

In the digestive organs.—Gouty persons are often flatulent and bilious, and many things disagree with them. Even small quantities of beer or wine produce burning in the soles and pain in the knuckles.

Minor signs of gout in the *urinary organs* are the deposit of urates and uric acid in the urine; and cystitis, leading to intense irritability of the bladder, and painful burning on passage of the urine, which contains mucus or pus, and, though very rarely, blood; heat along the urethra, and sometimes a thin purulent discharge. These bladder attacks often come on suddenly in the night, and as if by metastasis, as gouty symptoms elsewhere subside. Persistent gleet, with increase of discharge during attacks of acidity, is often largely dependent on gout, as is herpes or eczema about the glans, often recurring, and producing a

bright-red, florid, and shining surface. So, again, is the frequent occurrence of erections, unassociated with sexual feeling, and especially troublesome during attacks of acidity or indigestion.

In the *nervous system* gouty persons are subject to various neuralgiæ, sciatic, lumbar, etc., sudden and fitful, and provoked by indigestion. Neuralgia of the heel, external ear, tongue, palate, and fingers, is often gouty. So are burnings, numbnesses, and tinglings in various parts of the surface; or the fingers and toes often "die" and become white, and then flush and are hot; or there is numbness of a limb, as if it were asleep; or there are "pins and needles." Cramps, especially in the legs and feet at night, are frequent; so are catching of the muscles, with a sudden feeling of stiffness, and pain after too long exercise. These are felt in the neck as sudden cricks, or in the loin, and are often followed by stiff neck or lumbago lasting several days. In gouty persons the *skin* is liable to eczema, psoriasis, and urticaria, and is very susceptible to irritation. The eruption, of whatever kind, comes out suddenly and without apparent cause, or often after some known error of diet; or by metastasis of gouty inflammation from some other part. Eczema is the most frequent, and often leads, by weakening the skin, to varicose veins, and to the gouty eczematous ulcer.

The treatment of acute articular gout must be (*a*) local and (*b*) general. (*a*) Position is very important. The joint should be placed in a posture favourable to the return of venous blood. When the knee or ankle is affected, the limb must be kept in a raised position. When the elbow is attacked, the arm must be supported in a sling. When the wrist is involved, the fore-arm should be supported on a well-padded splint, circular constriction above being carefully avoided. Though the acute character of the inflammatory process seems to suggest the

local abstraction of blood by leeches, authorities are very generally opposed to this method, on the ground that experience has shown that local depletion appears to favour the deposit of urate of soda in the tissues, with the result that the ligaments become rigid, and the joints stiffened or even anchylosed. Sir Alfred Garrod—and we could listen to no higher authority—says :—"I can with confidence warn those engaged in the treatment of acutely-inflamed gouty joints never to resort to this mode of combating the disease." When the pain is only moderate, the joint should be covered with soft flannel, or a thin layer of dry cotton wool, kept in place with a silk handkerchief, or with oiled silk, or a lotion containing one grain of atropine, eight grains of the hydrochlorate of morphia, and two drachms of spirit in an ounce of water may be applied on lint covered with oiled silk. Sometimes a solution of bicarbonate of soda, a drachm to the ounce, applied warm, gives relief; or either a mixture of belladonna and opium, or a lotion of lead and opium, may be used. A lotion of lithia, five grains to the ounce, is a useful solvent to chalk stones, exposed by ulceration of the skin. In chronic gout the local treatment to be adopted is that which is described in the section on chronic rheumatism (page 48).

(*b*) The general treatment is best commenced by the administration of an aperient, either in the form of ten grains of the compound colocynth, or colocynth and hyoscyamus pill, followed, if necessary, by a draught containing two drachms of the sulphate of magnesia, ten grains of the carbonate, and a drachm of compound tincture of cardamoms in an ounce and a half of water, or two drachms of sulphate of magnesia and a drachm of tincture of senna. Should the liver be sluggish, a pill containing three grains of grey powder, or two grains of calomel may be given. An ounce to three ounces of the Hunyadi János water is a very good aperient in these cases. The question whether

colchicum should be given is an important one. This drug has undoubtedly a powerful influence on the disease, and its effect is often almost like magic. After two or three doses the attack begins to subside, and soon entirely disappears. Colchicum, however, is apt to produce sickness and purging, accompanied with depression of the action of the heart, and general prostration. It must, therefore, be always cautiously given, and its effect must be carefully watched; while in weakly persons, or in those in whom it has, when given for a previous attack, produced unfavourable symptoms, it is best not to use it. It appears to be most valuable when given to robust patients suffering from acute gout. Yet it is often of use in the chronic forms of the disease. The belief entertained by many observers, that the effects of the drug depend more on the idiosyncrasy of the patient than on the acute or chronic nature of the disease, is probably to a great extent correct. In practice, the best course, when the attack is either acute or prolonged, is, unless the drug has already been found to disagree, to prescribe colchicum in moderate doses, and to discontinue it if unpleasant symptoms are produced. The preparations most in favour are the tinctura colchici seminum, which may be given in doses of from fifteen to twenty-five minims, or the acetous extract, of which the dose is from one to two grains, every six hours. Often in subacute gout, a pill containing one grain of this extract may be usefully given each night at bed-time. The salts of lithia are held in high repute, and owe their efficacy to the fact that urate of lithia is more soluble than that of either potash or soda. Either from three to six grains of the carbonate, or from five to ten grains of the citrate (the latter salt is to be preferred) may be given two or three times a day in potash water, or in a draught with ten or fifteen grains of citrate of potash; or a tumbler of liquor lithiæ effervescens may be given twice or thrice a day. Alkalies, in the form either of

the bicarbonate or the citrate of potash (fifteen grains of the one or twenty of the other) every six hours, are useful to correct acidity, and to aid in the elimination of the urates and of uric acid. In cases of asthenic gout, in which the patient is pale and feeble, quinine or the compound tincture of bark is beneficial. Guaiacum, formerly much in use, has of late years fallen somewhat into disrepute. In chronic cases, however, it appears to have a good effect, and it certainly should be tried in obstinate forms of the disease.

CHAPTER IV.

RHEUMATIC SYNOVITIS.

The subject of acute rheumatism, or rheumatic fever, belongs rather to the province of the physician than of the surgeon. But considering that joints affected by this variety of inflammation may require surgical treatment, it is necessary to describe very briefly the changes to which they are liable.

In the great majority of cases these changes are similar to those which are found in cases of simple synovitis already described, and the usual result is a complete restoration of the articulation to its former healthy condition.

But in acute rheumatism there is a tendency for the disease to affect other structures than the synovial membrane; thus the sub-synovial and the peri-articular tissues are not uncommonly the seat of inflammatory exudation. The cartilages in severe cases present a bluish or opalescent tint, and may in places become distinctly swollen; microscopically examined, they are found to be the seat of cell-proliferation, and in a few instances they become fibrillated or eroded. Further, the inflammation may extend to the bones and ligaments, and, in rare instances, suppurative inflammation of the joint may occur. The characters of the synovial fluid in cases of acute rheumatism necessarily vary with the intensity of the inflammation, and with the structures that are involved. In general terms the fluid may be said to resemble that of simple synovitis, but it contains much more fibrin, and is consequently shreddy.

Although, as already said, most cases of rheumatic fever recover without any permanent lesion of the joints, it will readily be understood that where the cartilages, ligaments, and surrounding connective tissues have been involved in the inflammatory change, more or less stiffening may result; and in some cases a genuine fibrous anchylosis leaves the articulation permanently fixed.

The ordinary duration of synovitis in any individual joint in a case of acute rheumatism varies from about three or four days to a fortnight, but in instances in which the deeper structures are implicated the inflammation frequently drifts on into a subacute or chronic stage; and whilst the other articulations have become quite sound and painless, the affected joint (for rarely more than one is so involved) remains swollen and painful. The essential tendency of subacute or chronic rheumatic inflammation of a joint is towards the organisation of the inflammatory products into connective tissue, and not to simple cell-proliferation and the formation of pus. It thus happens that in protracted cases much thickening of the synovial membrane, of the capsular and other ligaments, and of the peri-articular tissues, results; and it is to this thickening and to the contraction of the newly-formed fibrous tissue that the subsequent stiffness is due.

In the following case, although no suppuration occurred, anchylosis took place.

J. B., æt. 21, was admitted into St. Bartholomew's Hospital, suffering from acute rheumatism. The wrist joints and the left shoulder were swollen and painful. Endocarditis was present. The temperature varied from 99° to 103·2°, and the left elbow and knee joints subsequently became implicated. The patient was treated with salicylate of soda, and after a fortnight all the joints except the left knee were free from pain. The left knee, however, became more swollen and more painful, and was much

distended with fluid. It was painted with iodine and wrapped in cotton wool, but continued, nevertheless, to get worse. It was next treated by blisters and a back splint, and in a fortnight the swelling and pain had subsided; but much pulpy thickening remained, and the bones of the leg were slightly displaced backwards. The limb was now fixed in a plaster-of-Paris splint, and finally, after some months, all pain passed away; but the joint was firmly anchylosed in an extended position.

In very rare instances the joint disease may, as already said, progress to suppuration. This event is most likely to occur in patients who are tuberculous. If recovery takes place, true bony anchylosis will generally follow, although repair with a movable joint may result.

Symptoms.—As an example of acute articular rheumatism, the case may be taken of a patient who, after being exposed to cold, or to cold and fatigue, has a chill or possibly a rigor, followed by a rise of temperature to 100° or 102°, or even more, accompanied by copious acid perspiration, and who a few hours later is seized with severe pain in one or more of the large joints, attended with rapid swelling, and often a distinct flush upon the surface, and with such tenderness over the joint that he is unable to bear the slightest pressure, or even the weight of the bed-clothes. The pain is most severe at night, is subject to marked exacerbations, and is increased to agony on movement of the limb. Frequently some other joint, especially the corresponding articulation of the opposite side, is soon affected, while in severe cases many are attacked. The duration of the affection in any particular joint varies from a few hours to three weeks or more. Its erratic character is one of the most marked features of this disease. Often, in a joint that is hot, swollen, red, and intensely painful, all the symptoms rapidly subside, and in a few hours every trace of the affection has disappeared,

while at the same time some other joint has, with equal suddenness, become involved. The articulations most apt to be affected are the knee, shoulder, and elbow, but none are exempt; and even the small joints of the hand and foot are often attacked. In many instances, when several joints have been involved, the majority recover, while in one or more the disease maintains a pertinacious hold, and runs on into the chronic form.

The *diagnosis* between acute rheumatism and gout may be arrived at by bearing in mind that rheumatism may occur at any age from infancy onwards, while gout is most common between the ages of forty and sixty; that rheumatism is often complicated with endocarditis or pericarditis, and is attended by high temperature, copious sweating, and considerable constitutional disturbance, while in gout the temperature is less raised (it may, however, in some acute cases, reach 101° or even 102°), and the general health is but little affected; in rheumatism pain is less severe, less intermittent, and less paroxysmal than in gout; in the majority of cases the first attack of acute gout is in the great toe. In chronic gout, deposits of urate of soda may often be detected in the finger joints, skin, cartilages of the ears, and other parts.

Treatment.—Much of the patient's suffering in acute rheumatism is due to the fact that the weight of the limb tells upon the joint. The limb should, therefore, be placed in the position of greatest ease, and be supported with pillows along its whole length. Great relief sometimes attends the application of splints to the joint, as recommended by Dr. Robert Bridges in the St. Bartholomew's Hospital Reports.* The best material is poroplastic felt, cut out to a paper pattern, softened in hot water, and well padded with an even and thick layer of cotton wool. It should be applied on the surface on which

* Vol. xii. p. 175.

the joint is resting, and be retained by a lightly applied bandage above and below the joint. The joint may be either wrapped in a thick layer of cotton wool; or hot poppy fomentations, lead and opium lotion, belladonna liniment sprinkled on lint, or a solution of atropine and morphia may be used. The plan of blistering the joint in the acute stage, as advised by the late Dr. Herbert Davis, sometimes gives speedy relief. Experience, no doubt, shows that the aspiration of a joint that has suddenly become tensely distended gives great relief; but the proceeding is not without risk, and had better not be ventured upon unless distension is very marked and pain very severe. Though this is rarely the case, the acute form of inflammation may leave the articulation permanently stiff, or with movement very considerably impaired. If, therefore, the attack is prolonged for more than a week or ten days, it will be advisable to place the joint on a splint in a good position for future use, in anticipation that movement may possibly remain limited. To effect this it may be necessary, in order both to relax the muscles and to save pain, to give an anæsthetic. Should the extremely rare event of suppuration occur, the case must be treated in the manner described at page 19. In the severer forms, in consequence of rapid muscular wasting and relaxation of the ligaments in such joints as the knee, wrist, and ankle, there is a marked tendency to displacement and deformity. Should this result threaten, no time must be lost in supporting the bones that form the joint, by the accurate application of efficient splints.

Chronic rheumatism.—When chronic rheumatism follows on the acute form, the affected joints remain enlarged, hot, tender on pressure, painful, especially on movement, or when the limb is warm in bed; and so stiff and weak that the patient is unable to grasp any object, or, in the case of the lower extremity, to bear any weight on

the limb. Usually several joints are affected, either together or in succession. The knees, ankles, shoulders, wrists, and the small finger joints, are more commonly involved than the shoulder or the hip. The disease is sometimes irregular in its course, changing its place from joint to joint, subsiding and relapsing, and varying in its intensity from day to day according to the state of the weather as to temperature, wind, and damp; while sometimes one of the large joints remains affected long after the patient has otherwise completely recovered. The local signs are often accompanied with a minor degree of fever. The affection may last for many weeks or months, and in some instances the joint never recovers its normal condition, but remains permanently enlarged, stiff, weak, and painful. In another variety the disease assumes from the first a chronic and insidious form, attended with pain, stiffness, and weakness, rather than with any marked heat or swelling. Pain and stiffness are aggravated by exposure to cold, and are more marked when the joint is first moved after having been at rest. Another symptom is that of creaking, grating, or snapping of the joint on movement. As the affection advances, considerable nodulation and enlargement of the articular ends of the bones may take place, and the joints may thus become distorted and crippled. In some cases there is so much effusion into the synovial cavity of the knee or elbow joint that the disease constitutes one of the forms of hydrarthrosis.

Treatment.—Patients subject to chronic rheumatism should be advised to use flannel underclothing both in warm and cold weather, so that as far as possible a uniform temperature of the skin is maintained; and to wear a knitted woollen cap or some similar covering over any joint that is affected. Fatigue should be avoided, but absolute fixation of the affected joint is not to be recommended, except in the early period of the attack, for if continued it tends to promote

stiffness. It is a common experience that patients suffer both less pain and less inconvenience from stiffness when they keep the affected joint in moderate use. For local treatment the hot douche, hot bathing or fomentation night and morning, or the local vapour bath, will give most relief. A convenient apparatus for steaming the different joints may be had of any instrument maker; or, failing this, if a space is maintained round the joint by a fracture-cradle or some equivalent contrivance, hot vapour may be applied by means of the ordinary croup kettle fitted with a long spout. In the later stages a succession of small blisters, massage, and passive movements after the hot bathing will be very beneficial; while if much fluid is present, strapping with soap plaister, or the application of the elastic rubber bandage will be of service. The more obstinate cases of effusion may be treated by the methods described in the chapter on hydrarthrosis (page 76). In some instances a weak constant electric current does good, both by restoring tone to the muscles and relieving pain. The question of forcible movement is discussed at page 232. General treatment should include the use of alkalies, in the form either of bicarbonate of potash (of which fifteen grains may be combined with an infusion of gentian, cinchona, or other vegetable tonic); or citrate of potash (of which twenty grains may be taken every morning, or twice a day in a tumbler of water); while if the patient is weak and anæmic, quinine and iron should also be prescribed.

Guaiacum is still sometimes prescribed. In many instances it does no good, but in obstinate cases it may be worth a trial. Iodide of potassium, in doses of three to seven grains, often gives relief. This drug should be combined with citrate or bicarbonate of potash, or be taken with some natural alkaline water. Great benefit is often obtained from salicylate of soda, given in ten-grain doses three times a day. Free elimination by the bowels should

be maintained. Malt liquors must be forbidden, and wine, if allowed at all, must be taken in small quantities, nor must the various kinds be mixed. A small amount of whisky is the form of alcohol which is most often harmless. A damp climate is to be avoided. Great benefit often results from a residence of a month or six weeks during the summer at Buxton, Harrogate, Leamington, or one of the other English health resorts, where an atmosphere well above the level of the sea is combined with the baths, and the internal use of the waters. In the cool seasons of the year Bath, for the development of which as a health resort so much has been done, may be strongly recommended. Amongst the chief resorts on the Continent valuable in chronic rheumatism are Aix-les-Bains, Nauheim, Wildbad, and Baden.

But those who propose to send patients abroad, should —unless they are personally familiar with the different resorts—consult some reliable authority on the subject. (*See* Dr. Hermann Weber's article on Mineral Waters in "Quain's Dictionary of Medicine.")

CHAPTER V.

OSTEO-ARTHRITIS.

THE disease now to be described has received a variety of names, which the student is apt to find not a little confusing. It is true many are becoming obsolete, and are no longer employed in the monographs of the present time. Yet, as they are still current in the phraseology of every-day practice, it is necessary, in order to avoid uncertainty, that they should all be enumerated here. The old writers styled the affection rheumatic gout; Haygarth, nodosity of the joints; Robert Adams, chronic rheumatic arthritis; Garrod, rheumatoid arthritis. The French term it arthrite sèche, or, after Cruveilhier, usure des cartilages articulaires; the Germans, arthritis deformans. Many recent authorities speak of it as osteo-arthritis, while that form which is limited to a single articulation has been known as mon-articular rheumatism or, when it is seated in the hip, morbus coxæ senilis. So profuse an assortment of titles suggests that much doubt has existed as to the real nature of the affection. This is, in fact, the case. To assume an alliance of the disease with rheumatism, a connection which many of its names have been expressly formed to indicate, throws but little light on the subject. The superficial resemblance between many examples of this malady, and those affections which are grouped under the head of chronic rheumatism, is, as regards both their clinical features and their morbid anatomy, obvious enough. But it must be remembered that the same symptoms and the same patho-logical appearances may be caused by diseases that are essentially different from each other; and that, moreover,

rheumatism is a term to which no very precise meaning can be attached Further investigation has led to the breaking up of the disorders now ranged under the name of rheumatism into independent groups, and the like subdivision will also be called for in dealing with the conditions hitherto classed under the term osteo-arthritis, and its synonyms. Various writers, indeed, have already drawn attention to the widely dissimilar affections that are ranged under these phrases (pages 62, 69), and have pointed out that all the anatomical changes which have been ascribed to osteo-arthritis are found in such essentially different joint affections as urethral arthritis (page 23), the arthritis occasionally following scarlet and other specific fevers (page 21), and in hæmophilia (page 164). Thus future subdivision must occur, and as it advances, names hitherto employed will either fall into disuse, or have some definite meaning assigned to them. In the meantime, a general heading is required, and osteo-arthritis seems the best term to adopt. It involves no pathological theory, while at the same time it serves to suggest the most obvious and constant anatomical features that are met with in the different forms of disease included under it.

The general clinical characters of osteo-arthritis are well seen in the small joints of the fingers, and in the knee. The affected joint becomes gradually stiff, enlarged, painful, and distorted, and is found to creak or grate when it is moved. These symptoms are explained when an advanced example is dissected. It is then seen that the cartilages are worn away and that the synovial membrane is extensively affected, so that its power of secretion is impaired, the ligaments and surrounding tendons are destroyed, and the articular ends of the bones are altered in shape, and in their relations to each other.

A question that has often been discussed is, whether this remarkable affection is primarily a chronic inflammatory

change, as most of its names imply, or a degenerative process to which a variable but limited degree of inflammatory action is superadded. A reference to the various groups of cases enumerated in the paragraphs that follow will show that both these views, though in different instances, are correct. The osteo-arthritis met with in old persons begins, there can be no doubt, as a purely degenerative change in the cartilages and synovial membrane, soon extending itself to the bones; and although there is added a form of inflammatory action—provoked by injury inflicted on the imperfectly nourished joint structures by movement and friction—degeneration is throughout the disease the main process. On the other hand, in the case mentioned under headings 2 and 5 (pages 63, 65), and still more clearly in such instances of acute osteo-arthritis as Sir Alfred Garrod has recorded (page 67), the affection runs a more active course, and the increase of both vascularity and local heat, though it is not very marked, is yet distinct enough to show that the condition begins as an inflammation. Yet even in these examples *post-mortem* examination shows that a large element of degeneration is also present. A further question raised by some of the cases, especially those in group 3 (page 63), is whether the disease should be regarded as depending on irritation or disease of the central nervous system. This view has recently found many advocates, among the most

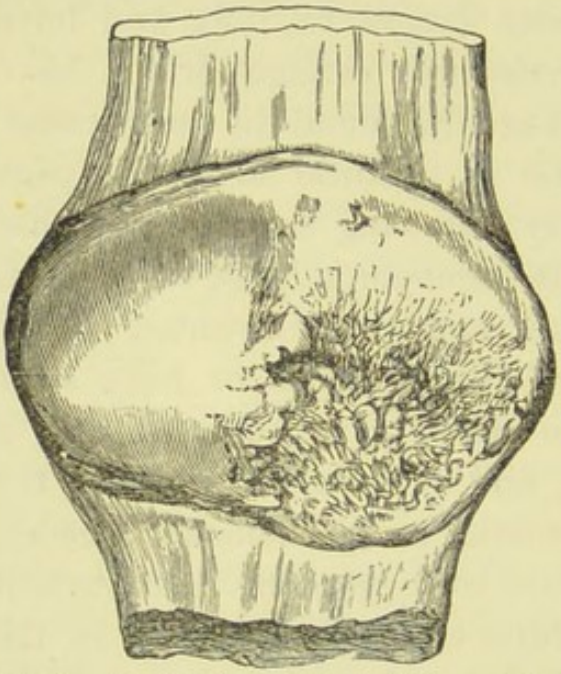

Fig. 5.—Fibrillation of the Cartilage of the Patella in a case of Osteo-arthritis. (From a preparation in the Museum in St. Bartholomew's Hospital, No. 594.)

authoritative being that able and laborious observer, Dr. William Ord. As to this hypothesis, it can only as yet be said that though it has much to support it, and though it promises to throw important light on the origin of many forms of joint disease, it is at present too imperfectly worked out to call for exhaustive discussion here. It is, however, referred to at page 63.

Morbid anatomy.—The disease may begin either in the synovial membrane, or in the cartilage: as a very general rule, it begins in the latter

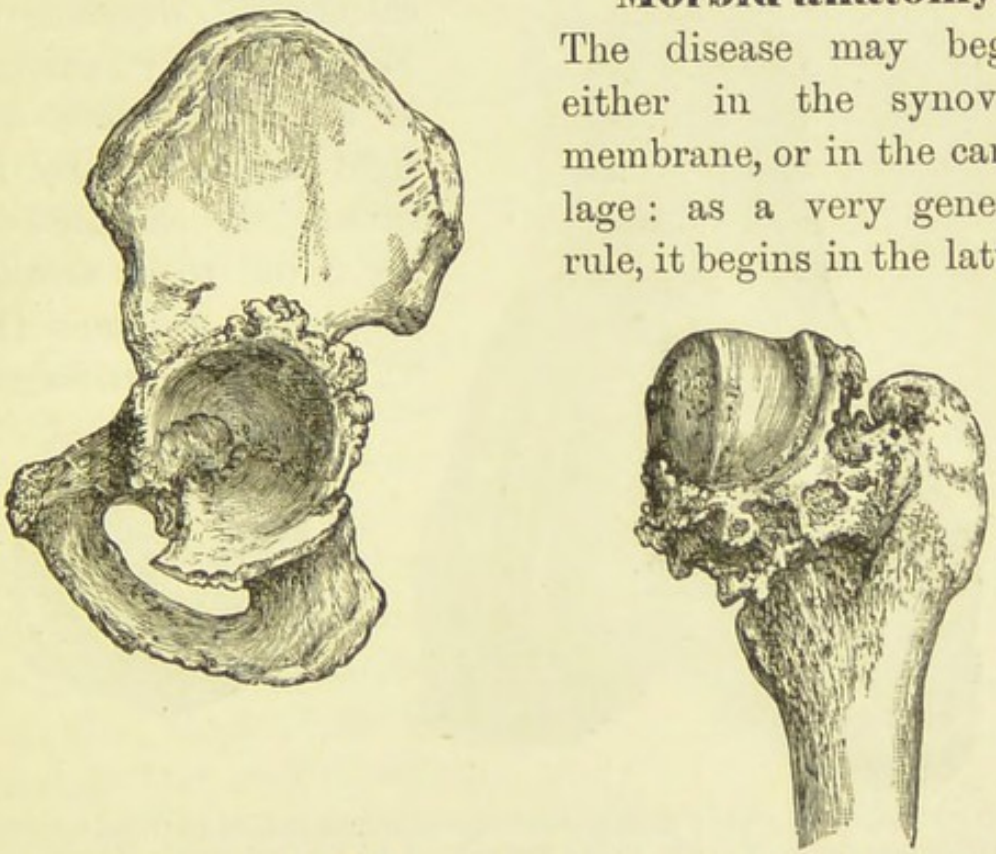

Fig. 6.—Osteo-arthritis of the Hip Joint. (From preparation, No. 681, in the Museum of St. Bartholomew's Hospital.)

structure. This to the naked eye becomes rough and uneven, and here and there eroded and worn down, and its surface presents a tufted or fibrillated appearance, resembling the pile of coarse velvet (Fig. 5). In parts not exposed to pressure, and especially at its margins, the cartilage undergoes hypertrophy, and becomes heaped up in irregular nodules or ecchondroses, which subsequently undergo ossification or calcification, and thus render the articular borders prominent and "lipped" (Fig. 6). Sometimes these

nodular masses are broken off so as to form "loose bodies" in the joint (page 186). As the disease advances, the cartilage in many places, but chiefly where it is most exposed to pressure and friction, is worn away, often with the formation of deep parallel furrows and intervening ridges (Fig. 7), while what remains is mainly broken up into a shreddy fibrous structure, intermixed with patches of calcareous degeneration. Microscopically examined, in a section made at a right angle to the free surface, the cartilage cells are found to be arranged in vertical columns (Fig. 8), and to be undergoing

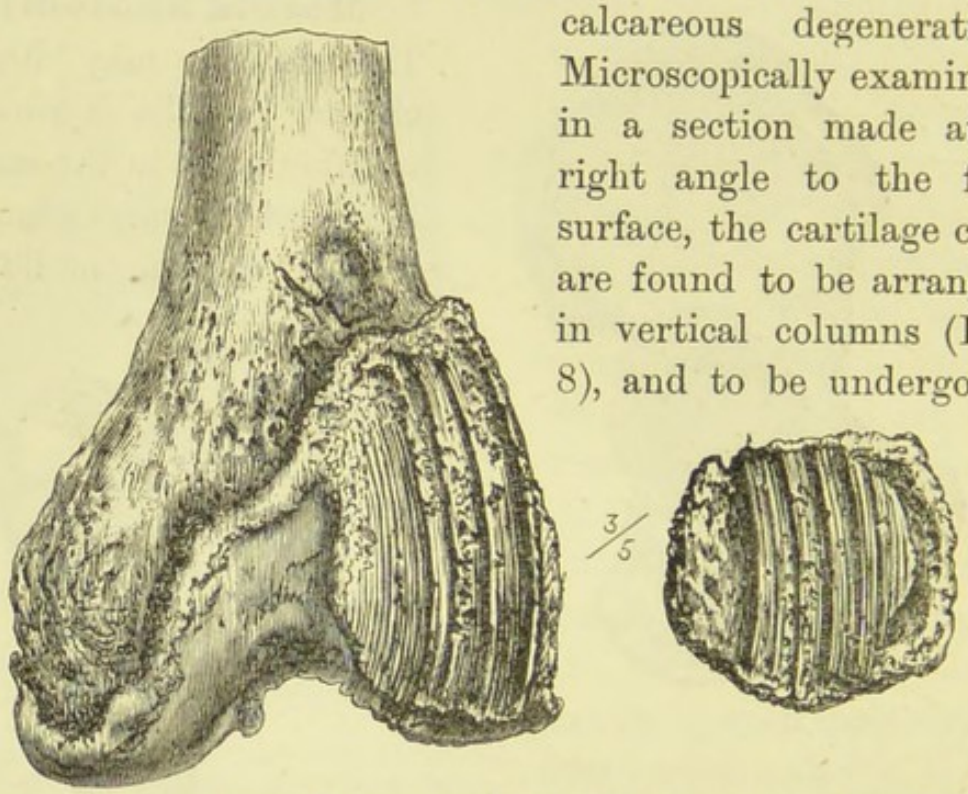

Fig. 7.—Grooving of the Cartilages of the Femur and Patella in Osteo-arthritis. (From specimen, No. 698, in the Museum of St. Bartholomew's Hospital.)

proliferation, so that the capsules in which they are enclosed become distended. The cartilage capsules thus arranged in a linear series open one into another by a simple process of absorption. The capsules nearest the surface open into the cavity of the joint, the cartilage cells escape, the matrix between the cells remains in part to form the longitudinal striæ and delicate fibrillated tufts already mentioned, whilst in part it undergoes mucoid degeneration. The degenerated matrix, unable to resist pressure and attrition, is worn away by the movements of the joint; and as this

process of fibrillation and wearing down is repeated, the whole thickness of the cartilage is gradually destroyed. At the periphery, where the ecchondroses are found, and the articular borders become "lipped," the same proliferation of the cells (Fig. 9) and fibrillation of the matrix ensue, but as the edge of the cartilage is covered by a prolongation of the synovial membrane, the cells, instead of escaping, are retained, and undergo multiplication in the sub-synovial tissue, so as to form cartilaginous outgrowths, which subsequently undergo calcification.

Fig. 8.—Fibrillation of Cartilage in Osteo-arthritis.

The *synovial membrane* becomes slightly increased in vascularity, thickened, and indurated, and, as the result of hypertrophy of its fringes, and enlargement and subdivision of its villi, thickly set with shaggy and tufted elongated or club-shaped processes (Fig. 23, page 158). As a further change, the cartilage cells (which, as pointed out by Rainey and Kölliker, the villi naturally contain) undergo hypertrophy, and are developed into cartilaginous nodules, varying from a mere speck to masses as large as a nut, or even, in some cases, as a walnut. These, when accidentally detached, constitute one of the varieties of "loose bodies" (page 186). As the affection advances to its later stages, the synovial membrane is, to a great extent, destroyed by ulceration and absorption. Some effusion of synovia, rendered cloudy, or even milky, by an admixture of disintegrated cartilage cells, usually

takes place into the cavity of the joint in the early stage of the disease, but in the majority of cases it is very limited in amount and of viscid consistence. In some instances, however, fluid is from the first considerable, and may be subsequently much increased in amount. The *bones* undergo a remarkable change, largely accounting for the

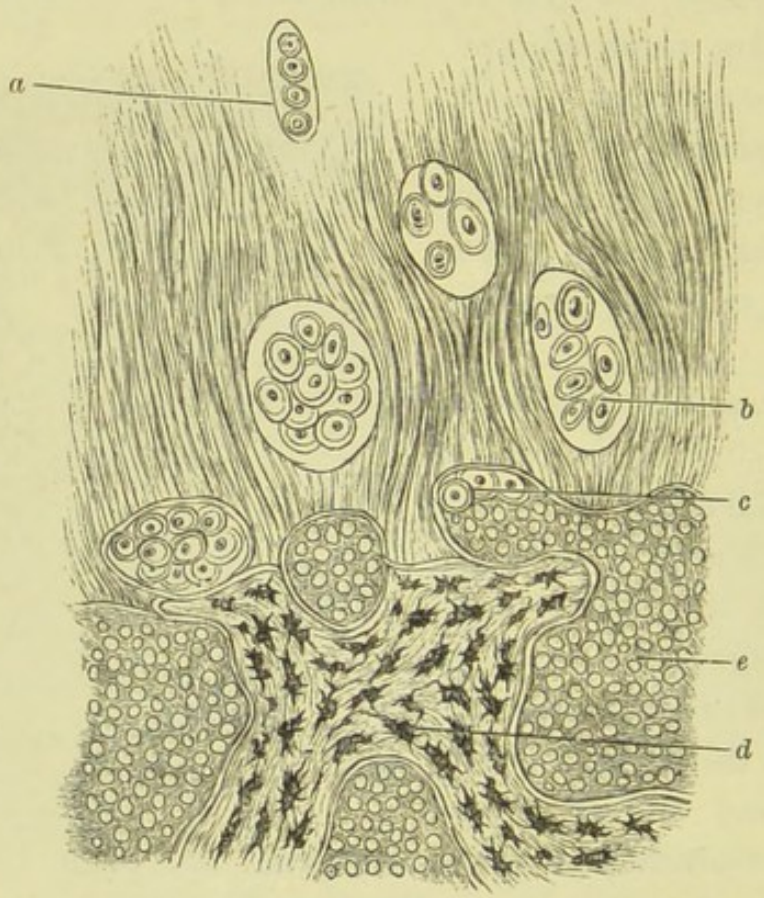

Fig. 9.—Cartilage in Osteo-arthritis. (*After* Cornil and Ranvier.)

a, Normal capsule; *b*, mother capsule containing secondary capsules; *c*, capsule emptying itself into a medullary space; *d*, newly-formed bone; *e*, embryonic medulla. × 300 diam.

peculiar features observed in this disease. As fibrillation and destruction of the encrusting cartilage proceed, and the ends of the bones become exposed, the articular lamella is reached. Subject to friction, and the seat of a low form of inflammatory action, this structure is, on the one hand, slowly worn away, while, on the other, it undergoes condensation and induration, with the result that

its surface is rendered dense and polished, or, as it is termed, eburnated or porcellanous, and studded with minute circular holes, as if worm-eaten, an appearance due to the fact that as the bone has been rubbed down the orifices of the Haversian canals have become exposed. Beneath this porcellanous layer, the cancellous tissue, involved in the chronic inflammatory action, undergoes a peculiar change, in which rarefaction and atrophy are combined with new bone formation and the production of osteophytes, and nodular or tuberous deposits, with the result that where pressure exists the articular ends become gradually flattened and worn away, while about the margins, and at such other parts as are free from pressure, large irregular plates and processes are developed. Thus *e.g.* in the hip joint, the convex head of the femur is absorbed, while its borders are surrounded by mushroom-like excrescences of new bone encroaching upon and overhanging the neck, or by thinner plates which partially ensheath it. On the other hand, the acetabulum is considerably enlarged, in a direction upwards and backwards, and rendered deep and oval, while its borders are walled in by large stalactitic formations and irregular plates. This remarkable process (in which waste and reproduction, far exceeding healthy limits, are combined) gradually leads to the complete destruction of the articulation, and to the accumulation of new material around it. By these means movement is more and more interfered with, and the limb is rendered more and more weak, stiff, and crippled. The changes in the *ligaments* and *adjacent tendons* contribute largely to this result. In the knee, for example, the crucial as well as the external and the internal lateral ligaments may entirely disappear, so that the joint is rendered "loose," and so weak and flail-like that it may even undergo complete spontaneous dislocation. In the later stages also *the peri-articular tissues* are sometimes the seat of chronic

œdema, which may even extend into the neighbouring parts of the limb. Thus for some distance up the fore-arm, for example, when the wrist is affected, the skin becomes infiltrated, pale, smooth, and shining, and is tightly drawn over the prominences of the joint; often, again, there is effusion into the sheaths of the adjacent tendons, giving rise to multilocular gangliform swellings. (*See* page 176.) The absorption of tendons is best illustrated in the shoulder, where that part of the long tendon of the biceps which lies within the capsule of the joint is often found displaced from its groove and frayed out, or completely worn through, and its two ends, separated by a considerable interval, are adherent to the subjacent bone; while the tendons inserted into the tuberosities of the humerus—those of the subscapularis, supraspinatus, infraspinatus, and teres minor muscles may completely disappear. Ossification of the tendon of the middle head of the triceps (which arises just below the glenoid cavity of the scapula), and of the tendon of the ilio-psoas, in the neighbourhood of the hip joint, may sometimes be observed. Interstitial atrophy and diminished strength of the articular extremities of the bones are illustrated by the fact that the neck of the femur sometimes yields under the weight of the body until it forms less than a right angle with the shaft. Usually, however, this change of shape is produced in another manner. The upper part of the head, where it presses against the upper border of the acetabulum, is absorbed: the neck is partly absorbed also. While these changes are in progress, new bone is formed on the under surface of the neck and under the remains of the head (these parts being free from pressure), so that the angle between the neck and the shaft is considerably reduced. The production of loose bodies in the joints, resulting from the detachment either of cartilaginous nodules from the synovial fringes, or of osteophytes

from the articular margins in osteo-arthritis, is alluded to at page 186 *et seq.*

Two important and noteworthy points respecting the pathology of osteo-arthritis are, first, that suppuration, even if it ever occurs, is rare in the highest degree; and, second, that although movement may be entirely lost, so that the joint is fixed, this loss of movement does not depend upon true anchylosis, which appears (the process of wearing down and loss of substance not favouring such a result) never to take place, but upon the locking of the articulation by alteration in the outline of the surfaces of the component bones, the accumulation of new bone around the joint, and the wasted and contracted condition of the surrounding muscles. (*See* page 470, where reference is made to bony anchylosis of the spine.)

Cases are occasionally met with, chiefly in the knee, in which the fluid accumulated in the interior of the joint—fluid consisting of synovia rendered turbid by cell exudation and molecular débris resulting from disintegration of the cartilage and other articular structures—travels towards the surface, and there forms an opening through which it escapes, and from which it subsequently continues to drain away sometimes for several weeks. Though the cavity of the joint is thus opened, no active inflammation may follow, the tissues having apparently become callous and tolerant of exposure. A man, aged 52, was in St. Bartholomew's Hospital in 1883 with osteo-arthritis of the right knee of some years' duration. The articular ends of the bones were enlarged and uneven. The joint cavity was considerably enlarged, and the synovial membrane was thickened and indurated, and here and there presented nodular masses of cartilage readily felt on palpation. On the outer side above the patella was an opening, through which an ordinary-sized cedar pencil might be passed, and from which turbid synovia, varying in quantity

from a few drops to two or three teaspoonfuls a day, constantly drained away. The joint, in which creaking and grating were felt, could be moved through an arc of three or four degrees without causing pain. The patient said that the discharge had been going on for six weeks, and that at first it was much more profuse. His temperature was normal, and he had little pain. The left knee presented well-marked evidences of osteo-arthritis, though only in an incipient stage.

It has been remarked above (page 53) that osteo-arthritis will probably, as pathology advances, be broken up into several minor groups that have not yet been differentiated. For the present, all that can be done is to arrange the cases that are met with in practice under separate headings from a clinical point of view.

1. The most common form is that which is seen in persons between 40 and 60, and more commonly in women than in men.

Frequently no predisposing cause is apparent, but in many instances the affection is either hereditary, or occurs in those who have previously suffered either with gout, or acute or chronic rheumatism, or have been much exposed to cold and damp. Commencing, as a rule, in the knees or small joints of the fingers, it tends gradually to spread to other articulations, till, in the more inveterate cases, all the joints, even those of the spine (page 520), are involved In many instances, however, it remains limited to certain of the joints—for example, to the temporo-maxillary joints, knees, elbows, wrists, and the fingers—while the rest escape. In these cases the patient finds the joints growing stiff, especially in the morning and after rest. At first the stiffness passes off as soon as the limb is moved, but it gradually increases until motion is in great part or entirely lost. The joints creak, grate, or snap, and grow more and more weak and painful; and as the articular ends become altered in

shape, irremediable and often great deformity ensues. The muscles waste and become flabby. The joints slowly enlarge and become nodular and prominent. Usually there is little or no increase of fluid; but in some instances, especially in the knee, the articular cavity becomes largely distended; or adventitious cysts are developed (page 176).

In 1885 I saw a man, aged 72, in an almshouse, who had suffered from osteo-arthritis for upwards of twenty years. Apparently not one of his joints had escaped. Many were distorted and completely fixed. His hands were so deformed and weak that he was unable to lift even a teacup without great difficulty; and his limbs were so crippled that, though he persevered in dressing himself, this process occupied him between two and three hours.

2. Another variety of the disease is that which is met with in the young or middle-aged; and in the anæmic and weakly rather than in the well-nourished and robust; and which is not rarely met with after the subsidence of acute articular rheumatism, or of some other acute specific disease, such as scarlet fever or measles. I recently examined a military cadet, 19 years of age, who had well-marked osteo-arthritis of the fingers after an attack of fever at Malta. In women it not rarely follows pregnancy or prolonged lactation.

3. Dr. Ord has recorded a remarkable set of cases, in which, in women near the climacteric period, ovarian or uterine affections, attended with disordered, profuse, or difficult menstruation, were associated with arthritis. In nearly half the patients the arthritic attacks were paroxysmal, and were developed at each menstrual period, but subsided in the intervals. In many instances the joint affections disappeared when menstruation finally ceased, or when it was rendered normal by the treatment adopted. In three of these cases the affection was limited to, or

mainly situated on, one side, and was associated with ovarian pain and tenderness on the same side, and also with the occurrence of neuralgia on the same side. A girl, under my notice, when she was fifteen, suffered from "dying fingers." The fingers several times a day became cold, shrivelled, and waxy, as if the seat of a mild degree of Raynaud's disease. Nine months after this vaso-motor disturbance was noticed she was attacked, during very cold weather, with a severe form of osteo-arthritis affecting her hips, knees, ankles, wrists, and finger joints. She was unable to dress herself, and could scarcely turn in bed. For some months the disease slowly advanced, and it seemed probable that she would be permanently crippled. She spent some months of the two following summers at Buxton. These visits proved to be very beneficial. By degrees the condition of the joints improved. She regained free movement in the hip joints, and, more gradually, in the knees and the other articulations. She still has enlargement of the finger joints and ankles; but she is in good health, and can move about without difficulty.

4. Another form of osteo-arthritis is that known as morbus coxæ senilis. This condition is much more common in men than in women, and after than before the age of forty. It may originate in a fall or other injury, but it is also often spontaneous. The first symptoms here, as in other varieties of osteo-arthritis, are stiffness and pain, often severe, and wandering through the limb, darting through the glutei or the muscles of the thigh, or taking the form of sciatica, lasting for many months, and obstinately resisting treatment. Wasting soon becomes marked, the gluteal region is flattened, and the muscles of the thigh are shrunken and flabby. Motion is gradually lost, so that the pelvis rocks when the thigh is flexed, and rotation of the femur in the acetabulum also is lost. The thigh either remains extended on the trunk, or slowly

acquires some degree of flexion, showing itself as lordosis, but this is usually not very marked. The limb, however, undergoes shortening (the result of absorption of the head of the femur and the upper border of the acetabulum) and rotation outwards, while it also becomes somewhat adducted. In these circumstances the patient becomes much crippled, and finds it especially difficult to go up or down stairs, or to rise from a low seat. On examination, in addition to the symptoms already mentioned, it is found that the upper end of the femur is enlarged, and that the trochanter is lying distinctly, often considerably, above Nélaton's line, while, if movement is still present, grating or creaking can usually be detected.

A striking deformity occasionally resulting from osteo-arthritis of the hip, is shown in Fig. 52, page 381, representing the condition of a patient under the care of Mr. Lucas.* In this patient both hip joints in the course of osteo-arthritis had become fixed in a position of adduction combined with extension. A like deformity has been met with in cases of double hip disease. The method of walking adopted by patients with this distortion has been termed by the writer alluded to "cross-legged progression."

5. An example of osteo-arthritis to be carefully borne in mind is that which by no means rarely follows injury of the hip joint by a fall on the trochanter. This condition is usually spoken of as absorption of the neck of the femur. This name is inappropriate and misleading, for the changes that ensue are in every respect identical with those of osteo-arthritis arising in cases in which no injury has taken place. The acetabulum becomes enlarged, and surrounded by irregular formations of new bone; and the appearances observed in the femur are due, not, as they seem on a casual inspection, to absorption of the neck, so that this part is primarily shortened; but to melting away of the prominence of the

* Clin. Soc. Trans., vol. xiv. p. 20.

head, and to the formation of new bone around its base and encroaching upon the neck. In these cases, in which the head appears to rest on the shaft without the intervention of a neck, the original head and the greater part of the neck have been completely lost, and the apparent head is in reality the base of the neck surrounded by a mushroom-like expansion of new bone. This form of osteo-arthritis, though met with chiefly in elderly people, especially in females, may be developed in middle, or even in early, life. Thus Gulliver* records examples of it in subjects, all being males, of the respective ages of fifteen, nineteen, thirty, thirty-two, and forty-five.

The affection, though sometimes ensuing very slowly, often reaches a stage in which all its features are well marked in the course of a few weeks, so rapidly indeed as to give rise to the belief that the patient is suffering from fracture of the neck of the femur which has been overlooked. I recently met with the following typical example:—A lady, aged 52, fell heavily upon her left trochanter as she was joining in the fun and romp of a children's party. Although conscious of a severe bruise of the hip, she moved about during the remainder of the evening, and went up and down stairs without assistance. During the next three days she still went about, though with gradually increasing pain and lameness. She was then obliged to remain in bed. Pain about the hip was so severe that she could obtain but little sleep, and the joint became stiff and the hip markedly tender. Two months later I found the limb an inch and a half shorter than its fellow, and everted; the trochanter was much less prominent than natural, and considerably above Nélaton's line: movement of the joint was very limited, and attended with great suffering and with distinct grating. That this was a case of osteo-arthritis and not of fracture was, I think, clearly proved by the fact that

* *Edin. Med. and Surg. Journal*, vol. xlvi. pp. 97 and 312.

for two days after the accident the patient was able to go up and down stairs without help, and that the symptoms gradually increased in intensity, having at first been those simply of a severe bruise. These cases are important, not only in themselves on account of the circumstance that they may give rise to the belief that a fracture has been overlooked, but as illustrating the fact that one of the causes of osteo-arthritis is an injury which at the time may seem to be unimportant. In 1885, in the out-patient room at St. Bartholomew's Hospital I saw a man, aged 48, whose right elbow joint was the seat of osteo-arthritis, which had ensued after a fall on the joint four months before he came under observation, and I have met with several examples of a similar kind in the shoulder, and with some also in the knee.

6. Usually chronic, osteo-arthritis occasionally presents itself in an acute form, as pointed out by several writers, particularly by Sir A. Garrod and the late Dr. Fuller. The following account is taken from Sir A. Garrod's article in Reynolds's "System of Medicine."* I venture to copy it, as I am not aware of having seen this variety of the affection.

"Now and then cases of osteo-arthritis are met with which, in most of their symptoms, closely resemble acute rheumatism. Several joints are attacked, the swelling is considerable, and there is distinct increase of temperature of the affected part, with pain, tenderness, and redness.

"In these instances, constitutional symptoms, as thirst, loss of appetite, heat of surface, a rapid pulse, and other evidences of febrile excitement, are often observed. There are, however, wanting the characteristics of rheumatic fever, namely, the profuse sweatings and proneness to acute inflammation of the internal and external membranes of the heart, so common in acute rheumatism, and likewise the

* Vol. i. p. 879.

erratic disposition or tendency of the inflammation to fly from joint to joint. Between cases of genuine acute rheumatoid arthritis and those of the very chronic varieties, there is every intermediate shade of difference. As the acute disease is so little known and recognised by the profession, it may be well to give an illustration, and the following case may be taken as a typical example:—A lady, 42 years of age, when living in Australia, in the bush, was confined, and, being unable to procure a good supply of cow's milk, was induced to nurse her child for a period of twenty months (at the same time she herself had but a very deficient amount of meat); by these means she was reduced to an extremely weak state. After a short time she noticed that some of her joints became affected; at first the knees, then the ankles, afterwards the elbows and wrists, and lastly many of the small articulations of the hands. These parts were painful, somewhat swollen, hot, and tender, but the local symptoms were never intense, nor was the constitutional disturbance very great; that is, there was no high degree of febrile excitement. After a few weeks some of the joints were much injured, the knees, although reduced in size by absorption of the fluid, could neither be extended nor flexed, and the patient was soon unable to stand by reason of their rigid condition; the movement of several of the other joints was limited, although in a less degree. The causes of the debility being removed, the patient soon gained strength and flesh, and the tendency to the joint affection passed off, but not without having inflicted irremovable injury."

7. One of the most intractable varieties of osteo-arthritis is that which is occasionally met with in young subjects. I have seen only a few cases at this period of life, and none under five years. E. C. Seguin, however, states that he met with three cases, in the same family, in children between the ages of two and a half and four years.

Moncorvo reports an instance in a child of two and a half; Laborde one in a child aged four; and Charcot one in a child of ten.* The disease in some instances has been hereditary; in others it has followed scarlet fever, or been developed on the subsidence of acute rheumatism. In one case it affected only the knees. These became gradually flexed, enlarged, and fixed; creaking was felt on passive movement, and the articular margins of the bones were heaped up and everted, or lipped. In other examples the finger joints, the wrists, the elbows, the knees, or the ankles become enlarged and stiff, and present the general characters of the disease as it is seen in older persons. One of these patients, when I saw her last, was in her twentieth year. The disease had spread to all her large joints, so that she was unable to walk, or to dress herself; in fact, she was already as helpless as patients of seventy often are who have suffered for years from the disease.

Treatment.—Although the morbid anatomy of osteo-arthritis is much the same in whatever circumstances the disease occurs, I have thought it advisable from a clinical point of view to arrange the various examples to which reference has been made under distinct headings, in order to emphasise the importance, when treatment is being discussed, of taking into account the origin of the disease in each individual case. This is necessary in order that both the predisposing and the exciting causes of the attack may be as far as possible removed. If this method is followed, much better results will be secured than are obtained by the too prevalent custom of accepting it as a foregone conclusion that the disease is incurable, and treating it, in a half-hearted manner, as if all the cases alike were closely allied to intractable chronic rheumatism. In accordance with this remark, after certain general rules

* Pepper: "System Prac. Med.," vo . ii. p. 88.

have been stated, the further means that are called for in the different clinical groups will be referred to.

Though usually an essentially chronic affection, osteo-arthritis, as already pointed out, is sometimes acute. Reserving the latter variety for notice at page 74, I will now allude only to the chronic form.

The influence of rest and of exercise on the course of osteo-arthritis is a question of much importance. Observation shows that in the generality of cases, if the affected joints are kept at rest, they become more and more stiff, while, on the other hand, stiffness is kept in check by moderate exercise. It is, therefore, customary to recommend patients to persevere in the effort of walking, even though the joints are very weak and painful, and although after exercise pain is considerably increased. I venture to say that in many instances this recommendation is carried too far. In the early stage of the disease, and in cases of moderate intensity, exercise short of fatigue is distinctly beneficial. It tends to diminish both weakness and stiffness. But when pain is severe, and is aggravated by exercise, great benefit will be obtained by keeping the joint completely at rest. I have on several occasions seen very marked relief obtained by weight extension in the case of the hip and by leather splints for the knee. The best rule appears to be to let the degree of pain and the effect of exercise determine the amount of movement that should be prescribed. Joints that are not painful are the better for moderate exercise; but if pain is present, and if it is aggravated by movement, rest with such mechanical support as may seem necessary, should be employed.

Passive motion is very useful. When circumstances permit, the patient should employ a well-trained rubber, who will daily, or three or four times a week, for two or three months, perform gentle passive movements, gradually increasing in their range, and will combine them with hot

douching and friction of the joint and with massage of the neighbouring muscles. Many patients derive much benefit from this treatment, which greatly diminishes the stiffness and weakness of the joint, and checks muscular atrophy of the limb. Even when a skilled rubber cannot be employed, much can be done by an intelligent servant, or by a relative, to whom the treatment has been explained. The joint should be protected from cold, and from sudden changes of temperature, by being enclosed in flannel. The most efficient local application is undoubtedly heat combined with moisture in the form of the hot bath or the hot douche. Patients unable to leave home should, using a large sponge or a piece of thick flannel, douche the affected joint with the hottest water that can be borne without discomfort, for ten minutes or longer, morning and evening, and much relief, both of pain and stiffness, may be obtained by enclosing the joint at night in lint soaked in warm lead and opium lotion, covered with oil-silk and a thick layer of cotton wool. Patients who can do so should go to some health resort where hot bathing and douching can be obtained : to Bath, Buxton, Harrogate, Droitwich, Leamington, or Woodhall Spa. The climate of Bath, in the centre of the town, is somewhat moist and enervating, especially in the hot months of summer; but in the higher parts around it is excellent. In the spring and late autumn it is genial and soft. Buxton is 1,200 feet above the sea, and, although there is sometimes a heavy rainfall, the weather, throughout the summer and autumn months (May to about the end of September), is, in dry seasons, delightful. At Harrogate, which, like Buxton, is considerably above the level of the sea, the rainfall is less, but the wind is often strong and cold in the spring and late autumn. Both are best visited during the warm and dry months of summer. Buxton is best suited for cases in which the joint affections are unaccompanied by marked debility

or anæmia, and in which the use of hot water alone is required. Harrogate affords the advantage of its alkaline and chalybeate waters to those who are weakly and anæmic, or whose arthritis is connected with the uric acid diathesis, or with symptoms of ordinary rheumatism more or less acute. The strong brine-baths of Droitwich are often of great service. The climates of Leamington and Woodhall Spa are dry and bracing. In all these health resorts hotel accommodation is good, and in many it leaves nothing to be desired, while the baths and douches are fitted with all recent improvements. Among the best health resorts on the Continent for this affection are Aix-les-Bains, Nauheim, Wildbad, Baden-Baden, and Teplitz. (*See* page 51.)

The general impression that counter-irritation is not of much service in cases of long standing is probably correct, but there are many cases, especially where any degree of inflammation attended with pain is present, in which a series of small blisters, one being allowed to heal before the next is applied, may be very advantageously used. In persons in fair health a Turkish bath once a week is beneficial. Alcohol should be used in but small amounts. Malt liquors and acid and sweet wines should be discontinued. Probably whisky is the form of alcohol which is least likely to do harm.

In the first group of cases above mentioned, should gout or rheumatism be present, lithia (page 42), or if the urine is abnormally acid, alkalies, should be prescribed. An alkali may be taken in the form of Vichy water; or twenty grains of citrate of potash in half a pint of water, either before breakfast or in the course of the morning. In some cases small doses of iodide of potassium do good, though this salt is apt to depress the general health. Sometimes small doses of arsenic continued for some weeks, especially when combined with iron or quinine, exert an obviously beneficial influence; but this drug often disagrees with

the digestive organs in persons over fifty, and must be cautiously given. The question of endeavouring to restore or improve motion by forcible movement, under an anæsthetic, is alluded to under the head of morbus coxæ senilis (page 64).

The main points in the treatment of cases of the second group (page 63) are, to prescribe iron (the arseniate of iron in doses of an eighth to a quarter of a grain is a good form), or quinine, and to remember that both arsenic and iodide of potassium act more favourably in young than in elderly patients. In cases of prolonged lactation the child must at once be weaned. The treatment of the cases forming group 3 (page 64) must aim at the removal of the ovarian or uterine disorder upon which the disease here seems to depend.

It must be allowed that the treatment of morbus coxæ senilis (page 64) is often attended with very disappointing results. When able to do so, the patient should, as soon as the disease is detected, go to one of the health resorts alluded to above, and take a course of baths and hot douching extending over a full month. The joint should be kept in moderate exercise, and be warmly covered; blisters may relieve pain, and the wasting of the muscles may be checked by the use of massage or of the continuous electrical current, which, however, to be of any service, must be applied with regularity, for ten minutes, once or twice a day. The stiffness and crippled condition of the joint so often met with in advanced cases may sometimes be diminished by movement under an anæsthetic. The cases, but they are rare, that may be improved by this treatment are those in which the joint is locked by osteophytes that have grown up around the articular margins, and that admit of being snapped off or pushed aside by movement; or in which surrounding adhesions can be ruptured. As a rule, however, forcible

movement is decidedly prejudicial, for, without relieving either pain or stiffness, even for a time, it inflicts injury on the degenerate textures, which tends to aggravate the malady. If the limb undergoes shortening from bone absorption, a high boot should be used. Rest and weight extension may be required when pain on movement is severe. (*See* below, and page 268.)

In osteo-arthritis of the hip following injury (the cases in which the disease occurs in its more acute form) the joint should be maintained at complete rest, and inter-articular pressure should be prevented. These ends are best gained by keeping the patient in bed, and applying a weight of from seven to twelve pounds, while the limb is steadied between sand bags. This treatment is necessary, for the pain felt on movement, the spasmodic jumping of the limb, and the rapid absorption of the opposed articular surfaces, all show that the muscles around the joint are the seat of reflex irritation leading to inter-osseous pressure, to which the persistence of pain is largely due. In this form of the disease, counter-irritation, produced either by blisters, or the actual cautery lightly applied, is also indicated. It must, however, be cautiously resorted to in elderly or enfeebled subjects.

I know of no special remedies by which osteo-arthritis in the young (group 7) can be relieved. All that can be done is to prevent deformity by the use of light splints, to make full use of hot bathing and the hot douche, and to promote the general health by residence in a dry and warm climate, and by prescribing iron and cod-liver oil, with which small doses of arsenic should be combined.

The treatment of acute osteo-arthritis must consist in maintaining the affected joints at rest, and in good position, and for this purpose splints may be required; in applying warm lead and opium lotion, or belladonna liniment, or

enclosing the joints in cotton wool. Salicylate of soda should be given internally for the relief of pain, while, should the patient be anæmic and weak, quinine and iron should be prescribed. As soon as the patient can bear the journey, a visit to one of the health resorts mentioned above, where bathing and the hot douche are combined with a suitable climate, should be recommended.

CHAPTER VI.

HYDRARTHROSIS (HYDROPS ARTICULI, HYDRARTHRUS).

The difficulty which is often met with of attaching a precise meaning to an old term introduced when nothing was known of pathology, and when leading symptoms were spoken of as if they were a disease in themselves, is encountered in the present instance. Hydrarthrosis, in its natural acceptation, merely signifies fluid in a joint, and makes no allusion either to its amount, or to the nature of the morbid action by which it has been produced; and it has followed as an inevitable result that so vague a phrase has been employed by different authorities to indicate diseases which have nothing in common with each other beyond the one particular feature of effusion into the joint. Some have applied the term to (*a*) any instance of chronic synovitis, attended with even a slight accumulation of synovial fluid; some to (*b*) rheumatic disease, accompanied by excessive secretion; (*c*) some cases which have been termed hydrarthrosis have probably been examples of tuberculous synovitis, while others have been syphilitic, for in both these affections the amount of effusion may be considerable, and may be unattended with the usual symptoms of chronic inflammation; (*d*) lastly, there is a group of rare and obscure cases in which a joint, apart from any distinct evidence of inflammatory action, becomes the seat of a large collection, sometimes amounting to one or two pints, or even more, of watery synovial fluid. Thus so indefinite a term might well be allowed to fall into disuse, and this will ultimately be its fate. It is noticed here only because it is still occasionally employed in clinical work. I shall limit it to the cases last mentioned, that is, to group *d*. The

condition is developed as a slow and continuous secretion of a watery synovial fluid which gradually distends the joint capsule. At no time is there any appreciable increase of vascularity of the synovial membrane, and the affection is nearly painless. The membrane assumes a dull, yellowish-white colour, and presents a sodden, macerated appearance. After the lapse of a considerable period, the subserous layer is the seat of a slow formation of fibrous tissue, so that the synovial membrane becomes greatly increased in thickness, especially where the natural folds exist. At the same time the synovial fringes become hypertrophied, and new processes are formed, so that the surface, which is ordinarily smooth, becomes rough and shaggy, and covered with thickly set pedunculated, dendritic, or villous growths, with here and there large soft processes of œdematous synovial membrane. In these hypertrophied processes nodules of cartilage may be developed. These are usually small, but some may attain the size of a nut, or even of a walnut, and be easily felt by external examination. As time goes on, the nutrition of the ligaments is interfered with by the process of soaking to which they are exposed, and they grow soft and weakened, so as to allow partial displacement of the articular surfaces. The cartilages also gradually become fibrillated, and are slowly worn away. Another feature of these cases is that any bursal cavities in communication with the affected joint are liable to get over-distended, and their enlargement may in some instances mask the real nature of the disease. A joint affected with hydrarthrosis shows little tendency towards recovery. Indeed it will be readily understood that when once the synovial membrane is changed in the manner just described, it is almost impossible for it to regain its natural state. The disease, on the contrary, usually continues to advance, so that the articulation becomes greatly enlarged, loose, and so weak that no weight can be thrown on it.

Frequently the corresponding joint on the other side becomes similarly diseased. The affection probably consists of a very slowly advancing form of osteo-arthritis. In the young it is sometimes tuberculous. The view that it is due merely to a passive dropsical effusion has been adopted by many authorities, and must be mentioned here. It is not, however, supported by any pathological fact.

The affection is most common in the knee, though it may be found in the shoulder, elbow, and ankle. In the knee, the instance that will now be described, it is characterised by the development of considerable enlargement of the joint, depending in great part on effusion into its cavity, but due to some extent also to thickening of the synovial membrane. In some cases as much as two or three pints of fluid are present. The joint is distended laterally, and also far upwards beneath the quadriceps extensor, bulging of the synovial membrane being especially marked where the joint-capsule is thin. The patella rides on the summit of the swelling, and can be pressed down so that it strikes the condyles, unless the distension is too great to permit this. Fluctuation is distinct in all the axes of the joint. Sometimes on deep pressure the thickened condition of the synovial membrane can be felt, and enlarged and indurated folds and fringes can be made out. In some instances the fluid passes into and distends the bursa under the semi-membranosus muscle in the popliteal space, and even makes its way for some distance beneath the muscles of the leg, so as to produce a large fluctuating swelling in the ham and upper third of the calf. (*See also* chap. xiv.)

In some cases the joint is almost entirely powerless, and may admit of considerable lateral movement, so that the patient walks with great difficulty. The affection is met with in all ages after puberty, but is most common in persons between thirty and sixty, and is more frequent in men than in women.

Treatment.—In dealing with a joint that has become slowly distended in the manner described, the first point should be to ascertain, if possible, on what the effusion depends. The surgeon must be especially careful not to overlook tuberculous or syphilitic disease, or osteo-arthritis. Should the presence of either of these affections be established or suspected, appropriate treatment must be employed. If no definite cause can be made out, when the condition is recent, the joint should be kept at rest by means of Thomas's knee splint, with which, if necessary, carefully moulded leather splints may be combined (page 450). These should be cut away to a sufficient extent in front to allow of the application of blisters. The blisters should be from an inch and a half to two inches and a half square, and should follow each other at intervals of three or four days, so that one is nearly healed before the next is put on; or sharp irritation of the skin may be effected by rubbing in every morning, or at appropriate intervals, the unguentum hydrargyri biniodidi; or the tincture of iodine may be painted on often enough to ensure the same result. After the joint has been thus freely blistered for three or four weeks, a Martin's elastic bandage may be applied when the skin will bear it. In cases in which blistering and pressure have failed, the joint may be aspirated, and the treatment by the elastic bandage tried again. These means not succeeding, part of the fluid has been withdrawn and an equivalent amount of tincture of iodine, diluted with one or two parts of water, has been injected. Formidable as such an operation appears, it has proved to be attended with slight danger if care is used in its performance. But it must be admitted that its success in the advanced form of the disease is very doubtful. It is followed by considerable inflammatory effusion, such as is seen after the injection of a hydrocele; but in many instances, when this has subsided, the fluid, in very much its original character, soon returns.

In a case of hydrarthrosis of the knee, which had resisted all milder proceedings, Mr. Willett treated the joint in the following manner * :—

Under antiseptic precautions an incision two and a half inches long was made from the centre of the outer border of the patella directly into the joint. A considerable quantity of turbid serum, mixed with large flakes of lymph, escaped. A second incision was made for the same distance along the inner border of the patella; and a third, of the same length, at the outer and back part of the knee. This extended upwards from the head of the fibula and followed the inner border of the biceps. The joint was washed out with carbolic lotion, and the synovial membrane was well scraped, and afterwards swabbed out with a solution of chloride of zinc, ten grains to the ounce. A drainage tube was passed between the first and second openings, and a bundle of horse-hair, previously soaked in carbolic lotion, between the second and third. The limb was put up on a straight back splint and a long outside Liston's splint. The subsequent progress of the case was favourable. The temperature rose on one occasion to 102·2°, but after the sixth day was natural. Five weeks afterwards all drainage was removed, and in another week the wounds were nearly closed, and the patient could lift his leg without pain. A month later still the limb was put up in plaster of Paris, and the patient was allowed to get up. Four months after the operation there was no fluid in the joint, but the synovial membrane was somewhat thickened. The patient could flex the limb to an angle of 30°, and walk with the aid of crutches. He was examined several months afterwards, and was found to have retained a very useful joint, free from swelling, and possessed of considerable movement.

* St. Bartholomew's Hospital Reports, vol. xix. p. 206.

CHAPTER VII.

CHARCOT'S DISEASE.

In 1868 Professor Charcot gave a lecture on the relation between certain forms of joint disease and tabes dorsalis (locomotor ataxia). Many were at first sceptical as to the truth of Charcot's observations; but this feeling has passed away, and the connection between tabes dorsalis and the joint affections now to be described has been conclusively established.

It may conduce to clearness if I refer, at the outset, very briefly to the symptoms of tabes dorsalis. As to its morbid anatomy and pathology, I cannot do better than quote the following account from Dr. Ormerod's excellent work * :—

"Tabes dorsalis (locomotor ataxia or posterior sclerosis) consists, to speak roughly, of a chronic degeneration, or 'sclerosis' of the posterior columns of the cord. These parts are affected as follows: The postero-lateral column degenerates first at the point where the entering posterior nerve-roots course through it (posterior root zone) in the lumbo-dorsal region to begin with, and then at higher levels. This degeneration is primary, so far as we know. Next, there occurs a secondary degeneration of the postero-median column, starting from the level of the primary degeneration (wherein it originates) and reaching up through the whole length of the cord. Thus, in the lower dorsal region, the whole sectional area of the posterior columns may be involved; in the cervical region, only the postero-median part of it (columns of Goll). In rare instances the

* "Diseases of the Nervous System," 1892, pp. 207. 213.

primary degeneration begins in the cervical region of the cord, and not in the lower dorsal region. The posterior nerve-roots are often diseased as well; indeed, it may be argued that the primary disease begins here. Other parts of the cord may be affected: Lissauer's column frequently, and at an early stage, it is said, the vesicular column of Clarke, and (probably in connection with them) the direct cerebellar tract; also the antero-lateral ascending tract. All these parts, it will be noticed, consist of centripetal fibres. The degeneration may spread from the posterior columns to the posterior horns of grey matter. In rare instances the anterior cornual cells also degenerate. Lastly, recent researches show that a degeneration of peripheral nerve-fibres is by no means uncommon in tabes. . . . As to the causation of tabes, syphilis is so frequent an antecedent that it is thought to be at least a predisposing cause, although we do not understand its mode of action. Exposure to cold, and injury to the spine, or to other parts, have also been alleged as causes. The disease is much commoner in men than in women."

The *symptoms* are, loss of co-ordination, leading to an unsteady gait, especially in the dark, or when the eyes are shut, and, later, to various irregular jerking movements of the limbs; inability to stand when the feet are placed together and the eyes are closed; difficulty in running and going up or down stairs; loss of sexual power; incontinence of urine, tenesmus and pain in the lower bowels, with diarrhœa, and sometimes the passage of blood, with occasional unconscious passages of fæces; loss of patellar-tendon reflex; impaired vision; primary atrophy of the optic nerve, detected with the ophthalmoscope; iridoplegia, in which, while the pupil acts in accommodation, dilating when distant objects are looked at, and contracting when objects are near, it does not respond to the stimulus of light (Dr. Argyll Robertson's test); gastric crises, consisting of violent

griping, or cramp-like pains in the abdomen; sudden flashings or lancinating pains—the so-called lightning pains; constant severe neuralgic pains, attended with cramp-like muscular contractions; local sweating, and various wandering pains and disordered sensations in the limbs.*

All the above symptoms occur in ataxia; but in different cases they meet each other in a great variety of combinations, so that scarcely in any two instances are precisely the same features to be observed.

A remarkable complication of ataxia is that of perforating ulcer, a disease which is met with chiefly in the sole of the foot, and which, commencing on the surface, often under the ball of the great toe, spreads inwards to the deeper structures until in many cases the metatarso-phalangeal and other joints of the toes, or of the tarsus, are reached and destroyed.† This malady will be again referred to.

A general view of Charcot's disease of the joints will be obtained from the following cases, which have been under the care of different members of the staff of St. Bartholomew's Hospital, or which are abridged from Mr. Baker's paper ‡:—

Case 1.—A woman, aged 54, seen in 1883, had disease of the right elbow and both hip joints, with symptoms of advanced tabes dorsalis. The notes state that her illness began about twenty years ago, when she had lightning pains in the legs. These have persisted, and are now more constant and more severe. Soon after, boring pains, as if a hot skewer were thrust into the flesh, set in. At first these were confined to the vicinity of the hip and knee joints, but they now extend to the legs, and occasionally

* For a further account of ataxia, *see* Ormerod, p. 209, *et. seq.*

† *See* a valuable paper by Sir W. Savory and Mr. Butlin, Med. Chir. Trans., vol. lxii. p. 373.

‡ Clinical Society's Trans., vol. xviii. p. 44.

to the body, and are very severe. About the same time she had a sensation of constriction around the waist, thighs, and legs, at first occasional, but now almost constant. Many years ago she had diplopia, and of late her vision has been very defective, and not benefited by glasses. She has *muscæ*, and objects appear very misty. Ataxic symptoms began eighteen years ago. Her feet, from impaired sensation, felt as if "wrapped in something soft." Movements were tremulous, and rapidly became impaired, so that she could only with difficulty walk so short a distance as across the road, and she was obliged to watch her feet. She could not walk or stand in the dark. At present she cannot lie down unless a light is burning in the room. Seventeen years ago she was under Dr. Wilks and Dr. Habershon in Guy's Hospital, and was said to be suffering from paraplegia, having lost motion and sensation in both legs. She has partially recovered from this, but for eight years was unable to use her legs. While in Guy's Hospital she had severe and obstinate vomiting, but no violent abdominal pains.

Present condition.—Patient is anæmic and very debilitated; pupils are small, and do not respond to the stimulus of light, but act during accommodation. She has occasional violent headaches, and neuralgic pains shooting through the lower jaw and temporal region. She has constant pain in the epigastrium, occasionally extremely acute, and at times attended with vomiting, the "crisis" lasting several days. She has also boring and lancinating pains, and a sense of constriction in the abdomen. She has scarcely any power in the lower extremities. Tactile sensation is much impaired. There is no patellar reflex and no ankle clonus. There is sometimes involuntary micturition, sometimes difficulty in micturition and in defæcation; occasionally she has forcing pains in the bladder and rectum. The bowels seldom act without medicine.

Joints.—The right elbow is four and a half inches larger in circumference than the left, and has a roughly globular outline. It is tense and elastic from the presence of effusion. The synovial membrane is considerably thickened. There is grating on movement, and the joint is loose and admits of abnormal motion, both in a lateral and an antero-posterior direction. Motion is unattended with pain. Hard nodules form part of the enlargement, especially on the inner aspect. The joint feels as if scarcely held together at all by ligaments; but the patient is able to bend and extend it almost perfectly, although with creaking and grating. Sometimes there is a momentary lock, but then suddenly the joint surfaces slip again. Sensation is defective in the little, and ulnar side of the ring, finger. The elbow became affected a year ago, after a slight injury. The hips present the same loose, flail-like condition that exists in the elbow. The trochanters lie an inch above the anterior iliac spines; but they can be drawn down to their normal level, retracting, however, when extension is removed. The joints grate on movement. The head and neck of both thigh bones seem to have entirely disappeared. No nodular deposits of bone can be felt. The hip joints have been affected for many years. Like the elbow, they are free from pain. The great toe of the right foot is shorter by an inch than the left. The metatarso-phalangeal joint moves freely, but with distinct grating. Three scars are visible on the toe, left after the healing of three perforating ulcers, which closed three years ago under the influence of rest and stimulating ointment.

Case 2.—A man, aged 56, was admitted in 1884, under Mr. Baker. He had had good health all his life, and denied that he had ever suffered from syphilis. Two years previously he gave his right knee a severe twist. The joint at once began to swell, and he walked with great difficulty.

Three weeks later, though he had kept his bed, the knee was still swollen; but he could bend it and walk without much pain. Three months after the accident he went to a bone setter, who moved the joint about, once a fortnight. He went next to the London Hospital, where the joint was placed on a splint, and enclosed in an indiarubber bandage

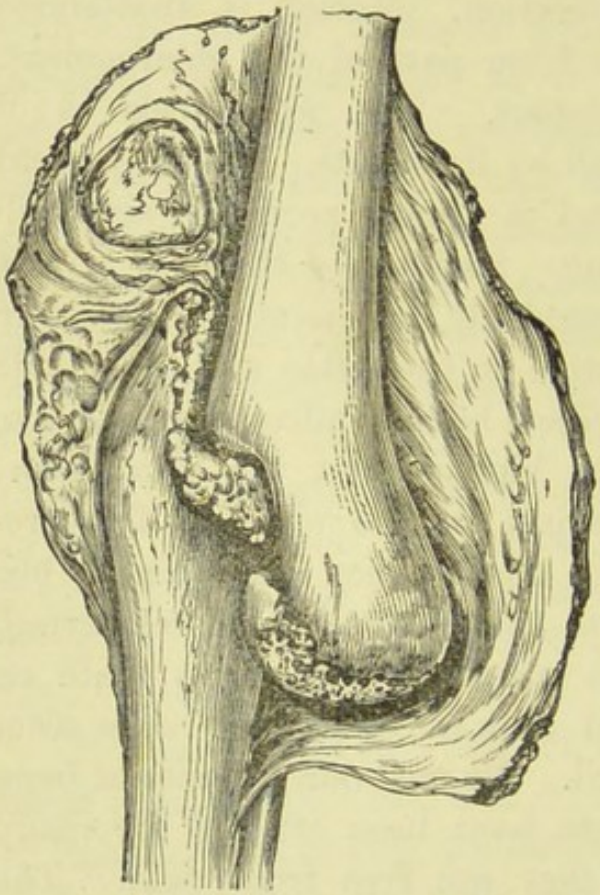

Fig. 10.—Mr. Baker's Case of Charcot's Disease of the Right Knee Joint. (St. Bartholomew's Hospital Museum, No. 691B.)

Present condition.—The right knee is much swollen and distorted, and three inches and a half larger than the left. The internal condyle of the femur, though preserving its normal shape, gives the idea of being enlarged and of projecting downwards and inwards, and not resting at all on the inner half of the head of the tibia, which has apparently been absorbed. The external condyle has almost disappeared, and in its place can be felt a semi-detached rounded nodule of bone, freely movable, and about the size of a walnut. The outer half of the head of the tibia seems to take the place of the wasted external condyle of the femur, and projects about four inches higher than the internal condyle of the femur. The joint is very loose and flail-like, so that the leg can be widely bent outwards and inwards, and also hyper-extended on the thigh. Grating accompanies movement. The patient suffers no pain in the joint. Beneath the right great toe is a small perforating ulcer an inch in

depth. In both legs sensation is impaired. There is no tendon reflex or ankle clonus. The patient has had lightning pains in all parts of his body. The pupils are contracted, and do not act to light; they contract when near objects are looked at. During Mr. Baker's absence from London the great toe was amputated, and the patient died of septicæmia.

On examining the knee, the synovial membrane was found much thickened. The external condyle of the femur (Figs. 10 and 11) had almost disappeared, and was replaced by two nodules of bone, together as large as a chestnut, which were embedded in the thickened synovial membrane. The internal condyle was flattened laterally, and deeply grooved from contact with the head of the tibia. At the back of the condyle was a large bony mass, lodged in a cup-like cavity in the head of the tibia. The inner part of the head of the tibia was completely worn away by the internal condyle of the femur, while the outer side took the place of the lost external femoral condyle (Fig. 10). To such an extent had this change occurred that the line of the tibio-femoral articulation, instead of being nearly horizontal, was almost vertical, while the only part of the bones which could serve as a support in walking was the narrow ridge on the femur, which rested on a corresponding narrow surface of

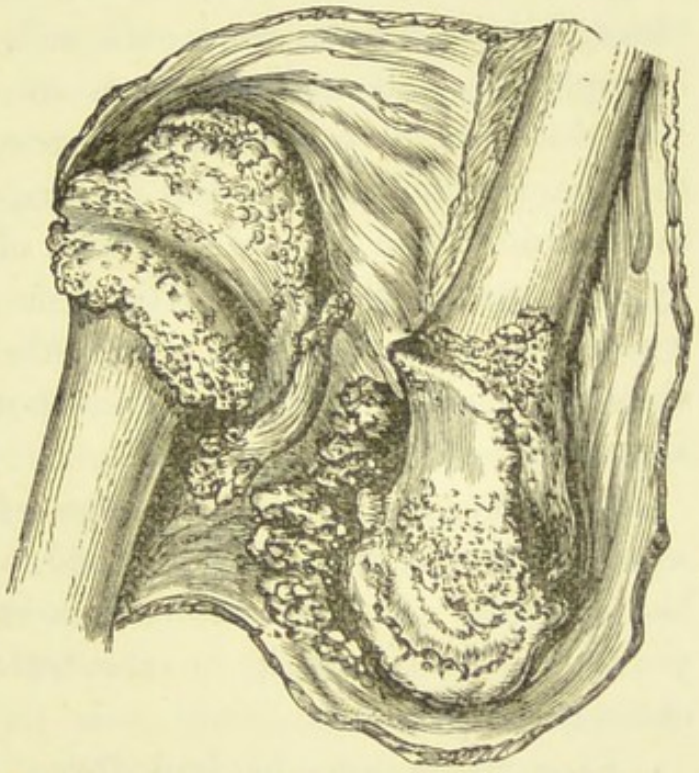

Fig. 11.—Mr. Baker's Case of Charcot's Disease of the Knee Joint. (St. Bartholomew's Hospital Museum, No. 691B.)

the tibia. The bone exposed by the eroding process was, for the most part, smooth and hard, but in places the cancellous tissue was exposed, as in caries (Fig. 11). The cartilage had almost entirely disappeared, but here and there patches were still seen. These had undergone fibrous degeneration. The patella was thickened and irregular, and its cartilage was fibrillated. The synovial membrane presented numerous villous growths: some of these were calcareous, while others were still soft. The development of osteophytes had taken place to a remarkable extent. Nodules were, so to speak, infiltrated in the tissue around the ligamentum patellæ, and in various parts of the synovial membrane. The edge of the head of the tibia was covered by irregular overhanging "lips" or ridges of bone exactly resembling those found in osteo-arthritis. At a distance of about four inches from the joint both the femur and tibia appeared perfectly normal.

Case 3.—Henry G——, aged 42, engine fitter, was admitted under my care in 1885. Twenty years ago he had syphilis. Has always been a hard drinker. Eighteen years ago had a kick on the left knee, from which he entirely recovered.

Five years ago he had three fits, apparently of an epileptiform character. At the same time he suffered from shooting pains in the limbs, and his left knee joint began to be stiff and painful. He soon noticed slight difficulty in walking, especially in the dark, and was a patient in St. Bartholomew's Hospital for some time, suffering from perforating ulcer of each great toe. With these symptoms he also had failure of vision, especially in the right eye. Three years ago he was troubled with frequent nocturnal emissions; these have latterly subsided. Has now but little sexual power.

Present condition.—Looks older than his years.

Eyes.—Pupils react in accommodation, not to light.

Grey atrophy of right disc. Field of vision much contracted in right eye. This eye is colour-blind for red and green, whilst the perception of yellow and blue is impaired. In the left eye there is commencing atrophy of the disc.

Has difficulty in standing or walking with the eyes shut, and staggers in his gait. The great toe joints are anchylosed. The left foot sweats excessively. Slight incoordination in right upper extremity, as evidenced by difficulty in touching his nose when his eyes are shut.

Arms.—Numbness in each little finger.

Thorax
Abdomen } are natural.

Legs.—No tendon reflex. Left knee much enlarged, with great bony outgrowth from inner condyle of femur. Tibia much lipped. Patella enormously increased in size. Much fluid in joint. Shortening of limb half an inch. Movements of joint abnormally free in every direction, and accompanied by much grating and creaking. The joint surfaces are oblique instead of horizontal, the tibia being worn away behind and the femur in front.

On analysis, it is seen that these cases are formed of two elements : disease of the central nervous system, and an affection of the joints. The evidence of disease of the nerve centres varies considerably in different instances, and consists of different combinations of the symptoms enumerated at page 82. Many of these symptoms are frequently absent, and it therefore becomes necessary in any doubtful instance to go carefully through the whole list, and to form a conclusion only when all the phenomena that occur in tabes dorsalis have been passed in review. Unless this is done, there is a risk that the early signs of disease of the spinal cord may be overlooked. The affection of the joints, both in its symptoms and its morbid anatomy, bears so close a resemblance to osteo-arthritis that

many observers have maintained that they are one and the same disease. Thus in Charcot's disease, as in osteo-arthritis, the joints attacked become enlarged, sometimes by succulent thickening of the synovial membrane, sometimes by collections of synovial fluid, mixed with turbid flaky serous exudation. Sometimes peri-articular collections, or cysts, are developed. The articular borders become lipped and the joints may be rendered deformed by the growth of adventitious bone about the articular ends. Grating or creaking is often felt on movement. Probably the knee is most commonly affected, but all the joints, even the small joints of the hand and foot, are liable to be involved. These changes may be attended with considerable pain, and the patient may be unable to use the limb.

It is usually in regard to the joints themselves, only in the later stages of Charcot's disease, that any striking divergence from the symptoms and general course of osteo-arthritis is observed. This divergence, however, is clearly marked when a joint becomes disorganised by the wide destruction of its ligaments, and the articular ends of the bones, and where great deformity and wide displacement of the bones on each other occur; and when, moreover, it is observed that, although such very extensive changes have taken place, the patient still uses the limb, and has but slight pain, or, as is often the case, no pain at all, in the joint. In exceptional instances, however, the early stage is more characteristic. The joint affection beginning suddenly with a large effusion into the synovial cavity, and œdema of the limb, makes such rapid progress, that in the course of five or six weeks the destruction of the articulation and of the adjacent ends of the bones is complete. Thus it is seen that the clinical features observed in Charcot's disease, though they bear originally a close resemblance to those of osteo-arthritis, frequently transcend, both in their ultimate extent and in the rapidity with

which they may be developed, anything that is met with in the latter affection.

Morbid anatomy of the joints.—When the joints are dissected, the appearances disclosed fully explain the clinical aspect of these cases. The synovial membrane is, in the early stage, just as in osteo-arthritis, thickened, and its fringes are enlarged and thickly set with tufts and villous processes. The cartilages, at first the seat of fibrous degeneration, are at length, like the synovial membrane, entirely destroyed, so that no trace, or only a small patch here and there, remains. The ligaments become softened and loosened from their attachments, and then completely disappear. The ends of the bones, as the cartilage is lost, are exposed, and worn down where they are subject to pressure, while around their borders and in other situations, where no pressure takes effect, irregular osteophytic masses are developed. By these changes the remarkable condition shown in Figs. 10 and 11 is produced. However the process of disintegration in Charcot's disease is brought about, it evidently consists of two factors, as in osteo-arthritis : (*a*) excessive waste, amounting in parts exposed to the mechanical agency of pressure and friction to complete wrecking of all the structures concerned, and to such an amount of interstitial disintegration, or degeneration of texture, that spontaneous fracture is by no means rare (Buzzard and Charcot) ; (*b*) hypertrophy and reproduction, leading by the heaping up of new tissue to "lipping," and to the accumulation of irregular masses of ill-formed bone about the confines of the joint. These two elements are observed on a more limited scale in osteo-arthritis (pages 55 *et seq.*), and of the two the degenerative change is usually the most apparent. In Charcot's disease the magnitude which they reach, and the high degree which degeneration and waste attain, are especially to be observed.

In the great majority of instances in which the peculiar

changes met with in a well-marked case of Charcot's disease of the joints are developed, the patient is found to present distinct evidence, when critically examined, of disease of the nervous system (page 82). In other words, the symptoms of ataxia very generally precede or accompany the joint affection. Cases are, however, sometimes met with in which the joint disease is present before any symptom of nerve disorder can be detected. I have lately seen a patient (under the care of Mr. Thomas Smith) who was suffering from an affection of the hip joint which was indistinguishable from advanced Charcot's disease, but who had no symptom whatever of ataxia. It is obviously open to those who believe that Charcot's disease is merely osteo-arthritis to quote this and similar examples (in which all the changes ascribed to Charcot's disease are present, without the slightest evidence of disease of the nervous system), as tending to confirm their view. My own opinion is that this patient will sooner or later become ataxic. This point, however, must remain in doubt. I relate the case in order that all available evidence, whatever its bearing on the subject, may be recorded. It is certainly necessary, without falling into the absurdity of finding Charcot's disease in every case of osteo-arthritis, to be on the watch in obscure examples of disease attacking a single joint—especially if the articulation, although the seat of advancing deformity, is free from pain—for the occurrence of ataxic symptoms.

Treatment.—Under this head there is, unfortunately, very little to say. Not cure, but some palliation only, can be attempted. In the early stage of the disease the same general rules of treatment must be followed as have been laid down for the management of osteo-arthritis (pages 69 *et seq.*). Moderate exercise may be allowed, and warm douching and friction will be of some service. In the later stage, when rapid disorganisation of the joint is going on,

the progress of the disease may be materially checked by complete rest and the use of splints. Indeed, considerable improvement may sometimes be thus secured. In early cases, should there be evidence, or even a suspicion, of constitutional syphilis, iodide of potassium or mercury should be given. If gout or rheumatism is present, it must be treated. A caution must be given against the performance of amputation. If ventured upon, this operation is very likely to be attended by an unfavourable result. Excision is equally to be avoided. In neither case can sound repair be anticipated. For a notice of the disease in the different joints, *see* shoulder, elbow, etc.

For the following valuable note I am indebted to my friend Mr. J. H. Targett.

Joint disease associated with syringomyelia.—The morbid changes in the joints and bones met with in syringomyelia are very similar to those occurring in locomotor ataxy, in spite of the marked differences which exist in the spinal lesions of the two disorders. Syringomyelia is characterised by a destruction of the grey matter of the spinal cord through the development of a gliomatous tissue around the central canal, and by the formation of an elongated, irregularly-shaped cavity in this tissue. The disease is usually situated in the cervico-dorsal region, but it may extend throughout the whole length of the cord. The grey commissure and posterior horns are first affected, then the anterior cornua are involved, and eventually the white matter may become the seat of ascending and descending degenerative changes.

The cardinal symptoms of syringomyelia are altered sensibility, muscular atrophy, and trophic lesions. The sensory symptoms include the impairment or loss of the perception of pain, heat, and cold; but the tactile sense, the muscular sense, and the special senses are preserved. Muscular atrophy is generally observed in the small muscles

of the hand or in the fore-arm, though it may extend to the shoulder and trunk, as in progressive muscular atrophy. Trophic lesions of the integuments, such as bullous eruptions, ulcers, and whitlows are not uncommon, while the effects of disturbed nutrition upon the finger-nails may be very striking.

Articular changes.—The large joints of the upper extremity are those usually affected, which is explained by the fact that the spinal lesion most commonly involves the cervical enlargement and the upper dorsal region of the cord. In 100 examples of arthropathy due to syringomyelia the distribution of the disease was as follows:—shoulder, 32; elbow, 24; wrist, 18; hip, 4; knee, 7; tarsus, 7; and other joints, 8—that is, 74 per cent. for the upper and 18 per cent. for the lower extremity, or in the proportion of four to one. On the other hand, 76 to 80 per cent. of the joints affected in locomotor ataxy belong to the lower extremity. Arthropathy is present in nearly one-third of all the cases of syringomyelia; and of these patients three-fourths of the number are men, which is doubtless due to their greater exposure to accidents and injurious influences by virtue of their employments.

Two forms of joint disease are met with, the hypertrophic and atrophic varieties. In the hypertrophic form the articular surfaces of the bones are deprived of their cartilage and the exposed osseous tissue is worn down; but at the margins of these surfaces the cartilage is much thickened, and the ends of the bones are irregularly enlarged by the formation of many osteophytes. The capsule of the joint is dilated, and thickened by large deposits of bony or calcareous material; its inner surface is beset with polypoid outgrowths of the synovial membrane. These pedunculated bodies may be very abundant and occupy much of the cavity of the joint. Sometimes they become detached and lie free in the joint. Along with the

wearing away of the articular end of the bone there is often a marked production of new bone upon the adjacent part of the shaft, either in the form of exostoses or as a general thickening of the diaphysis by an osteoplastic periostitis. Moreover, the attachments of tendons, ligaments, and fasciæ near the joint are liable to become ossified. In syringomyelia, as in tabes, the bones exhibit a predisposition to spontaneous fractures. When such fractures are intra-capsular, the displacement of the broken ends may lead to extreme deformity of the joint.

The atrophic variety of arthropathy is distinguished by rarefaction of the cancellous tissue and more extensive destruction of the articular extremities of the bones. At the same time there is little or no formation of new osseous tissue. In the shoulder-joint, for example, the glenoid cavity and the neck of the scapula are gradually removed, the head of the humerus is worn away, and the atrophied upper end of the shaft plays upon the root of the coracoid process. In this manner the humerus may be reduced several inches in length. The affected bones are exceptionally smooth and light from wasting. Yet the tendency to ossification in the adjacent ends of muscles, such as the triceps in the case of disease of the shoulder or elbow, may still be present.

Clinical symptoms.—The onset of the disease is often marked by a sudden, rapid, and almost painless effusion into the cavity of the joint, but without redness or heat. There may be a considerable amount of exudation into the soft tissues around the joint which do not pit on pressure, and perhaps œdema of the parts beyond through interference with the venous circulation. By recurrent attacks of swelling, or through persistence of the original effusion, the capsule of the joint becomes relaxed, the ligaments soften, and a subluxation or spontaneous dislocation may speedily take place, especially in the shoulder.

The joint continues to enlarge in the hypertrophic form, osteophytes are developed, and much deformity may result from excessive destruction of the ends of the bones, or from an intracapsular fracture, or a separation of an epiphysis in a young subject.

In consequence of septic absorption through the trophic ulcers in the integuments, the diseased joint in syringomyelia is more liable to suppurate than that of tabes. This complication usually develops in connection with joints of the hand or foot. The bones become carious and necrosed, and a rapid formation of pus takes place. As the condition is unattended with pain, operations for the removal of the sequestra have been performed without an anæsthetic—indeed, in several instances by the patient himself.

The arthropathy of syringomyelia may be distinguished from Charcot's joint disease by its usual localisation in joints of the upper extremities of males, by a greater liability to suppuration, and more particularly by the peculiar sensory, motor, and trophic symptoms already mentioned. Scoliosis of the spinal column, possibly due to arthropathy of the vertebral joints, has been observed in nearly half the cases of syringomyelia, but does not occur in locomotor ataxy.

CHAPTER VIII.

TUBERCULOUS DISEASES OF THE JOINTS.

THE discovery by Professor Koch, in 1878, of the Bacillus Tuberculosis, must always rank as one of the greatest and most far-reaching achievements of pathology. Many had long seen that our conception of the wide group of diseases which passed under the antique names of Scrofula and Struma was derived entirely from their clinical manifestations, and that their true pathology was a mystery. The phenomena observed disclosed a subacute and persistent form of inflammation. This was the result. But behind this inflammatory process there was evidently some hidden cause. It is to Koch we owe the solution of this problem. We now know that these diseases are parasitic, and that their phenomena depend essentially on the inflammatory process which the bacillus tuberculosis sets up in the tissues which are infected by it. Thus the terms Scrofula and Struma are no longer required, for the whole group of diseases to which they were formerly applied are now ranged under the head of Tuberculosis. But, given the bacillus tuberculosis, another factor for the development of the tuberculous process is required. There must be an appropriate or fitting soil. In what this fitness consists is not at present known. In some individuals it is clearly hereditary. In others it is produced by impaired general health; in others, again, by local injury.

The tuberculous process does not originate in ligaments or in cartilage. It commences either in the synovial membrane, or in the articular ends of the bones. The relative frequency with which these two structures are

primarily attacked no doubt varies in the different joints. In the wrist, elbow, and ankle tuberculosis most frequently

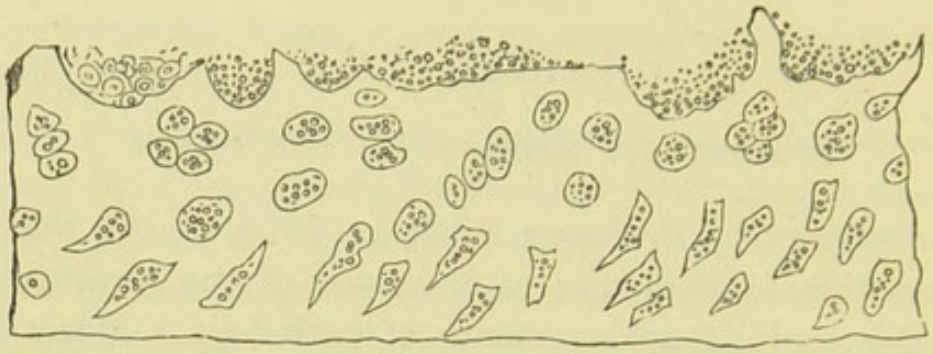

Fig. 12.—Erosion of Articular Cartilage in Tuberculous Joint Disease. (After Billroth.)

starts in the synovial membrane: in the hip, in a large proportion of cases, it begins in the bones (page 385); in the shoulder and knee it begins in the synovial membrane and the bones in about equal proportions. At first only a circumscribed area is involved, and from this primary focus extension occurs till the whole membrane is infected.

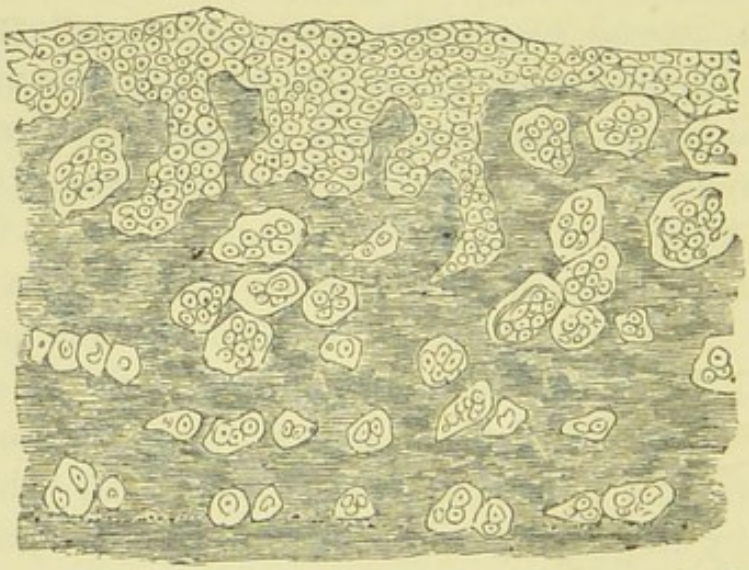

Fig. 13.—Destruction of Cartilage in Tuberculous Disease, extending from the Synovial Membrane. The surface of the cartilage is covered by granulation tissue. (After Billroth.)

This was well shown in the following case: A girl of five was lame, but without obvious cause. On examining her, I

found the hip and knee sound. The ankle on its anterior aspect was absolutely free from swelling, and movement was free and painless. The calf muscles were wasted. On inspecting the joint from behind, the depressions on either side of the tendo Achillis were filled up. Evidently the posterior part of the synovial membrane was the seat of a circumscribed deposit of tubercle. Ultimately the whole membrane became involved.

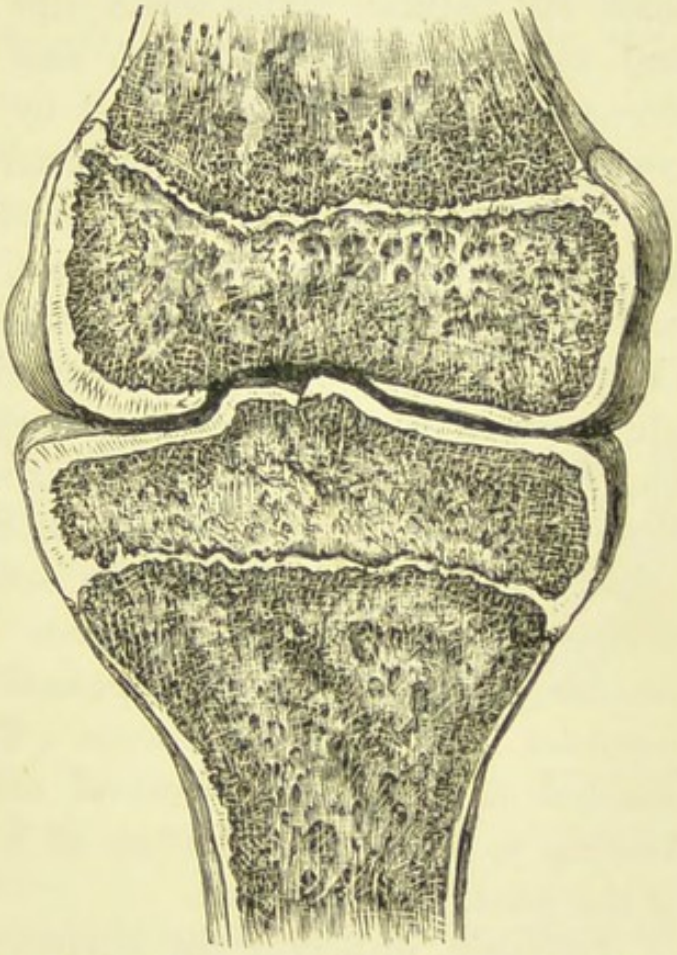

Fig. 14.—Tubercle deposited in the articular Ends of the Femur and Tibia. (From preparation, No. 123, in the Museum of St. Bartholomew's Hospital.)

The swelling caused by tuberculous synovitis of the knee may, at first, be limited to some one part, the rest of the joint appearing healthy. It is very important that this early stage of localised deposit should be detected so that treatment may be commenced at once. It is, however, very easily overlooked. When disease begins in the synovial membrane, this structure becomes swollen and opalescent, and is found on section to be succulent and loaded with exudation products, while its surface loses its smooth appearance, and is gradually changed till it assumes the aspect of granulation tissue. As the disease advances the membrane becomes thickened, soft, and friable, and here and there, both in the membrane itself and in the

sub-synovial tissue, masses of caseous material are present. When once established in the synovial membrane, the inflammatory process soon extends to other structures, so that the articular cartilage, the ligaments, and frequently the ends of the bones also, are involved. The cartilage loses its natural bluish-white tint and polished surface, and assumes a dull yellowish and opaque tint. Wherever its margins are overlapped by vascular synovial processes it undergoes erosion or even complete destruction; or the synovial membrane acquires firm adhesions to its surface, vessels enter its substance, and a number of pits and excavations are formed containing granulation tissue (Figs. 12, 13). These pits, continuing to increase both in number and size, coalesce into large hollows and spaces, and by degrees the bones are entirely denuded; and the ligaments become permeated with newly-formed blood-vessels, and undergo swelling, softening, and partial or complete destruction. The ends of the bones in like manner, as the tuberculous process reaches them, become involved in a rarefying osteitis. Thus, if the mischief is allowed to advance, a general arthritis, involving, and leading to the disorganisation of, all the constituent parts of the joint, is established.

In other instances the inflammatory action originates in a deposit of tubercle in the ends of the bones (Fig. 15), and extends, in the manner described on page 126, to the synovial membrane, cartilage, and ligaments, and, as before, general arthritis is established.

In their clinical aspect tuberculous diseases of the joints constitute a very important group. They are of frequent occurrence; they involve all the principal articulations; they are, with few exceptions, the only affections of the joints, setting aside tumours and the results of injury, which call for such proceedings as amputation and excision; they are attended, in many instances, with

severe and prolonged suffering; they often leave the patient crippled for life; they may even lead to a fatal result. But there is a further ground on which these diseases claim careful attention. The estimate that is often formed of them is derived partly from tradition, and partly from what is seen in the wards and out-patient rooms of hospitals, where children are still to be met with whose joints have undergone complete disorganisation, and who are worn out with pain and long-continued suppuration. Such cases as these, however, convey a highly exaggerated impression of the intractable nature of these affections. It must be remembered that a disease of inflammatory character is very much what it is allowed to become, and the instances I have referred to reach the destructive stage which they ultimately attain only because they have been left to drift from bad to worse. In their incipient period these affections are, to a degree which some appear unable to credit, amenable to the influence of appropriate treatment. Take, for example, a case of tuberculous disease of the hip joint. In its first stage, that is, in the first month or two of its progress, this affection is merely a subacute, slowly developing inflammation, which is undoubtedly obstinate and prone to relapse, but which, on the other hand, if it is met with adequate treatment, will gradually subside without producing

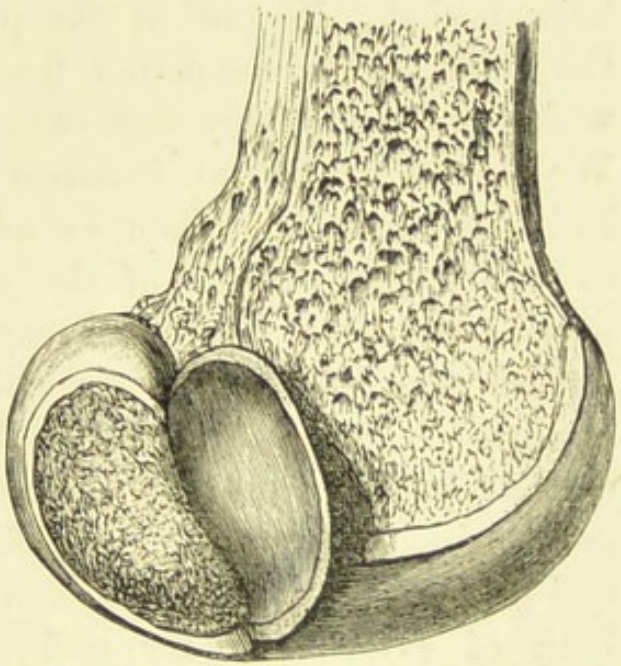

Fig. 15.—Cartilage eroded on its Deep Aspect and detached from the subjacent Bone. (From specimen, No. 583, in the Museum of St. Bartholomew's Hospital.)

deformity, often without involving loss of movement, and very generally without leading to suppuration; while, should suppuration occur, it may be remedial rather than destructive (page 418). Now it is much more important to recognise the fact that these tuberculous affections are curable in their early stage than it is to dwell on the destructive changes to which they give rise at a later period. No one at the present day would estimate the gravity of a compound fracture by taking a case in which all the necessary steps of treatment had been withheld. We should turn to an instance in which adequate means had been applied. When we adopt this course in respect to tuberculous diseases of the joints we are led to entertain a very much more favourable opinion than is usually formed regarding them. As obstinate local inflammations, tending to relapse, they call for the application, at the earliest possible moment after they are detected, of two great principles of treatment; first, that of long-continued and perfect rest, which will secure them against the effects both of external injury and of reflex muscular spasm (page 263); and, secondly, the prevention of deformity by the aid of some adequate form of mechanical support. When these two conditions are fulfilled, and when patients are placed in favourable circumstances as to air and food, and are treated with cod-liver oil and other tonics, recovery, with complete restoration of the functions of the joint is, in a large proportion of instances, simply a matter of time.

It would be unreasonable, as well as futile, to deny that this long expenditure of time is a serious element. It is distressing to parents to keep a child at rest in the horizontal position for the six, twelve, or, as it may be, eighteen months that are required for the cure of incipient hip disease; or to continue the use of splints for a knee or elbow joint for a similar time. All this may at once be allowed; but the

proposition I am anxious to enforce is, that if this care can be taken, and this penalty paid, a cure is generally assured. There are very few parents who, when the choice is laid before them, will hesitate to carry out this treatment, tedious and difficult though it be, in order that their child may escape the suffering and life-long injury and incapacity that must ensue if the case is allowed to take its course. I remember a case in point. Mrs. G. had spent two distressing years in nursing her boy, who had drifted into incurable disease of his hip joint, and who at length died of lardaceous disease. Six months later it was found that her girl of five had incipient hip disease. Laying her former experience to heart, she carried out the treatment by rest and extension, which was recommended to her, with the most critical care and with unwearied assiduity, for eighteen months, with the result that the child made a complete recovery. The objection to the treatment of these cases by long periods of rest which many entertain, namely, that it is prejudicial to the general health, has been greatly exaggerated. There is abundant evidence to show that mere confinement to the horizontal position has, in itself, no seriously prejudicial influence on the patient's health. As a rule, there can be no doubt whatever that children, whose health has not been already injured by the presence of local disease, will remain, although they are kept at rest, perfectly well, with good colour and good appetite. They will grow rapidly, sleep well, and, possessing as children do a great power of adapting themselves to circumstances, will be contented and cheerful. Often, instead of wasting and growing pale, they gain flesh and colour ; especially is this the case when the treatment by rest relieves them of pain in a large joint. I have known many children who, having chronic hip disease, have been kept in the horizontal position for upwards of two years, and who have maintained perfect health for the whole period, and have subsequently borne

no trace whatever of confinement. At the Alexandra Hospital for Hip Disease it is easy, by their appearance, to point out which of the patients have been recently admitted and which have been longest in bed; for the former are pale and wasted, as the result of the pain and loss of sleep which the disease has entailed, while those who have been in the horizontal position for a twelvemonth, and in whom the disease has subsided, are well nourished and rosy.

A point of great importance, in respect to these chronic inflammatory affections, is that the tendency to their development is transitory in all but the worst cases. Many children who, when they are between three and eight, develop various tuberculous inflammations, appear, as time goes on, to pass into an entirely different condition of health. They recover from the lesions with which they have been suffering, and subsequently continue perfectly well. This change from liability to immunity (of the exact nature of which, however, we as yet know nothing) may depend either on the acquisition on the part of the tissues of an increased power of resistance, or on the disappearance of those qualities, in whatever they may consist, which constitute fitness of soil. Bearing this clinical fact in mind, it is evident that the course to pursue is to treat these diseases diligently and persistently, so as steadily to oppose their advance, and in the case of the joints to be studiously careful to prevent the occurrence of deformity. For if, in the period during which the tendency to tuberculous inflammations, with the various complications by which they are followed, exists, we are able to avert any results that lead to permanent injury of the joint, we may confidently look forward to the time when the tendency to disease will give place to an equally marked tendency to repair. That this ultimate tendency to repair is the key to treatment, and that we may depend upon it, is shown by numerous cases in which, even though

disease has reached an advanced stage and has led to suppuration, recovery, often unassisted by treatment, has at length taken place. These are the instances in which a hip joint is found firmly anchylosed, though, as the numerous cicatrices show, many abscesses have been developed, and though great deformity has resulted: or in which Pott's disease of the spine, after advancing to the stage of extensive angular deformity, has been followed by recovery: or in which, again, all disease has ceased in a knee joint after, unhappily for the future of the limb, irremediable deformity has been allowed to take place. It must always be a matter of regret that the efficacy of repair in these instances has been so largely discounted by the deformity which has been allowed to supervene, and that, though the patient has recovered from a serious local disease, he remains crippled for life.

Like many other forms of tuberculosis, affections of the joints most frequently occur between the ages of three and nine. A very large proportion of the patients admitted into the Hospital for Sick Children, and the Alexandra Hospital, with hip disease have been attacked before they were six. The most common period of all is between the ages of three and five. As age increases, the frequency with which these affections make their appearance steadily declines. They may, however, be developed at any period of life. In the last few years I have met with several instances of well-marked tuberculous disease of the joints in patients of middle age; while in elderly persons these affections are by no means very rare. (*See* under Senile Tuberculosis, page 120.)

The impression, which has long been current, that tuberculous disease often follows local injury, such as a blow or a severe jar, is, no doubt, correct. And the explanation is that when tissues have been injured, and especially when they have become the seat of inflammatory

exudation, they offer a very favourable soil for the growth of the bacillus tuberculosis. In the same way, and equally because the power of resistance of the tissues is diminished, tuberculous disease is apt to follow the exanthemata, particularly measles and scarlet fever.

Frequently, however, it is developed in cases in which there has been no previous attack of illness, and in which no local injury has occurred; thus, to give a clear example, a child may be attacked with disease of one hip joint when he has been kept at rest for five or six months for disease of the other hip, or of the spine.

Symptoms of tuberculous disease of the joints.—The general conception to be formed of these tuberculous affections of the joints is that they are examples of sub-acute inflammation, beginning, and in all their earlier periods progressing, so insidiously that they are apt to make considerable advance before they are detected. Their symptoms are so slight, and so wanting in any specific feature, that parents, and sometimes even surgeons, are apt entirely to misunderstand their significance. Slight and intermittent lameness, scarcely interfering with free exercise; occasional pain, ascribed by the mother to rheumatism or growing pains, or put aside as a mere whim; disturbed and uneasy sleep, with twice or three times in the night a faint cry or whimper, thought to be a nightmare—these are often the only symptoms in the first two or three months of an affection which, unless recognised early and very pertinaciously treated, will tend to develop into such a formidable condition as advanced disease of the hip or of the knee joint.

Lameness.—Lameness in the lower, or impaired movement in the upper, extremity is an early symptom which must never be left without investigation. Sometimes it is constant and obvious, and the child is seen at a glance to be lame; or it is noticed, in the case of the upper

extremity, that the patient uses the limb in a peculiar manner for lifting objects, or for feeding himself, which on closer observation is found to be due to stiffness or tenderness of one of his joints. In other cases this lameness or impaired movement is only occasionally seen, when the child first gets up in the morning, or after a long walk, or after he has been about all day: while at other times movement is natural, and he runs about as freely as ever, and without any visible defect. There is nothing whatever that is characteristic of tuberculous disease in this symptom of lameness, and it may be difficult at first sight to determine which joint is affected; but its mere existence must lead to a full search into its cause.

Pain.—The amount of pain, and the period at which it is developed, present wide differences in different cases. In some instances, particularly in the hip, pain is from the first considerable and persistent, is increased by exercise, and leads to night screaming, a symptom which cannot fail to excite apprehension. In other cases mothers and nurses are entirely misled by the complete absence of pain. Many a parent, when told that her child has disease of the hip or knee, will dispute the diagnosis on the ground that the child has had no pain. It cannot, however, be too clearly stated that pain is no essential characteristic of either the commencement or the subsequent progress of tuberculous disease; and I have often seen children with advanced disease of these joints walking on the limb, without, as the mothers stated, any complaint even of uneasiness. Cases in which it was found that advanced joint disease was present, although no pain had ever been complained of, are mentioned at pages 143 *et seq.*

Swelling.—In all the joints except the shoulder and the hip, which are so deeply covered with soft parts that (unless it is considerable) it cannot be detected, swelling is a very important symptom, for it is almost invariably present,

even in the earliest stage. It may be very slight, and only to be detected after very careful comparison (by inspection and measurement) of the suspected with the corresponding sound joint. In the knee, a slight fulness or puffiness at the sides of the ligamentum patellæ, or in the elbow, at the back of the joint on either side of the triceps tendon, is often the only distinct evidence that can be obtained that disease is really present. A few months ago, a boy, aged five, was brought to the out-patient room because he sometimes walked lame. I examined him very carefully for disease of the hip, knee, and ankle, but all these joints moved with normal freedom and without pain. Suspecting that the case might be one of Pott's disease, or of anterior polio-myelitis with slight loss of muscular power, I placed the boy on a chair in a good light, in order to examine his spine. I then saw that there was swelling of the synovial membrane of the ankle on each side of the tendo Achillis, giving the joint the appearance of increased width as seen from behind. On further investigation there was no doubt that the case was one of tuberculous disease of the ankle joint.

Defective movement.—Here, again, is a symptom of the greatest value. Impaired movement is, in fact, the symptom which is, on the whole, the most constant and the most trustworthy. Its value in the case of the different joints is alluded to in the special sections, "Hip," "Knee," etc. It is most marked in the shoulder and the hip. In the disease of these joints it is absent only in very exceptional cases. It is least apparent in the wrist and the ankle; yet even here, when movement is tested at its extreme ranges, some defect will almost invariably be detected. In short, if a joint moves with perfect ease and freedom, it is very nearly safe to conclude that it is not the seat of even incipient disease. This proposition, however, must not be taken as absolute. (*See* page 397.) Nor must it, in the presence of other

symptoms, induce us to omit the further examination of the case after the lapse of a few days more. I saw a girl, aged 9, at the Hospital for Sick Children, who, her mother said, was occasionally slightly lame. I very carefully examined her limb and could not detect anything amiss. A fortnight later, however, I found the hip joint completely stiff, and there was appreciable muscular wasting: clearly hip disease was present. It must also be remembered that if a child who has incipient joint disease is kept for a few days at complete rest, especially if a weight has been applied to the limb, every trace of stiffness may for a time disappear, and in these circumstances the affection may easily be overlooked. A caution must here be given against the practice, sometimes recommended, of using an anæsthetic during the examination of a timid or fractious child for supposed joint disease; for, with the relaxation of the muscles, both the abnormal position of the limb and the limitation of movement at the joint—the two clearest symptoms—will be removed, and a case whose true nature might with a little tact have been correctly ascertained will probably be overlooked.

Muscular wasting.—This symptom is developed in very different degrees in different cases. It is, however, always a very important evidence of disease, and one that is very rarely, if ever, absent when a tuberculous joint-affection has become established. It may be detected by comparing the circumferential measurement of the suspected with that of the sound limb at exactly the same level. But further, even though this measurement is the same on the two sides, wasting may sometimes be recognised by the flabby condition of the muscles in the neighbourhood of the affected joint. Particular groups of muscles are especially affected in the case of the different joints. In disease of the shoulder joint the surrounding scapular muscles which act on the humerus are involved, the deltoid is flattened, and

the supra- and infra-spinatus muscles are wasted; so that the whole shoulder looks flattened and shrunken in comparison with its fellow. When the elbow is affected it is mainly the muscles of the arm that waste; in the wrist it is chiefly those of the fore-arm, particularly the extensors, and the supinator longus; in the hip the glutei are wasted, so that the gluteal region is flattened and the gluteal fold lost. But atrophy is also very clearly marked in the muscles of the thigh, and may be detected by measurement of the two limbs at the same level, without an exposure which would be painfully annoying to a female patient. In disease of the knee the quadriceps extensor group is chiefly affected, while in the ankle the muscles of the calf are mainly involved. It must be borne in mind that this symptom of muscular wasting, like others that have to be considered in the diagnosis of joint disease, has, taken alone, no diagnostic value. It is a condition met with in many other affections: *e.g.* wasting of the muscles of the calf is found, not only in disease of the ankle, but in infantile paralysis, in flat foot, in congenital dislocation of the hip, etc. It must therefore only be taken as evidence that something is wrong, and must induce the surgeon to undertake a complete investigation of the case. This symptom is of value in affording some measure of the severity of the joint affection with which it is associated. When it is considerable and has been rapidly developed it indicates grave disease; when it is slight, notwithstanding that the joint has been some time affected, it is evidence that the disease has not assumed a severe form.

Treatment.—In discussing the natural history of tuberculosis, allusion has already been made to the paramount influence of local rest in controlling the advance of the disease, and averting the evils to which it so frequently leads. But I must venture on some repetition here while

referring to the general question of treatment. For many years I have had opportunities of carefully studying the treatment of tuberculous diseases of the joints, and I have been led more and more strongly to the opinion, so forcibly held by Brodie, Hilton, and Paget, that by far the most valuable agent is complete and long-continued rest.

Rest, to be efficient, must be as far as possible absolute, so that the joint is never moved. Obviously, the earlier in the case that rest is secured, the shorter will be the period during which it is required, and the better the ultimate result. The full truth as to the recovery of joints from tuberculous disease has been obscured by the fact that, in the first place, rest is often but very imperfectly maintained, and too soon abandoned; and, secondly, that disease is generally allowed to make considerable progress before the case is seriously taken in hand. Parents do not at first realise its gravity, and surgeons are sometimes perhaps not sufficiently emphatic in the directions which they lay down, nor always very firm believers in the efficacy of this kind of treatment. Moreover, as I have mentioned above, the very general feeling is that two material drawbacks are attached to this method. First, that the patient's health will suffer from confinement; and, secondly, that, if a joint is kept for any long period in splints, it will become stiff. Neither of these objections is valid. I have alluded to the first at page 103, and therefore need only say that a child who is suffering merely from tuberculous disease of a hip or knee joint which has not been allowed to advance beyond the early stage will remain perfectly well, although confined to the horizontal posture for so long a period as six months, or even a year or more. Children with advanced and neglected joint disease are wasted and pale from the pain they have long been suffering, and from the drain involved by chronic suppuration. This is equally the case whether they are allowed to be up and limping

about as best they can, or are confined to bed without the necessary means for arresting the local mischief which is telling so seriously upon them. In such cases the result of placing the patient at complete rest, and adapting the necessary apparatus to the joint, is a rapid improvement of both the joint and the general health.

Secondly, as to stiffness. The doctrine that if a joint is kept in a fixed position it will thereby be rendered stiff, I regard as completely erroneous. I am convinced that no joint ever undergoes anchylosis merely because it is kept at rest. On the contrary, to maintain rest is often the only way in which future movement can be secured. Stiffness results from inflammation, and is due either to muscular contraction, produced by reflex irritation, or to the organisation of the products of exudation. To prevent it, therefore, the proper course is to arrest the inflammatory process. When this is done, it will be found, in the great majority of cases, that, as inflammation subsides, movement previously lost is regained, and the old saying is once more illustrated, *causâ sublatâ tollitur effectus.* In some instances, however (alluded to at page 143), the inflammatory process assumes from the first a plastic form. In these cases stiffness will ensue whether the joint is left to itself or whether splints are applied.

In cases that have been allowed to reach an advanced stage there is still much to be done by prolonged rest, but here two additional elements are introduced. These are the occurrence of deformity and the development of suppuration. Deformity may be due (*a*) merely to posture, as when the thigh, in hip disease, becomes flexed and adducted, and when secondary distortion ensues, in the form of lordosis and apparent shortening (page 391); or (*b*) it may depend either on destruction of bone, as when the head of the femur and the upper border of the acetabulum are absorbed, and the

trochanter is drawn up on the dorsum ilii, so as to be considerably above Nélaton's line; or on displacement of the ends of the bones forming the joint, as when, in disease of the knee, the head of the tibia travels backwards and outwards towards the popliteal space. In the former case (*a*) the distortion may generally be removed; in the latter (*b*) this may be impracticable; but even then the patient may recover with a very serviceable limb. As to the treatment of suppuration, pus must be evacuated at once (page 420), with, however, this essential proviso, that the most scrupulous care is taken to prevent septic infection. In no department of surgery has the introduction of asepsis effected a more complete change than in the treatment of tuberculous diseases of the joints. The wide destruction which formerly was so common did not, it must be remembered, depend upon the mere tuberculous process itself. It was due to the fact that an entirely different element was introduced, the element, namely, of sepsis. It was by this, and by this alone, that all the more grave results were produced. Now that it can be excluded, the dangers of tuberculous joint affections have, it is not too much to say, been reduced by, at the least, seventy-five per cent. The method of opening abscesses is described at page 420. The effect on the progress of the disease which follows the removal of pus is also pointed out.

When the affection has reached the stage of disorganisation of the joint, or of extensive caries of the articular ends of the bones, attended with suppuration of long standing, rest, the provision of free drainage, the scraping of sinuses, and attention to the general health, may still, if thoroughly carried out, lead to repair; but in many instances it will be found that no improvement is taking place, and that some further means are called for. In such cases the question of performing arthrectomy or excision must be considered. As the grounds for resorting to either

of these operations are fully discussed in later chapters, at pages 313 and 334, they need not be stated here.

Complications.—The principal complications of tuberculous joint disease are phthisis, acute general tuberculosis, and lardaceous disease of the internal organs.

Phthisis.—It is worthy of remark that patients suffering with tuberculous disease of the joints are little liable to phthisis. This fact, which may be observed in the case of the other joints, is especially obvious in the instance of hip disease. At the Alexandra Hospital, where there are always between sixty and seventy children under treatment for hip disease, and where the subsequent history of the cases is, as far as possible, traced out, phthisis is so rare that sometimes a year passes without the development of more than two or three examples of it.

Acute general tuberculosis.—Acute general tuberculosis, often declaring itself by the onset of tuberculous meningitis, may arise during any period of the joint affection. In some instances it has occurred within three months of the commencement of the local disease; in others a year, or even two years, after the joint affection has apparently entirely subsided; and it may occur not only when the local disease is severe and attended with suppuration, but also when the local disease is slight and when no suppuration has taken place.

Cases of meningitis present considerable variety in their method of onset, the symptoms developed, and the period over which the affection extends before the fatal termination is reached. The symptoms that usually mark its commencement are (*a*) sickness, occurring not only after food has been taken, but spontaneously, when the stomach is empty, and especially when the child wakes in the morning, or after sleep during the day. This sickness often extends over two or three days before any other symptom is present; after the third or fourth day it usually ceases;

(*b*) a slow, irregular, and intermittent pulse, of not more sometimes than 60: (*c*) headache, which may be very severe, with intolerance of light, and restlessness, alternating with, and soon followed by, drowsiness; (*d*) obstinate constipation, and marked retraction of the abdomen; (*e*) squint, and, more rarely, irregularity of the pupils; (*f*) moaning, or calling out during sleep. A very important point is that, in the early stage, and when the difficulty is to distinguish between meningitis and some other intercurrent disease, the temperature, if the case is one of meningitis, will be found to be very slightly raised. Should the temperature be as high as 102°, the probability is that the sickness, headache, and restlessness from which the child is suffering are not dependent on meningitis. Instances, however, in which the temperature is considerably raised are occasionally met with. In some cases the disease comes on very rapidly, with constant sickness, intense headache, great drowsiness, flushing of the face, and convulsions. In other cases the early symptoms are very deceptive. The child may make no complaint about his head, and his mental faculties may be entirely undisturbed. In one case, a little girl was joining in a children's service and singing hymns with the other patients within five hours of her death, from constant and severe convulsions, due, as post-mortem examination showed, to acute meningitis. In another, the chief symptom, for four days, was such severe and uncontrollable vomiting that the child was believed to be suffering from acute intestinal obstruction. The child was perfectly sensible, and presented no symptom in any way pointing to intra-cranial mischief.

The symptoms that should especially rouse suspicion are headache; sickness unprovoked by food; slow, irregular, or intermittent pulse; and drowsiness or restlessness, together with the absence of any marked rise of temperature. It may be useful to mention that I have met with three cases in

which the symptoms of meningitis followed immediately on the administration of chloroform given when an abscess resulting from hip disease was to be opened. In one of these the child never became fully conscious, but passed from the sleep produced by the chloroform into a drowsy condition, soon followed by other distinct signs of meningitis. In another, sickness persisted for forty-eight hours, and, having at first been ascribed to chloroform, then proved to be the earliest symptom of the meningeal attack. It seems probable that in both these instances brain mischief was close at hand before the anæsthetic was administered, and that the symptoms were merely precipitated by the disturbance of the circulation due to its use.

Once declared, meningitis runs a variable course. It may extend over from a few hours to three weeks, or even longer. In the majority of instances death occurs in from ten to sixteen days. The child becomes more and more drowsy, and is soon completely unconscious; sickness usually subsides after the first two or three days; the pulse may still be slow and irregular, or may become more rapid again. Squint, irregularity of the pupils, and convulsions come on; headache may either subside, or continue to be very severe. Paralysis, either of an arm, or a leg, or of one side (often combined with rigidity), or of the parts supplied by some of the cerebral nerves, as the third, or the sixth, may be detected. The face is flushed and dusky, the eyes are half-open, the conjunctiva is insensible, and the pupils are fixed. Death may ensue from convulsions, or the child may linger on in a state of unconsciousness for many days, until at length exhaustion leads to a fatal termination.

The *treatment* of tuberculous meningitis may, unhappily, be summed up in a very few words. All that can be done is to endeavour to relieve the pain in the head and the convulsions by giving full doses of bromide of potassium; ten

grains every six or eight hours may be prescribed for a child of six or seven. A few drops of chloroform may be inhaled when convulsions are severe. Mercury, given internally, or by inunction, formerly much resorted to, must be regarded as useless, as must also iodide of potassium. I have in former years seen leeches applied, but not with permanent benefit. Nothing is gained by determined attempts to make the bowels act. Medicines given for this purpose often have no other effect than to increase the sickness, and so to interfere with the administration of food.

Lardaceous degeneration of the liver, spleen, kidneys, and intestines may occur as the result of continued or profuse suppuration. The amount of suppuration, however, required to produce it varies very much in different cases. In some patients it ensues when discharge has been going on for only two or three months, and when the drain of pus has never been great. In other cases it comes on only when profuse suppuration has existed for two or three years, or even for a still longer period. I have, indeed, known it to be still absent although suppuration has been going on for twenty years. In view of this uncertainty, a careful watch should be kept in all cases of chronic discharge. Lardaceous degeneration is declared by enlargement of the liver and spleen, or of either of these organs, or by the appearance of albumin in the urine. It is attended by gradually increasing pallor, an opaque waxy complexion, and in the later stages by general anasarca. It sometimes gives rise, by involving the mucous membrane of the intestine, to diarrhœa, which it is found extremely difficult to check. In the early period of lardaceous disease the urine contains only a small amount of albumin, and preserves its normal specific gravity, showing that the excretion of urea is not interfered with. Gradually, however, with an increase of albumin there is diminution of urea and a fall in the specific gravity to 1012°, or even to a lower point. At first, this lardaceous change may, if

suppuration can be arrested, be entirely repaired, so that the liver and spleen return to their normal size, and albumin disappears from the urine. The presence of lardaceous disease in its early stage is no bar to operative interference, even although the urine may contain a considerable amount of albumin. Indeed, when, in any case of continued suppuration, lardaceous disease is found to have set in, the possibility of diminishing the quantity of discharge by operative interference should be fully considered. The removal of sequestra, the scraping out of deep sinuses, the provision of more efficient drainage, or, in carefully selected cases, the performance of arthrectomy, excision, or amputation (*see* under these headings, pages 313, 334, 425), may be followed by complete recovery. In the latter stages, however, when the liver has long been considerably enlarged, when the urine contains from a quarter to a third or more of albumin on coagulation and settlement, and when its specific gravity is habitually low, and especially when ascites, or general œdema (first noticeable in the eyelids and scrotum), or persistent diarrhœa, is present, any considerable operation is attended with a largely increased risk; and the healing of any wound that is made will be very tedious. Still, even in these very unfavourable instances, the removal of a sequestrum, or the provision of free drainage, may be followed by considerable improvement.

Adult tuberculosis.—The foregoing description of tuberculosis refers to the disease as it occurs in the young. It must, however, be remembered that tuberculous joint disease, though less common than in childhood, is not rare in persons of middle age and even in advanced life. In the last few years I have seen several cases in which the different joints, including the knee and the hip, have been attacked in persons between forty and sixty-five. The following was one of the most typical:—A patient, aged 55, complained of pain in her hip and

knee, and of difficulty in straightening the limb. She was believed to have rheumatism, for which medicines were prescribed. Her pain soon became so severe that she could not lie in bed, but passed her nights in a chair. Two months later, when I first saw her, she was in great pain, especially on the slightest movement of the hip, and she suffered with severe startings of the limb. On examination, the joint was found to be flexed nearly to a right angle, and fixed; the muscles were wasted, and an abscess had formed under the tensor fasciæ femoris. The abscess was opened aseptically, but suppuration became free; and the evening temperature was 102° to 103°. She quickly lost flesh, had repeated attacks of hæmoptysis, and, nine months later, died of tuberculous phthisis.

The prognosis in tuberculous disease of the joints in patients over thirty is very unfavourable. Suppuration is likely to occur, and the disease shows an obstinate tendency to advance. In two cases of hip disease the patients, a man of 48 and a woman of 56, died of exhaustion, following profuse suppuration; in a third the acetabulum was perforated, and a large abscess burst into the rectum. In three cases of disease of the knee suppuration occurred, and amputation had to be performed. Indeed, recovery, when either the hip or the knee is attacked in patients between thirty and sixty-five, very rarely takes place.

Many of the cases, especially those involving the knee, have illustrated a point of great clinical importance—namely, that in its early stage tuberculous joint disease so closely resembles osteo-arthritis that the differential diagnosis is extremely difficult; in fact, in the first few weeks impossible. The disease commences with slight pain, stiffness, and synovial swelling, limited effusion, and creaking of the synovial fringes on movement (page 443). There is very slight surface heat. The disease at first advances slowly, and there is little tendency to flexion. The degree

of muscular wasting corresponds with that usually present in osteo-arthritis. In some instances the presence of tuberculous disease of the lungs, or a history of hæmoptysis has indicated the probable nature of the joint affection. In others this has been disclosed by further thickening of the synovial membrane, and the occurrence of night startings, rise of temperature, and loss of general health.

Senile tuberculosis of the joints.—Sir James Paget, in his "Clinical Lectures and Essays,"* has a chapter on Senile Scrofula, in which he expresses his belief that the old (that is, people over sixty) are more often scrofulous than those between thirty and fifty, and certainly are more often so than they are generally supposed to be. "The evidences of scrofula in the old are not only in certain diseases of internal organs to which a scrofulous origin may be probably assigned, but in the diseases of the lymph glands, bones, joints, the spine, the testicles, and other structures which appear to be the 'seats of election' of scrofula in the young. There is not one of these structures in which I have not seen, within the last few years, instances of scrofulous disease in people more than sixty years old. The cases appear equally frequent in private and hospital practice, and no period of life is too far advanced for them. Some of the most marked have been in patients over seventy-five; one of them was in a patient ninety-one years old."

In the following account I shall, in accordance with present pathological knowledge, substitute the name senile tuberculosis for that of senile scrofula. This affection of the joints is still apt to be overlooked and (at least in its early stage, when treatment is so important) to be mistaken for some much less serious condition, such as slight rheumatism, that will soon pass off. I shall, therefore, offer some illustrations of the disease, and relate my experience of the cases that have come under my notice. But the reader

* 2nd edit., p. 344.

should not fail to consult Sir J. Paget's original paper on the subject.

Case 1.—In the museum of the College of Surgeons is a specimen * thus described in the Catalogue :—"A hip joint in which, after the head and upper part of the neck of the femur had been destroyed by ulceration, the shaft was drawn up, so that the remains of the neck rest upon the ilium just above the brim of the acetabulum. The capsular ligament has been removed ; the acetabulum is filled with fibrous tissue. The walls of the femur are very thin and light. From a woman of 70. Ten years before her death she had an apparently scrofulous affection of her hip. Abscesses, communicating with the joint, opened in the groin, and ultimately the limb became much everted and shortened. The parts, however, ultimately healed. The patient died of apoplexy. After death her lungs and liver were found tuberculous." Short as this description is, it presents us with all the features of an ordinary case of tuberculous hip disease in a child of five or six, and the preparation is similar in all respects to many specimens of cured hip disease in young subjects.

Case 2.—Four years ago a patient came to the out-patients' room at St. Bartholomew's Hospital for advice about her wrist. She was 62. Nine months before she had sprained the joint while she was wringing a wet cloth. This injury, though she thought very little of it at the time, was followed by stiffness and swelling of the wrist, and by a sense of fulness and uneasiness, especially at night. Within two months of the accident, swelling was very considerable, and she could not use her hand, and very soon the wrist "dropped," so that she was obliged to support it with the other hand. A fortnight later an abscess formed beneath the extensor tendons and soon burst. The process of suppuration continued, and the joint gradually

* Path. Cat., No. 1992.

became disorganised. When I saw the patient the wrist presented exactly the appearance met with in advanced tuberculous disease of the joint in a young subject. The wrist was enlarged; there were three sinuses bounded by protruding granulations and discharging thin flaky pus. A probe introduced, entered the carpal joints in several directions, and everywhere came into contact with carious bone. The joint allowed abnormally free lateral movement. The limb was subsequently amputated. On dissection, it was found that the synovial membrane was pulpy and extensively ulcerated, the ligaments were destroyed, and many of the carpal bones were necrosed and quite loose.

Case 3.—I lately saw a man, aged 67, who (together with epididymitis, ending in abscess which continued to discharge thin cheesy pus for several months) had disease of his left elbow corresponding closely with tuberculous disease in a child of eight or nine. There were the same indolent, almost painless swelling, slow suppuration and formation of sinuses; the same muscular wasting of the fore-arm, and at last the same looseness of the joint, owing to destruction of the ligaments, allowing of free lateral movement. During movement free grating was detected. The patient declined operative interference, and I lost sight of him.

Fig. 16 shows extensive tuberculous disease of the wrist joint, in a man of 65. The disease had been in progress for many months.

A main feature of this group of cases is their tendency to go on from bad to worse. This is due, in part, to the fact that their real nature is often at first overlooked, so that the necessary treatment is not brought to bear sufficiently early; but, even when the disease is recognised while it is still incipient, and all that is possible is done to arrest its progress, it still, in many instances, continues to

advance, or, at the best, admits of only very slow recovery. The tissues, in fact, are already senile, and their powers of repair are to a great degree exhausted. The tendency to advance is much more marked in tuberculosis of the old than it is when the disease occurs in the young. I have seen some instances in the old in which the affection has, in so short a period as three months, gone on to suppuration and the complete disorganisation of the joint—changes that in young subjects may never take place at all, or may result only after years of neglect.

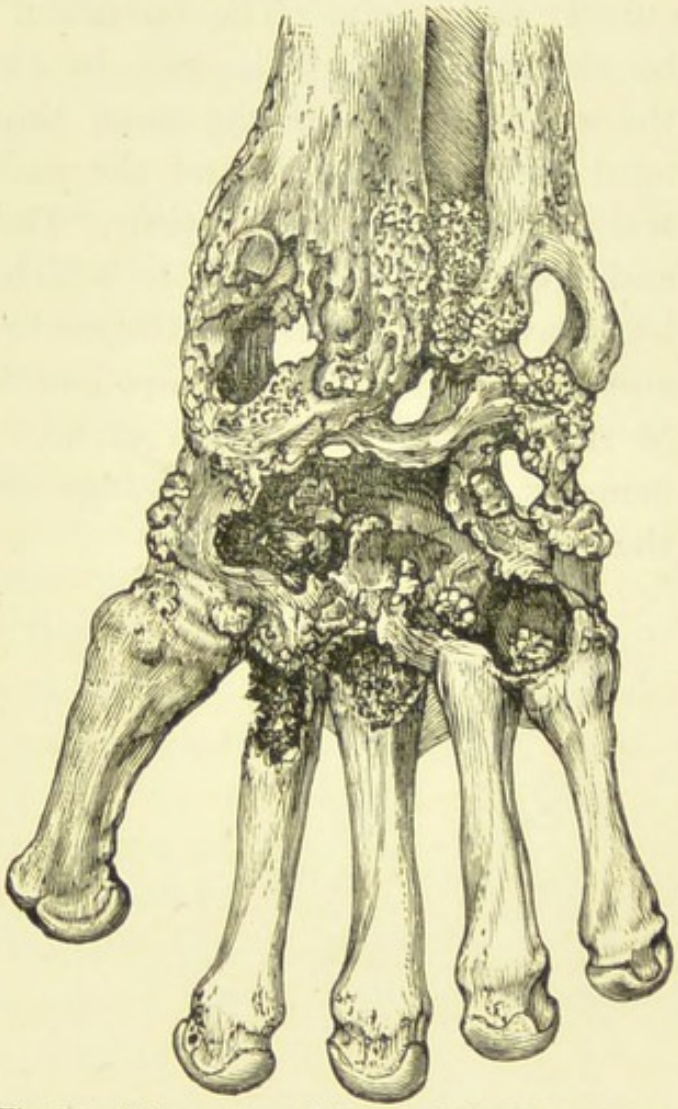

Fig. 16.—Tuberculous Disease of the Wrist Joint in a man aged 65. (From specimen, No. 136, in the Museum of St. Bartholomew's Hospital.)

Treatment consists in at once placing the joint at absolute rest, in well-fitted splints (*see* shoulder, elbow, wrist, etc.), in prescribing residence in a dry and bracing climate, in giving small doses of bark or quinine (cod-liver oil is usually found to disturb the digestive organs in elderly patients), and in ordering an easily digested and nutritious diet. If matter forms, it must be evacuated, with the use of every care to prevent septic changes. Should these means fail to arrest the disease, and should the patient's general health become impaired, amputation

must, if there is no visceral disease, and if the strength will admit, be performed, except in the case of the hip joint, where the operation could, of course, not be ventured upon. Generally this is well borne, and the wound heals quickly and safely. The operation should be carried out by the method which will, in the circumstances, leave the wound that is at the same time the smallest and the most easily managed, and the patient should be kept in bed as short a time as possible. The ready repair of injuries and wounds in the old, to which Sir George Humphry has drawn attention, was illustrated in a case in which I amputated through the fore-arm for tuberculous disease of the wrist in a woman of 68. The wound healed by primary union, and all dressings were dispensed with after the seventh day.

CHAPTER IX.

ARTHRITIS SECONDARY TO INFLAMMATION OF THE ENDS OF THE LONG BONES.

THE ends of the long bones play a considerable part in the production of disease in the joints: for disease which starts in, and originally exclusively concerns, the end of one of the bones, may subsequently extend to, and involve, the articulation which is adjacent to it. In other words, many examples of joint disease are not primary. The joints become affected in a secondary manner owing to the fact that they are in the immediate vicinity of areas of bone which are the frequent seats of inflammatory disturbance. This liability exists to some extent at all ages, but it is especially marked during the early period of life. At this period it arises out of the manner in which the stature of the skeleton is attained—that is, by the addition of new material at the ends of the diaphyses of the long bones, immediately beneath the epiphysial plates. In this situation the bone consists of a highly vascular structure in which cell-proliferation and development are in rapid progress—a condition in which the power of the tissues to resist disease is much diminished, so that they are, in Virchow's phrase, vulnerable.

Fig. 17.—Inflammation beginning in the Diaphysis immediately beneath the Epiphysis, and undermining the connection between them.

Here, then (Fig. 17), various forms of inflammation, such as the tuberculous, syphilitic, and pyogenic, are apt

to arise, with the prospect that, as they extend, they will reach and involve the contiguous joint. Tuberculous disease is of frequent occurrence in this situation, in the case, for instance, of the lower end of the femur and the upper end of the tibia. It is not, however, entirely limited to this part of the bone. The tuberculous process may originate in the cancellous tissue of the epiphysis itself. Thus Fig. 14, page 99, shows a specimen in which, while the diaphyses of the femur and tibia are comparatively free, the cancellous tissue of both the epiphyses is occupied by tuberculous deposit.

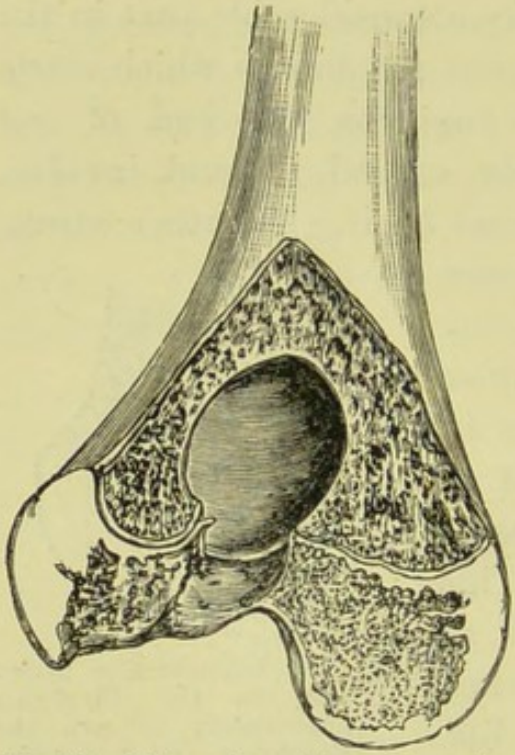

Fig. 18.—Tuberculous Abscess bursting into the Elbow Joint. (From specimen, No. 128, in the Museum of St. Bartholomew's Hospital.)

Whichever situation is the starting-point, the danger to the joint is the same. Should the tuberculous process continue to develop, as its products accumulate the inflammatory action will break down the structure of the epiphysis, so that it is to a greater or less extent occupied either by soft caseous material or by a definite tuberculous abscess (Fig. 18). Still extending in the substance of the epiphysis the disease comes to involve the tissue directly beneath the articular cartilage. The cartilage acts for a time as a barrier; but when it at length gives way the joint itself is reached. In some instances the opening into the joint is large, and a considerable quantity of tuberculous products suddenly escapes into the synovial cavity, with the result of producing acute suppurative arthritis.

Emma B——, aged 5, was admitted into the Children's Hospital with swelling of the lower end of the tibia of nine months' duration, and a discharging sinus just above the malleolus. The ankle joint was sound. Next day, having been sent for, I found that the child had been awaked during the night by sudden and intense pain in the ankle, which soon became hot, red, and very swollen. Her temperature in eight hours rose from normal to 104°. There could be no doubt what had occurred. Matter burrowing in the epiphysis had burst into the joint. In two days, in spite of free incisions and drainage, the joint was evidently wrecked, and the child was very ill. I therefore performed Syme's amputation. When the joint was opened a sequestrum of the size of a Spanish nut dropped out upon the floor. This sequestrum was found to have escaped from a large cavity in the lower end of the tibia, through a ragged opening in the articular cartilage.

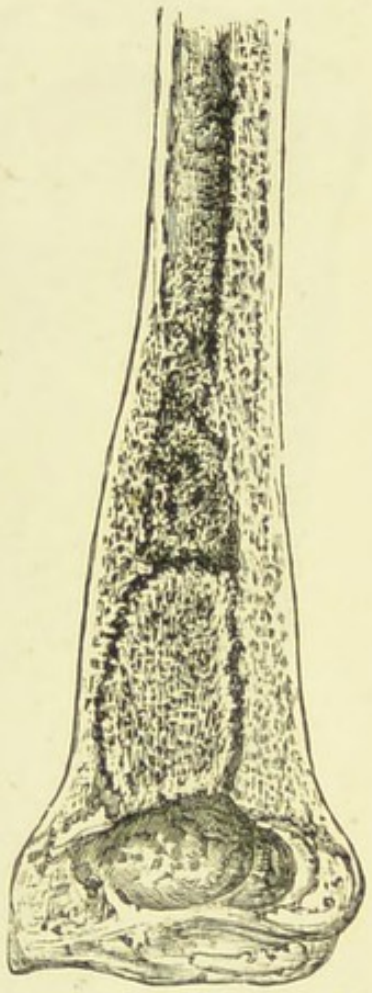

Fig. 19.—Necrosis of the Tibia, with an Abscess bursting into the Ankle Joint. (From a specimen in the Museum of St. Bartholomew's Hospital.)

Fig. 19 shows necrosis of the lower end of the tibia, with an abscess bursting into the ankle joint.

In other cases a mere pin-hole orifice in the cartilage is formed, through which minute portions of tuberculous débris escape, and, inoculating the synovial membrane, produce a subacute or chronic synovitis. In other instances, again, no loose material escapes, but the joint becomes involved by the extension of tuberculous inflammation from the soft parts

around to the synovial membrane. Of these three forms in which the joint may become involved, the last is by far the most commonly met with. The result to the joint will largely depend on the extent of the bone lesion. When this is limited, and when treatment is adopted early, repair, although it is tedious, will usually follow; but when the bone disease is considerable the joint is under the ban of a persistent irritation, and no sound repair can take place until the mischief in the bone has been successfully dealt with.

Fig. 19A.—Acute Osteo-myelitis of the Tibia, leading to destruction of the Knee Joint. (From preparation, No. 621C, in the Museum of St. Bartholomew's Hospital.)

In Fig. 19A it is seen that, as the result of acute infective osteo-myelitis, part of the shaft of the tibia has necrosed. The epiphysis has become detached, and pus has made its way into the knee joint by a perforation through which a bristle is passed.

In some instances the joint is completely destroyed. Fig. 20 shows extensive necrosis of the lower end of the femur. The knee joint has undergone complete disorganisation. For this specimen I am indebted to Dr. Joseph Griffiths, of Cambridge.

Acute arthritis of infants.—Under this title Mr. T. Smith has described in a valuable paper in the St. Bartholomew's Hospital Reports * an affection which here deserves separate notice. Its exact pathology is often obscure. It appears sometimes to be due to septicæmia, and sometimes to injury during birth, or to a subsequent strain or wrench. Its clinical features are remarkable. All the instances recorded by Mr. Smith occurred in infants under the age of a year, and in many the patients were not

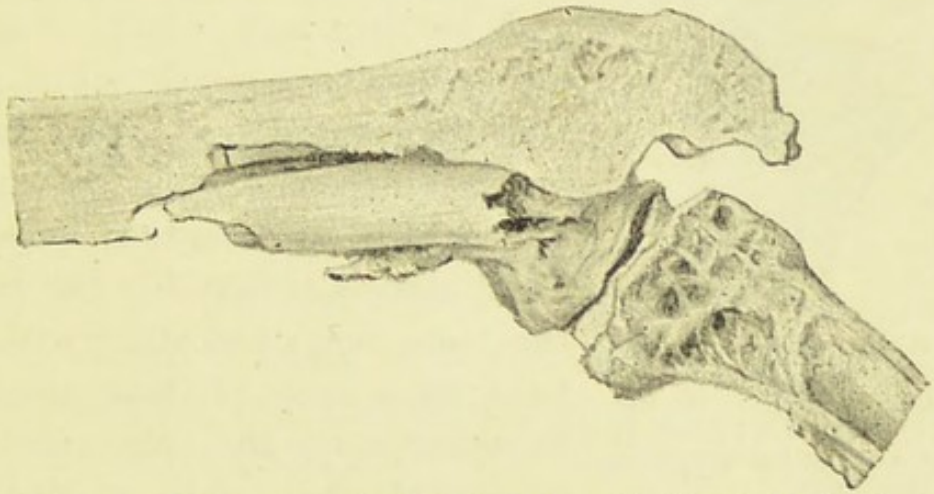

Fig. 20.—Necrosis of the lower End of the Femur, leading to Destruction of the Knee Joint. From a specimen, No. 1810B, in the Cambridge Museum.

more than two months old; but it is sometimes met with in children as old as two years. It is characterised by its sudden onset and rapid progress as acute destructive inflammation, involving the growing tissue of the diaphysis immediately beneath the epiphysial cartilage, leading to the formation of an abscess in the articular end of the bone, quickly bursting into and producing disorganisation of the joint (Fig. 21). It is a formidable condition. No less than thirteen of the twenty-one cases described by Mr. Smith ended fatally. The disease may attack either only one, or several joints. Mr. Smith relates a case in

* Vol. x. p. 189.

which both knees, an elbow, and an ankle were affected. The knee, hip, and shoulder are the joints most often involved. The first symptom is that the joint becomes flexed and stiff. Very soon pain and swelling supervene, and are followed by the distension of the synovial cavity with pus, which, increasing in quantity, makes its way out through the capsule and forms a large collection of four, six, or more ounces in the soft parts round the joint. Should the abscess burst, or be opened, the discharge may cease, and healing may occur; but in many instances death takes place from exhaustion or septicæmia. On post-mortem examination, when the mischief is recent, sometimes a small abscess is found in the end of the bone, communicating with the joint by a mere pin-hole aperture. In other cases the epiphysis is so excavated that only a shell remains, and a large ragged hole in the cartilage leads into the cavity of the joint, which is filled with pus. Sometimes, but rarely, a sequestrum is present. At a later stage the epiphysis is found to have been completely destroyed, and the end of the bone forms a shapeless stump.

Fig. 21.—Inflammation originating in the growing Tissue of the Diaphysis of the Femur, with the formation of an Abscess bursting into the Hip Joint.

Sometimes the acute inflammation going on in the joint involves the opposite bone, so that its articular end also is destroyed. In cases in which recovery from such extensive disease takes place the joint remains flail-like and loose, and the bones, having entirely lost their articular ends, and often their connecting ligaments, move very freely on each other.

As to the frequency with which the disease attacks the different joints, Mr. Smith has recorded twenty-one cases,

and to these I have added, in further illustration, six, making a total of twenty-seven. In twenty of these, one joint only was attacked, while of the remaining seven, in one, four; in three, three; and in three, two were involved, bringing the total number of joints affected up to thirty-nine. Of these the hip was attacked in fourteen cases, the knee in eleven, the shoulder in five, the ankle and elbow in four each, and the wrist in one. In these numbers we seem to trace a confirmation of the view that the disease is intimately associated, in respect to its origin, with the great activity with which growth is taking place in the ends of the bones. Fourteen cases occurred in the hip, next to the knee the largest and, as regards the development of the bones, the most complicated of all the joints. Eleven affected the knee, the largest of the joints, and that which is formed by the growing ends of the great bones of the thigh and leg. Five were in the shoulder, into the formation of which the growing end of the humerus enters. The remaining nine instances were in joints of smaller size, and in the neighbourhood of which the growth of the bones is comparatively inactive.

An analysis of these cases clearly shows that this affection is one that is fraught with grave peril both to life itself, and to the joint which is attacked. Of the twenty-seven examples, no less than thirteen, that is, about fifty per cent., ended fatally. This result, however, can scarcely be a matter for surprise when the character of the disease, the age of the patient (generally not more than a few months), and the fact that two or more joints may be affected, are borne in mind. In those instances in which the child escapes with his life it is often found that the joint is entirely disorganised, and that the articular ends of the bones are destroyed by ulceration, so that the shapeless and truncated stumps, embedded in loose scar tissue, meet each other like the two ends of an ununited fracture. In the

elbow this result is not inconsistent with a fairly useful condition of the limb. But in either the hip, the knee, or the ankle, the loss of the joint leads to great and permanent lameness, or may even render the patient unable to bear any weight upon the limb. I have seen several examples in which the head of the femur completely disappeared, and in which the upper end of the bone, formed by the shaft and great trochanter, remained so loosely connected with the pelvis that it could be made to travel freely in any direction, either upwards nearly to the level of the crest of the ilium, or backwards and downwards to the tuberosity of the ischium, or outwards so that it protruded immediately beneath the skin. This change in the situation of the bone was, of course, attended with a corresponding variation in the length of the limb. The femur could be drawn down or pushed up, through a range of at least three inches. When these patients, as they grew older, tried to walk it was found that, when the weight was thrown on the affected limb, the pelvis sank down upon the femur till the elongated bond of union between the two became tense; but this did not happen till the trochanter was nearly on a level with the iliac crest. In these circumstances progression was very unsteady and laboured, and very similar to that observed in the worst cases of congenital dislocation of the hip. Indeed, these two conditions are very apt to be mistaken for each other. (*See* page 255.)

In one case in which the knee had been affected, and in which I saw the patient fifteen months afterwards, the stump-like ends of the femur and tibia could be moved freely on each other, and were found to give way whenever the child, who was then twenty-two months old, bore any weight on the limb. In another instance the upper end of the tibia had slipped backwards into the popliteal space, and was overhung by the projecting lower end of the femur, and in this position the two bones were united by cicatricial

tissue. In another case, mentioned at page 140, the ankle joint had been so completely destroyed that the ends of the bones of the leg fitted into a deep socket in the tarsus.

It may be useful to draw attention to the fact that in instances in which matter has escaped from the joint, and formed a large collection deep in the muscular interspaces of the limb, and when fluctuation may, to a superficial examination, be indistinct, when large veins are conspicuous on the surface, and when the patient has become wasted, sallow, and feeble, this affection is not unlikely to be mistaken for malignant disease. Several cases have been sent up to the Children's Hospital illustrating this difficulty of diagnosis; and in one instance a surgeon was so firmly persuaded that an infant under his care was suffering from sarcoma of the muscles of the thigh in the adductor region that he declined to allow me to open the abscess, or even to explore the swelling. The result was that the abscess increased still further in size, and at length burst; but the child sank from exhaustion.

In some cases, not only is the epiphysis in great part destroyed, but necrosis of the diaphysis may occur.

For a description of *syphilitic disease* of the ends of the bones, *see* page 148.

Chronic adjacent osteitis often lays the foundation of very intractable joint disease, especially in the knee. Cases are met with in which children of eight or ten, or even young adults, are found to be suffering with joint disease which originated in tuberculous disease of one of the neighbouring bones when the patient was only two or three years old, and which, though there have been periods of remission, or even of apparent recovery, has several times relapsed. In these cases the joint gradually becomes stiff, and often deformed, and liable, on increase of exertion or disturbance of health, to a renewal of synovitis more or less acute. Ann P——, aged 23, was

lately in the hospital with synovitis of the right knee, attended with severe pain and an evening temperature of 103°. A scar was seen at the back of the external condyle of the femur. The lower end of the femur was enlarged. She stated that her knee had been diseased ever since she was three years old, and that, from time to time, the scar gave way and matter had escaped. She had often been confined to bed with long-continued pain in the knee. After admission she remained in severe pain, and a few days later the old scar became inflamed, and soon gave way, and half an ounce of pus escaped. On examination I found that a probe entered the external condyle, and defined a cavity about as large as a walnut. A week later the knee was intensely painful, considerably swollen, and hot to the touch. The skin on the inner side of the patella was red and œdematous, and pitted on pressure. On gentle pressure over the knee pus escaped from the sinus. The sinus which clearly led into the joint was therefore dilated by the introduction of a strong pair of sequestrum forceps and the forcible expansion of the blades. About an ounce of pus was let out from the articular cavity. From this time the patient lost her pain, and her temperature fell in a few days to normal. In three weeks the sinus had nearly closed. She afterwards left the hospital, wearing leather splints; but the sinus was still discharging. The joint admitted considerable movement. The suppuration within the joint was, no doubt, due to a renewed attack of inflammation in the lower end of the femur. The condition which may at length result from bone disease involving a joint is well shown in Fig. 20, taken from a specimen in the Museum of Addenbrook's Hospital. The disease was evidently of very long standing. The lower end of the femur has undergone extensive necrosis, and the joint is completely destroyed.

In two of his best-known papers, the one entitled

"Necrosis of Joints" and the other "Chronic Abscess in the Extremity of the Tibia," Sir Benjamin Brodie has left clear evidence that he was familiar, from a clinical point of view, with the forms of disease just described. His cases of "necrosis of joints" were examples of disease beginning in the diaphysis, beneath the epiphysial line, in which the articular cavity had become involved; while his cases of "chronic abscess of the tibia" were, for the most part, instances of tuberculous disease in the same situation, with the formation of matter enclosed in the cancellous tissue. Thus, as an example of mischief extending from the bone into the joint, I may quote his case of J. G., a boy aged 9, admitted into St. George's Hospital in 1814. One knee was much enlarged, painful, and tender when handled, and the leg was partially bent on the thigh. It was said that he had met with an injury seven years before, and that from that time the joint had not seemed to be quite in a sound state. He had not suffered much from it till within the last four or five weeks, when the knee became suddenly swollen, and the seat of pain, which confined him to bed. As suppuration occurred round the joint, amputation was performed. "In making a section of the femur through the condyles, an abscess was found in the middle of the bone, in which lay a piece of dead bone of the size of a walnut. The sinus extended from this cavity downwards into that of the knee joint, communicating with the latter by an opening in the space between the two condyles." And no clearer description of chronic tuberculous disease leading to abscess in the articular end of a long bone could be given than that in which Brodie relates the case in which he first recognised "Chronic Abscess in the Extremity of the Tibia." Mr. P., æt. 24, consulted him in 1824. There was considerable enlargement of the lower end of the right tibia, extending two or three inches from the ankle joint. The integuments at this part were so dense that they

adhered closely to the bone. The pain was constant, but at times there were such severe exacerbations that the patient's sufferings were described as very great. They confined him to his room for several days, and were attended with considerable constitutional disturbance. The disease had existed twelve years, and had rendered the patient's life miserable. Amputation was performed. The patient unfortunately died in five days, evidently of acute septicæmia. On making a section of the lower end of the tibia, the bone was found to be greatly thickened, and unnaturally hard and compact. In its centre, about one-third of an inch above the ankle, there was a cavity of the size of a walnut, filled with dark-coloured pus. The bone immediately surrounding this cavity was distinguished from that in the neighbourhood by being of a whiter colour and of very hard texture; and the inner surface of the cavity presented an appearance of great vascularity. The ankle joint was free from disease.

Although these cases of chronic abscess in the articular ends of the bones are most common in young subjects, and are now known to be generally tuberculous, they are sometimes met with as the result of local injury in persons who are free from tubercle, and in whom union between the shaft and the epiphysis has long been complete.

Symptoms.—The symptoms of tuberculous disease in the articular end of a long bone if it is active, are usually characteristic when carefully investigated. The bone becomes painful, and tender on pressure, often over some particular spot. The soft parts covering it are swollen, and the skin may be suffused with a faint blush, but it frequently presents its normal appearance. There is often increased heat of the surface. The patient cannot use the limb, and the joint is maintained in a position of slight flexion. Swelling generally is limited to the neighbourhood of the affected bone, but sometimes, even from the first, the

joint is puffy and enlarged. The temperature is raised to 100° or 101°. The disease rapidly advances, and it soon becomes clear that suppuration has occurred. The resulting abscess may present beneath the skin, or, by burrowing beneath the periosteum, give rise to swelling, œdema, and fluctuation extending in the limb for some distance away from the joint. Should matter burst into the articular cavity, evidences of acute arthritis will supervene at once.

The symptoms attending subacute and chronic disease are often in the early stages of the affection so obscure that they are apt to be overlooked. When the mischief is seated in the mid-substance of the bone, and is advancing slowly, the only symptoms will be severe pain, especially when the limb is being used, slight heat on the surface, and a disinclination on the part of the patient to move the joint. When the affection is more advanced, there is swelling about the articular end of the bone, with acute tenderness on pressure and pain on movement, and a habitually fixed condition of the joint. Swelling increases, and at length fluctuation can be detected. Should the abscess be allowed to discharge itself spontaneously, a sinus will remain, through which pus continues to escape. Accompanying these symptoms, swelling of the synovial membrane, with pain, and sometimes heat of the surface, may be detected as evidence that the joint is involved. A probe, cautiously introduced, is found to pass through the substance of the epiphysis into the immediate neighbourhood of the joint, and will often disclose the fact that the whole articular end of the bone has been hollowed out into a cavity containing fragments of carious bone.

In some cases a small tuberculous abscess formed beneath the articular cartilage in connection with disease of such limited extent that its presence has never been suspected, may burst into the joint. In such instances the real origin of the acute arthritis which follows is very likely to escape detection.

Treatment.—In acute inflammation of the articular end of a bone, the imminent danger in which the joint is placed is the main fact to bear in mind, and steps must be taken without delay to provide for the safety of the articulation. The limb must be placed at rest by the use of an efficient splint, and the patient should be kept in bed. This is absolutely necessary in the case of the lower extremity, and a wise precaution in the case of the upper. I have, on several occasions, applied one or two leeches when the child was strong, and when the affection was in its early stage, with the result that inflammatory action has subsided. Leeches should not, however, be used in children under two, or when suppuration has taken place. The part should be covered either with lead and opium lotion, or with a boracic fomentation. Should the child's temperature remain high, or should any part of the end of the bone present marked tenderness on pressure, and should there be circumscribed redness of the surface, especially if this is combined with œdema, so that there is pitting on pressure, an exploratory incision should be made under precautions against septic infection. It is of paramount importance that pus should be let out as soon as it has formed. The removal of half a drachm, or even of fifteen drops, and subsequent drainage, may save the joint and avert an injury to the epiphysis that would be followed by arrested growth of the limb. Should matter be found travelling beneath the periosteum of the shaft, it must be at once evacuated. When pus has burst into the joint it must immediately be let out by lateral incisions, the synovial cavity must be freely irrigated with perchloride of mercury lotion (1 in 4,000), drainage must be secured, and the wounds must be treated antiseptically. In cases in which not only has the joint become acutely inflamed, but the epiphysis is found to be separated, or in which the shaft of the bone

is found to be involved, the question of amputation must be considered. Should the temperature be not above 102°, and if the child be not rapidly losing flesh and strength, the operation may be delayed; for when free drainage has been secured, the separated epiphysis may unite, and repair that was at first despaired of may take place. A great danger in these cases is that general septic infection may be developed. The best chance that this complication may be avoided lies in the early and free evacuation of matter, and the use of irrigation and drainage, and antiseptic dressings.

In the *Acute Arthritis of Infants* the same rules must be followed. The joint must be kept at rest by the use of a suitable splint, and matter, as soon as it is detected in connection with the end of the bone, must be let out by incision. If matter has entered, or formed in the joint, it must be at once evacuated. Undoubtedly the early removal of pus, which, if allowed to remain, will lead to the destruction of the epiphysis and also of the joint, is often followed by an immediate arrest of the inflammatory process and the ultimate recovery of completely free, or of scarcely impaired, movement of the joint. I have seen this result occur even when the knee joint, for instance, has contained as much as two ounces of pus. If it is found that the ligaments are destroyed, so that the articulation admits of abnormally free movement, care must be taken, should the patient survive, to prevent deformity. For general treatment all that can usually be done in these young children is to see that they are amply supplied with milk, and with small quantities of well-prepared beef-tea, or pounded raw meat, and with two to three drachms of brandy in the twenty-four hours, to be given in doses of ten to fifteen minims; while sometimes a few minims of liquor cinchonæ may be given every six hours; and when there is much pain half a minim of tincture of opium should be prescribed.

In subacute and chronic bone disease threatening a joint, prolonged rest with fixation of the joint is required. The part must be kept in splints just as it would be if the joint itself were the primary seat of disease. If this rule is adequately carried out, though the case may extend over several months, recovery will be the usual result, and often suppuration will be avoided. Should matter form, it must be evacuated without delay. In any case in which matter has already formed, and has discharged itself through a sinus that has remained unclosed, a careful exploration should be undertaken for the purpose of ascertaining whether a sequestrum is present. If a sequestrum exists it must be removed, together with all granulation tissue; and care must at the same time be taken that a free exit to the surface is provided. To secure this a sufficient amount of the superficial wall of the bone must be cut away. The interior of the cavity, however, should not be roughly gouged. This may lead at the time to perforation of the joint, or be followed by an accession of inflammation, in the course of which the articulation may become involved.

When disease attacks that end of the bone at which elongation of the shaft is mainly accomplished (*e.g.* the upper end of the humerus or the lower end of the femur), subsequent growth may be considerably interfered with. A young woman, aged 20, was lately seen who had suffered from acute arthritis of her shoulder joint when she was an infant, and whose arm was now five inches shorter than its fellow. In other instances not only is growth arrested, but the joint is useless. In a girl, aged 9, who had acute arthritis of the left ankle when she was four months old, the left leg was three inches shorter than the right, and the joint was so flail-like that the tibia came to the ground when she tried to walk. As the limb was thus useless, amputation was performed, and an artificial foot supplied. On dissection the malleoli were found to

have disappeared, and the truncated lower end of the tibia fitted into a large cup-shaped hollow formed in the tarsal bones, which had to a great extent been destroyed. In another case the head and neck of the femur, and apparently also the acetabulum, had disappeared, and the stump-like upper end of the femur slipped about loosely on the dorsum ilii, as it may be observed to do in some cases of congenital dislocation. (*See* page 250.) In a girl, aged 4, the leg was an inch and a half shorter than its fellow in consequence of acute arthritis in infancy affecting the upper end of the tibia.

But, instead of producing atrophy and shortening, inflammation in the neighbourhood of the growing end of a bone may, if slight in degree and continued over a considerable period, lead to increased length of the limb as the result of persistent and abnormally free blood supply. A boy, aged 9, had had, when I saw him, disease of the knee and enlargement of the lower end of the femur for three years. The limb was very nearly an inch longer than its fellow. In another instance of chronic synovitis of the knee joint, with increased vascularity of the ends of the bones, the limb was an inch and a half longer than the opposite one. A girl of 11 was lately seen whose left radius was three-quarters of an inch longer than the right, and whose hand was pushed over to the ulnar side, as the result of chronic tuberculous disease of the lower end of the shaft in the neighbourhood of the epiphysial plate. Such results are not very uncommon. The condition should be kept in mind, for it is occasionally the explanation of lameness or awkward gait, the cause of which is not at first apparent.

Chronic abscess in the articular end of a bone.—This condition is most common in the lower end of the tibia, but it has been met with in the upper end of this bone, in the lower end of the femur, in the upper and the lower ends of the humerus, and occasionally elsewhere.

When the abscess is small, and buried in the mid-substance of the bone, the only symptom, generally, is constant pain, attended with exacerbations, usually occurring at night, and increased by previous exercise. Sometimes the bone is slightly enlarged. When matter is nearer the surface there is usually some spot to which pain is especially referred, which is tender to the touch, and sometimes so sensitive that the patient cannot bear even the slightest pressure over it. This tender spot is very characteristic. In some instances a soft spot may be detected. In this situation there is often some slight surrounding swelling of the soft parts. These symptoms, though each when viewed alone may seem very slight, are yet, when taken together, sufficient to establish a strong probability that a chronic abscess is present. Especially is this the case when they persist in spite of treatment calculated to relieve neuralgia, rheumatism, or syphilitic osteitis (conditions which this affection most resembles).

Treatment.—In these circumstances the proper course will be to endeavour to hit upon and evacuate the collection, by making a crescentic incision down to the bone and perforating its substance with a narrow chisel applied over the tender spot, or the soft spot, or wherever there is any trace of swelling or of yielding of the wall of the bone on firm pressure. If the first exploration is not successful in reaching matter, the instrument may be introduced at some other spot. A fine chisel acted upon with a heavy mallet, gently used, is much to be preferred to a trephine—an instrument very difficult to use if the abscess is situated at any depth. When the abscess cavity is found it should be laid freely open and allowed to granulate from the bottom, under careful antiseptic dressing.

CHAPTER X.

QUIET DISEASE OF JOINTS.

It is well known that tuberculous diseases of the joints are often developed so slowly and insidiously, and are in their early stage so devoid of pain or any characteristic symptoms, that they are apt to be overlooked or mistaken by parents for slight rheumatism, or growing pains, or even for a trick. The obscurity in which the early symptoms of these affections are involved is so deceptive that it may be worth while to relate some illustrative cases, in order to show that these diseases may reach even an advanced stage without raising, in the minds of parents and relatives, any suspicion of their presence.* Sir James Paget† has described what he has termed "quiet necrosis," in which "all the essential facts of the process of necrosis, the death of the bone and its exfoliation, and the formation of new bone, may take place without any attendant phenomena either of inflammation or fever." The cases of joint disease which I am about to relate closely resemble those of quiet necrosis of bone, in the absence of the symptoms which usually accompany inflammation. There is no pain, no tenderness, and but very slight swelling. There are only slowly increasing stiffness and muscular wasting, symptoms which parents wholly misunderstand, or perhaps entirely overlook.

Case 1.—A girl, 9 years old, who had been kept for six months at complete rest, for the treatment of Pott's disease

* I have related (page 486) instances in which disease of the spine advanced to the development of well-marked angular curvature, although the patient was unconscious of any symptoms indicating its presence.

† "Clinical Lectures and Essays," 2nd edition, p. 339.

in the dorsal region and coexisting hip disease, complained that she could not move her elbow. On examining the joint I found it almost absolutely stiff, slightly swollen, and a very little hotter than the opposite joint. The muscles of the upper arm were much wasted. On inquiring of the mother, I learnt that the patient had never complained of pain, but had been noticed for three months to be awkward in feeding herself, and to bend her arm oddly at the wrist, but there was no suspicion that the elbow was diseased and had become stiff. Six months later the joint, which had in the meantime been enclosed in splints, was free from all signs of disease, and looked quite normal, but it was absolutely fixed. For the past four years it has remained thus anchylosed, possibly by bone, but more probably by very close and firm fibrous adhesions. I believe the case to have been one of tuberculous inflammation of the synovial membrane, in which the exudation-products, instead of breaking down, as they commonly do in tuberculous inflammation, became organised into cicatricial tissue.

Case 2.—A boy, aged 11, was brought to the Hospital for Sick Children, in 1881, for what his mother thought was some affection of the spine, which had become much arched forward in the lumbar region. On examination, it was seen that the left hip joint was completely stiff and flexed at an angle of about 120°, and that there was considerable wasting of the glutei and other muscles of the limb. The curvature of the spine was merely compensatory. I found, on careful inquiry, that the boy had never complained of pain about the hip, and it was difficult to convince his mother that it was this joint, and not the spine, which was the seat of disease.

Case 3.—A man, aged 23, who belonged to a very tuberculous family, observed that his right hip and left shoulder were gradually becoming stiff, and that the muscles about these joints were wasting. There was no pain in the

shoulder, and very little in the hip. On examination of the joints under ether, it was found that they were firmly fixed. An attempt was made to restore movement in the shoulder by separating the adhesions and employing manipulation; but, though some slight movement was produced, stiffness soon returned, and the treatment was discarded. Both joints have now long been fixed, but they give no pain, and show no other evidence of disease.

Examples of the same kind are not rarely seen in children between four and twelve, in whom the shoulder joint is found to have become stiff, though none of the other signs of disease have been observed. I have many times seen attempts made to restore movement in these cases, but never with success. Not having had an opportunity of dissecting a joint thus affected, I cannot say what are the precise changes that occur; but, judging from clinical observation merely, they consist of plastic inflammation of the synovial membrane, leading to the rapid removal of the articular cartilage, and to either bony or very close fibrous anchylosis. The shoulder joint is more commonly involved than either the elbow or the hip. I have seen instances in which this condition has followed injury of the elbow due to a fall, and in which stiffness has been the only symptom observed. In some of these, the children have been sent to the hospital with the report that they were suffering from muscular rigidity following injury, and the joint affection has escaped notice. In the hip all the usual symptoms, except stiffness and wasting, may be so entirely absent that for many months no suspicion of the real state of the case is excited. Even on close inquiry it cannot be ascertained that the child has ever complained of pain, and all that has been observed has been that he has had a peculiarity in his walk. On careful investigation, however, a correct diagnosis may be easily arrived at. Stiffness is, so far as I have observed, always from the first a marked symptom.

In the shoulder, when an attempt is made to rotate the head of the humerus in the glenoid cavity, it is found that the scapula moves with the humerus; and the same is noticed when the elbow is moved forwards or backwards, or is drawn away from the chest. The muscles, especially the deltoid, are wasted. In the elbow swelling may be detected, though it is often very slight; there may be distinct rise of temperature of the surface, but this is neither marked nor constant; the joint is more or less stiff, both as to flexion and extension; and supination and pronation are sometimes entirely lost. There is also invariably muscular wasting of the upper arm, and when the case is of long standing this wasting is very marked. I know of no condition, apart from joint disease, in which rigidity involving the muscles that act upon a single joint, *e.g.* the shoulder, comes on thus spontaneously, or follows an injury, and persists while all the other muscles of the limb remain in a normal state. In other words, the explanation of such rigidity always is that the contraction is reflex and dependent on disease of the joint.

Treatment.—The treatment of these cases of quiet disease must be the same as that of ordinary tuberculous mischief. The parts must be kept at absolute rest, in the manner described elsewhere. (*See* Hip, Knee, etc.) If this course is not followed, and the cases are neglected, the disease will go on to develop into a well-marked example of tuberculous inflammation of the joint. If rest is employed early and is persistently maintained, the joints will in many instances ultimately recover, and regain complete or considerable movement. In some instances, however, the inflammatory action is followed by rapid organisation of adhesions, so that (as I have said) the joint may become permanently anchylosed within three or four months. It is these latter cases which have given rise to the view that if joints are kept at rest they will become

fixed. Such instances, however, are, it is highly important to bear in mind, exceptional. Generally, when complete rest is enforced in the treatment of tuberculous joint disease, it is followed by the subsidence of inflammatory action, the absorption of lymph, the cessation of muscular spasm, and, at length, by restoration of movement. This restoration is sometimes only partial, but often it is complete.

CHAPTER XI.

SYPHILITIC DISEASES OF THE JOINTS.

When the first edition of this work was published in 1886, I ventured to remark that syphilitic diseases of the joints had hardly received the attention they deserved at the hands of English surgeons. Very few cases had been reported, and in some of the standard works on surgery and surgical pathology the subject was not even mentioned. Lancereaux, Voisin, and Méricamp in France, and Bumstead in America, however, had already described these affections, and recorded illustrations of them. They are, I believe, much less rare than was formerly supposed, and there is good reason to believe that not a few instances of joint disease which resist treatment by the usual methods of rest, blistering, etc., and which show an obstinate tendency to relapse, are examples of syphilis. It is easy to see how the cases may have been overlooked, for having been mistaken for subacute rheumatism (which they often closely resemble), and having been treated with iodide of potassium, a drug that enjoys a considerable reputation in rheumatic affections, their disappearance has given rise to no remark. Or they have occurred in association with some other well-marked syphilitic manifestations, and having been regarded merely as incidental rheumatism, and having subsided during the treatment prescribed for the lesions that were clearly specific, there has been nothing to excite a suspicion as to their true character. It must also be remembered that *post-mortem* examinations of the subjects of active syphilitic disease are comparatively rare.

The following account, which agrees in the main with

the descriptions given by Lancereaux and Bumstead, and with those of Mr. J. Hutchinson, junior,* is drawn from cases that have occurred in St. Bartholomew's Hospital.

The joints may be attacked during either the secondary or the tertiary stage of constitutional syphilis, and also in the inherited form of the disease.

Three main varieties have been met with in adults.

1. During the period of the earlier secondary skin eruptions, ulcers on the tonsils, plastic iritis, etc., one or more of the joints may be affected with a subacute or chronic synovitis, attended with moderate effusion, and in all respects resembling rheumatic synovitis of a like grade of severity. No post-mortem examinations, so far as I know, of joints in this condition have yet been recorded; but there is no reason for supposing that any special changes would be found.

Case 1.—Thomas T——, æt. 19, was admitted into St. Bartholomew's Hospital, in September, 1885, under my care, suffering from a stiff, swollen, and painful knee joint. He stated that two years previously he had acquired syphilis, and since that time had frequently suffered from various secondary affections. Three weeks before he came under notice, his right knee became swollen and stiff, and the seat of shooting pains, especially at night. Latterly the symptoms had increased in severity.

Present condition.—A rather emaciated and cachectic-looking lad. He has numerous pigmented scars on his body and legs. On the shins are recent and painful nodes. Both testes are the seat of well-marked syphilitic inflammation. They have been enlarged since January last.

Except for a few months after inoculation, the patient has had no treatment for syphilis.

Right knee.—Is in an extended position, and cannot be completely flexed. Movement causes slight pain. The

* *Brit. Med. Jour.*, 1892.

joint is a little swollen, though in an irregular fashion. The synovial membrane on each side of the ligamentum patellæ feels thickened and pulpy; that of the upper part of the joint appears to be in a healthy condition. There is no general elastic bulging of the synovial membrane, as in tuberculous synovitis. There is slight excess of synovial fluid. No thickening of the tibia or femur can be detected. The patient was ordered a twelfth of a grain of perchloride of mercury, and five grains of potassium iodide three times a day. In a week much of the swelling had disappeared, and in three weeks the joint was quite free from any feature of disease, the nodes on the tibia had diminished, and the testes were smaller. He was so much improved, a few days later, that he was made an out-patient, and shortly afterwards he ceased to attend.

Case 2.—A man, æt. 32, came to the out-patient room at St. Bartholomew's Hospital for the treatment of secondary eruptions and a sore tongue, six months after he had contracted syphilis. His right elbow joint was partially stiff. It was painful, and moderately swollen, partly from thickening of the synovial membrane and partly from fluid, estimated to amount to about three drachms. The skin over the joint was very slightly warmer than normal. He was ordered a twelfth of a grain of perchloride of mercury, and five grains of potassium iodide. Under this treatment he steadily improved. The skin eruptions disappeared in about three weeks, the ulcers on the tongue healed, and at the same time the elbow became much less painful and swollen. A fortnight later the joint had returned to its natural condition. Six months afterwards he came with a node on the right tibia, a sore tongue, and with the elbow swollen, stiff, and painful, especially at night. Under the same treatment as that first adopted the node disappeared, the sores on the tongue healed, and he lost the pain in the elbow, which became much less swollen. The joint,

however, remained rather stiff. From this time I lost sight of the case.

Case 3.—A woman, aged 36, was under treatment with sore throat, cutaneous rash, and two small gummatous swellings in the subcutaneous fat over the biceps in the front of the arm. Her right elbow was swollen and painful, as if the seat of subacute rheumatic synovitis. She was pale and emaciated, and had miscarried six weeks previously. Under potassium iodide and cinchona all her symptoms disappeared in a month, and the elbow had returned to its natural size, and had recovered free movement. The patient had gained flesh and strength. She then ceased to attend. Three months later she returned. She was again very ill. She had a large subperiosteal node on the middle of the ulna, and the elbow joint was again stiff, painful, and swollen. Under the use of potassium iodide and quinine she improved, and the node and the joint affection slowly disappeared. Three months later, however, she was attacked with hæmoptysis, and I afterwards learnt that she died of pulmonary phthisis.

2. In the later stage of constitutional syphilis, during the period of tertiary nodes, rupial ulcers, and gummata, the joints may be attacked with more severe forms of syphilitic inflammation. One or more of the joints may be affected, and the larger articulations apparently are more often involved than the smaller ones. The disease, in some instances, begins as a syphilitic infiltration of the deeper layers of the synovial membrane, and extends into the synovial and adjacent tissues, in places taking the form of definite gummatous nodules. The endothelial lining of the joint is not itself diseased, but is irregularly bulged towards the cavity of the articulation by the inflammatory products beneath it. In some instances the synovial membrane has the appearance of being half an inch, or even an inch, in thickness. Effusion, always limited in its amount,

is often entirely absent. In some instances inflammation and enlargement of the articular ends of the bones are also present.

Case 4.—H. C., æt. 30, was admitted into St. Bartholomew's Hospital on November 16th, 1885, under the care of Mr. Willett, suffering from painful swellings of several joints. In 1878 he had a venereal sore, followed by a skin eruption. Since that period he had remained well until fifteen months before his admission. At this time his left ankle was the seat of pain at night, and after five or six weeks became swollen. Three months later his left great-toe joint was similarly affected, and after three months more the left knee. Six weeks before he came under notice, the left knee began to give him trouble. In all the joints the pain was at first felt only at night, but afterwards it continued throughout the day. There was no history of tuberculous disease, or of gout or rheumatism, in his family.

Condition on admission.—The skin over the left great-toe joint and the left ankle is tense and shiny. The lower end of the tibia is distinctly enlarged, but the fibula is natural. There is some limitation of movement in the ankle joint, and some swelling on the inner side and in front of the articulation. The head of the metatarsal bone of the great toe is enlarged, and the movements of the metatarso-phalangeal joint are limited. Pressure causes pain both over this joint and the ankle.

The left knee is swollen, and measures one inch more in circumference than the right. It cannot be completely extended. There is no fluid in the synovial cavity, but the synovial membrane feels thickened and pulpy. The depressions on each side of the patella are partially obliterated. The patella is irregular in shape and increased in size by the formation of new bone around its margins. The internal condyle of the femur is considerably enlarged, apparently by the development of new bone. There is

very slight pain on movement, unless an attempt is made to extend the leg fully.

Four days after his admission into the hospital, a syphilitic node appeared on the patient's forehead. He exhibited no other evidences of syphilis. Potassium iodide and mercury were now administered, and the swellings of the joints, as well as the node on the forehead, soon began to diminish. In a fortnight the left knee had diminished in circumference half an inch, and by December 9th the patient could walk without pain, though the swelling had not all disappeared. On January 9th, 1886, after continued treatment, the swellings of the left knee and ankle had still further subsided, and, as far as the synovial membrane was concerned, the joints appeared natural. Some bony thickening, however, remained.

Although the right knee caused him pain on admission to the hospital, it presented no evident signs of disease, and all pain in it passed away simultaneously with that in the other joints.

In this form of disease, as *post-mortem* examinations recorded by Lancereaux show, the synovial fluid becomes turbid from the admixture with inflammatory products. The cartilages may become eroded, and the ligaments softened or destroyed.

3. Arthritis, in another group of cases, begins in the ends of the bones, and subsequently spreads to the soft tissues of the joint. In these instances the articular extremities of the bones are enlarged, and the patients complain of severe neuralgic pains, especially at night, resembling those experienced in syphilitic osteitis elsewhere. The examination of the knee joint of a patient who died in St. Bartholomew's Hospital, under the care of Sir W. Savory, showed (Fig. 22) that the periosteal disease, attended with the formation of new bone, was precisely similar to that met with in other situations.

I have lately seen two cases, both in women affected with tertiary syphilis, in whom, with extensive gummata deposited in the subcutaneous fatty tissue around and below the knee, there was some stiffness of the joint, and very obvious thickening of the synovial membrane, and

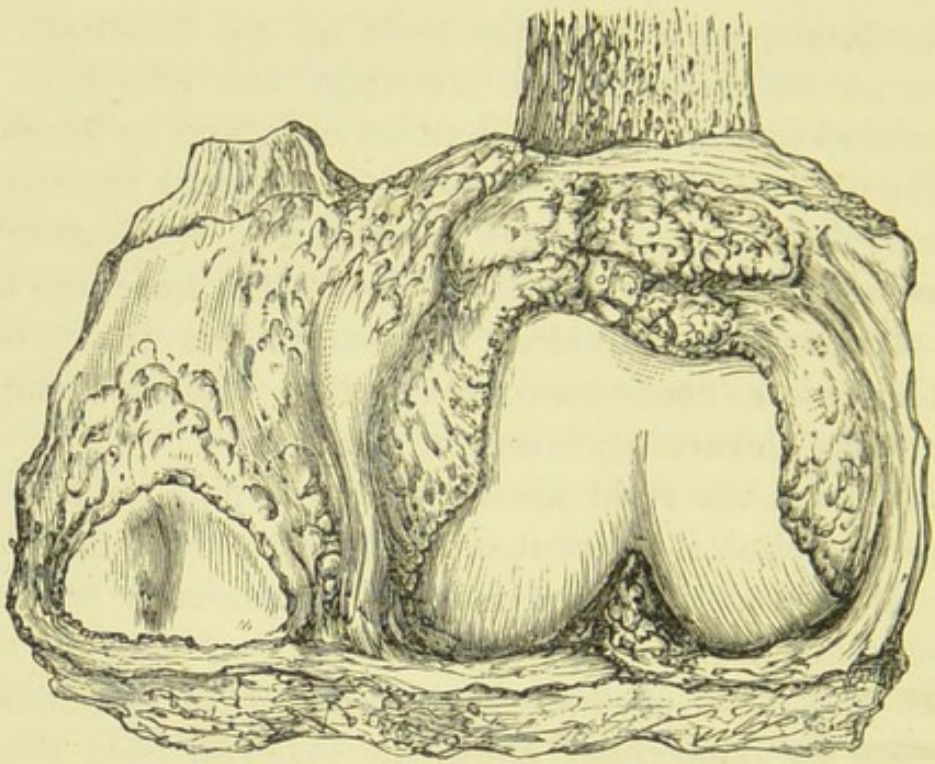

Fig. 22.—Syphilitic Disease of the Knee Joint. The subsynovial tissue, thickened and tuberose from gummatous exudation, bulges the synovial membrane itself towards the cavity of the joint. The lower end of the femur is inflamed and roughened. (From specimen, No. 567*a*, in the Museum of St. Bartholomew's Hospital.)

effusion into the cavity of the articulation. In one, the gummata had broken down, and led to the formation of a number of large and deep ulcers, running together in the shape of a crescent below the joint. In the other, the patella underwent necrosis, and almost the whole of the bone came away in three or four large fragments. In both, the disease extended over many months, and showed a strong tendency to relapse, in spite of full courses of potassium iodide. In these cases the joint affection was secondary to gummatous disease in the neighbouring soft parts.

Mr. Bowlby recently published * a case in which many of the joints were the seat of remarkable changes, which were probably the result of congenital syphilis.

The patient, a boy of 18, came under the care of Mr. Baker, in St. Bartholomew's Hospital, in 1882, for ulceration of the right leg. He had been in good health till three years before, when he had synovitis of the left knee.

A year later swellings began to form on his tibiæ. After several months one of these swellings broke, and ultimately some bone came away. An ulcer was left which was still unhealed. At its base the tibia was thickened. On the right tibia was a hard nodular swelling. There were no other signs of hereditary syphilis, and the eyes and teeth were normal. Mr. Baker prescribed potassium iodide, and chiselled away the carious bone. The wound healed very slowly. A year later the wound had broken down again, and the right tibia was enlarged and the bone was exposed in the floor of an ulcer. The condition proved very intractable, but after six months' rest, several gouging operations, and the prolonged use of potassium iodide, the shin again healed.

Soon afterwards a sharp attack of synovitis of the left knee and of both elbows brought him back to the hospital. The joints contained a good deal of fluid, and were a little painful, but with the application of Scott's dressing the fluid quickly disappeared, and the boy was discharged in March, 1885. On September 1st he returned, having three weeks before noticed swellings on the left side of his forehead, and right arm. His shin, he said, broke out again shortly after he was last discharged. Examination showed a fluctuating swelling, covered by hot and red skin, on the middle of the right humerus, on its outer side. The bone around felt thickened. Over the left eyebrow was a

* Med. Chir. Trans., vol. lxxvii. (1894), p. 43.

swelling as large as a walnut, firm, and attached to the subjacent bone. The tibiæ were thickened, and over each was an ulcer, exposing the bone. Both knees were somewhat stiff, and were occupied by a good deal of effusion. The left elbow also contained fluid. The joints gave no pain. On September 4th, pus and carious material were removed from the swelling in the humerus and from that over the eyebrow. In both rough bone was exposed. Subsequently the general health steadily declined. In December the patient was evidently suffering with lardaceous disease. The wounds never healed, and in January, 1886, a swelling appeared over the right acromion, and another below the left ramus of the lower jaw. He died on February 22nd.

Post-mortem examination showed disease of the skull indistinguishable from syphilitic gummatous inflammation; the lower jaw was carious. Considerable cicatricial tissue was discovered at the back of the pharynx. The liver and spleen were enormously, and the kidneys considerably, enlarged: all were lardaceous, as were also the intestines here and there in patches. The surface of the liver was scarred, especially on the left side and behind: and was puckered and contracted as if from condensation of fibrous tissue. *Right shoulder joint:* The right humerus showed gummatous ulceration of the shaft. The articular cartilage of the head of the bone was thinned in almost its whole extent, and of a bluish colour. On the posterior aspect of the head, near the anatomical neck, was a deeply-cut groove extending for an inch or more towards the centre, after which it turned towards the greater tuberosity and ramified over the greater part of the posterior surface of the head. The posterior portion of the articular surface looked as if portions of cartilage had been gouged away so as to leave irregular tracts with crescentic margins. Islands of cartilage here and there remained intact. In parts, the bone was involved, and had undergone the same serpiginous gouging

process as the cartilage. Crossing the bone, and closely attached to it, was a thin membranous layer. When this was peeled off the bone was rough, and softer than usual. The synovial membrane was more vascular, and thicker than natural, but otherwise appeared normal. The *right elbow* contained a considerable quantity of thick synovial fluid. Part of the cartilage of the trochlear surface of the humerus had become converted into fibrous tissue, but on the anterior part of the same surface there was a nodular proliferation such as is met with in osteo-arthritis. Elsewhere in the joint the cartilage was destroyed, and the bone exposed and roughened, and worn into grooves like those found in osteo-arthritis. The *left shoulder* joint contained inspissated synovia. The articular surface of the glenoid cavity appeared normal, but the head of the humerus was affected in much the same manner as the head of the right bone. The *left elbow* was normal. The shins were covered with scars adherent to the bone. The tibiæ were thickened. The ankles and the joints of the feet were normal.

The *right knee* contained much viscid fluid. The synovial membrane was everywhere thickened and unduly vascular. The patella was surrounded by a mass of fringes, some pedunculated, others sessile. The external condyle presented a deep groove, which ran antero-posteriorly for an inch and a quarter. The groove extended down to, and involved, but did not expose, the bone, which was covered by a membrane similar to that which lined the grooved portions of the shoulder joints. At the upper and anterior part of the groove an island of cartilage remained intact. The cartilage on the upper part of the condyle was rough and fibrillated, and greatly increased in thickness. On the upper part of the internal condyle was a large nodular outgrowth of cartilage about an inch in length; elsewhere, in patches, the cartilage was fibrillated. *Left knee joint:*

The cartilage of the external condyle near the intercondyloid notch was deeply gouged in the manner already described, as seen in the opposite knee. The destructive process had extended in a somewhat serpiginous manner, and had left islands of cartilage intact, but almost the whole of the cartilage of the anterior surface of

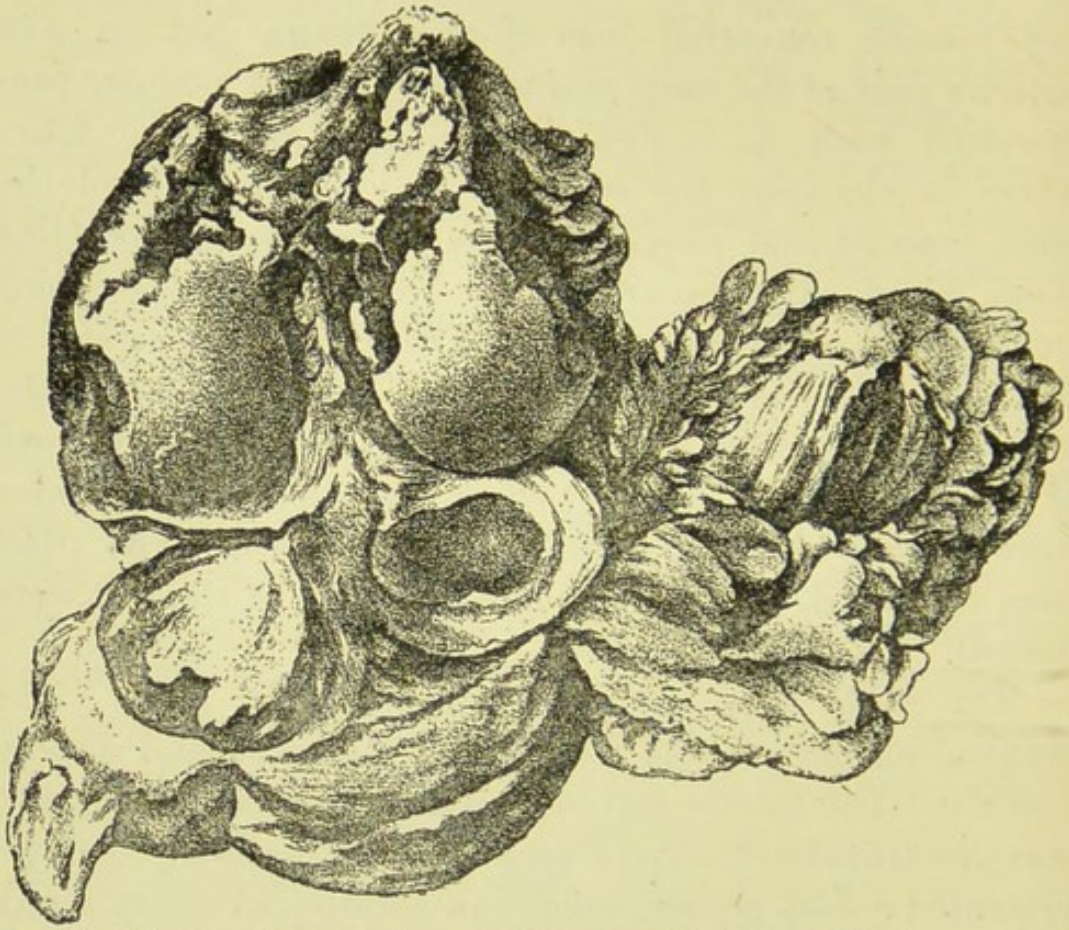

Fig. 23.—Mr. Bowlby's specimen of Disease of the Knee Joint in a case of Congenital Syphilis, showing the fringed synovial membrane and the gouging of the articular cartilage of the femur. (No. 312*d*, Museum of St. Bartholomew's Hospital.)

both the external and the internal condyles had been removed, and much of the subjacent bone had been excavated. That part of the articular cartilage which had during life been in contact with the tibial tuberosities was for the most part natural, but in places was a little fibrous and thickened by the growth of small nodular masses.

The bottoms of the grooves were everywhere covered by a membrane, as was the case in the opposite knee. At the edges of the condyle were nodular outgrowths of cartilage, such as are commonly seen in osteo-arthritis; none of them were of large size: the external condyle was "lipped" in a very marked manner.

The cartilaginous surface of the patella was rough and fibrous, but there were no outgrowths round its edges. The cartilage of the tibia was slightly roughened, and at one spot, over the internal tuberosity, had been replaced by a soft mass of pulpy tissue, which intervened between the free surface and the subjacent softened bone. The cartilage covering the external articular surface of the tibia was normal, except beneath the semi-lunar cartilage: here its surface was fringed and rough, and in parts slightly worn away. At its edges there was a little nodular thickening, but no definite lipping.

Whatever view may be taken of the nature of this case, it must be allowed that it presented very unusual features. On the whole, I am inclined to regard it as an example of congenital syphilis. The grounds for this conclusion are clearly indicated by the author of the paper. They are (1) "The appearance of the affected bones, and especially the gummatous lesions of the calvaria, and the caries and thickening of the humerus; (2) the occurrence of extensive scarring of the pharynx due to previous ulceration; (3) the scarring and thickening of the capsule of the liver." Mr. Bowlby inclines to the view that the destructive process originated in the bone in the form of a sub-chondral caries, which led to an inflammation of the cartilage spreading from below towards the surface. In the same paper, which will well repay careful study, reference is made to the writings of Virchow, Gies, J. Hutchinson, junior, and others. All these sources of information indicate that, although the subject of syphilitic affections of the joints is

imperfectly worked out, it is one which occupies a much wider field than has till lately been suspected.

In hereditary syphilis, in children and young adults, it is not rare to meet with a syphilitic joint affection which very closely resembles tuberculous synovitis of a chronic type. The knee is most commonly involved, and the disease is often symmetrical; there is considerable effusion, so that the synovial membrane is distinctly mapped out, the patella rides, and fluctuation is easily obtained in all the axes of the joint. The synovial membrane is much thickened, and, in places, irregular indurations and gummatous masses can be felt. The joint remains in an extended position, and there is no tendency to deformity. Movement is but little impaired. The affection is usually quite painless. In one case I aspirated the joint. The fluid removed, four ounces in amount, was merely turbid serum. The condition is very persistent, often lasting for many months, notwithstanding the use of potassium iodide, and mercury, internally; and of blisters, mercurial applications, compression, and other local measures. Treatment, however, if steadily maintained, will generally lead to recovery.

Symptoms.—The first variety of syphilitic disease of the joints presents itself in the early period of the secondary stage, and consists of a subacute, slowly advancing synovitis, attended with stiffness, swelling, and sometimes tenderness of the affected joint, but with no alteration in the appearance of the skin, and with very little heat or pain, though some patients complain, especially at night, of neuralgia about the articulation, and in the adjacent bones. The enlargement of the joint, due to effusion, is generally not very marked, but in some instances it is considerable and very persistent. A peculiar feature in these cases is the manner in which the amount of effusion fluctuates, sometimes nearly disappearing, then returning, and remaining long stationary, and then

perhaps undergoing a considerable increase. No other change in the synovial membrane is apparent than that of slight and slowly increasing and irregularly distributed thickening. Often even this cannot be detected. In short, the affection presents itself as a subacute synovitis, with no very distinctive characteristics. Hence the real nature of these cases is, as already said, apt to escape detection.

In the second and much better-marked variety, depending on gummatous infiltration of the subsynovial connective tissue, and described by Richet as "syphilitic white swelling," the joint is considerably enlarged, and the thickening of the synovial membrane can readily be made out, while here and there distinct gummatous nodules may often be felt. The affection is very indolent in its progress. In the later stages grating, due to erosion of the cartilages, may sometimes be made out, and movement may be gradually much impaired. Suppuration is very rarely met with, and I have never seen it. The joints most often attacked are the knee, the elbow, and the ankle. I have seen no instances in the hip or the shoulder.

Thirdly, when the disease commences as an inflammation of the articular ends of the bones, the cases assume the same features as those just described, except that the enlargement of bone is earlier, and more distinctly marked, and nocturnal pains are more severe.

Diagnosis turns on the history of the case in respect to syphilitic infection; the presence of other syphilitic manifestations, or the scars of bygone attacks; the irregular, and sometimes distinctly nodular or tuberous thickening of the synovial membrane; the enlargement of the articular ends and adjacent portions of the shafts of the bones; the existence of nocturnal pains; the absence, in many cases, of previous rheumatic disease. Yet distinctive characteristics are often wanting in these cases, and error and oversight can only be avoided by bearing in mind that

syphilitic joint affections are not rare, that they resemble rheumatic disease, and that they must be suspected when any joint in a syphilitic subject becomes, without any obvious cause, and apart from previous rheumatism, the seat of chronic enlargement, and the other symptoms above-mentioned, which do not yield to non-specific remedies.

The treatment consists in the administration of potassium or sodium iodide. The latter should be used if the potassium iodide is found too depressing. The dose is the same, and many patients with whom the potassium salt disagrees take the sodium preparation without difficulty. The quantity of iodide given should, if necessary, in adults, be gradually increased up to fifteen or twenty grains, or even more, three times a day. In cases occurring in the early period of the secondary stage, or in obstinate examples in the tertiary period, mercury—best given in the form of the perchloride—should be combined with the potassium salt. In cases in which the ligaments are becoming softened, or in which the disease advances in spite of the use of anti-syphilitic drugs, it is necessary to place the joint at complete rest by the use of appropriate splints. The local application of mercury, in the form either of the oleate, or of the unguentum hydrargyri, is often of service.

When syphilitic affections of the joints occur in gouty subjects, they are apt to prove very indolent and intractable, and to show a strong tendency to relapse. In such instances the anti-syphilitic treatment must be combined with the remedies for gout.

In infants, the subjects of congenital syphilis, the articular ends of the long bones are liable to a remarkable form of disease. From the end of the diaphysis a fungating growth, the result of low inflammatory action, takes place, consisting, for the most part, of soft granulation-tissue, which

gradually separates the epiphysis from the shaft, so that mobility and dull grating, as if fracture had occurred, may often be detected, while the limb appears to be paralysed. In many cases there is no suppuration, and the joints themselves remain free from disease. The tendency of the affection to undergo repair when mercury is prescribed is very marked.

In the more severe cases, however, suppuration occurs, and, as the result of ulceration, the epiphysis becomes entirely broken down, and matter either bursts into the joint, or collects in the soft parts in the neighbourhood of the epiphysis. The ends of the bones, at which growth principally takes place, are the most frequently attacked. The nature of the disease is generally disclosed by the existence of other affections of a syphilitic character.

These syphilitic affections in the neighbourhood of, or involving, the joints are usually met with in infants between the ages of two or three months and two years. They may, however, occur in the first month after birth. They are often multiple. They are characterised by node-like swelling of the epiphysis and adjacent part of the diaphysis producing considerable enlargement, and attended with thickening of the surrounding soft parts, and with tenderness and a minor degree of pain.

Treatment consists in the use of mercury, in the form either of one grain of hydrargyrum cum cretâ twice daily, or of inunction of the unguentum hydrargyri.

Should deformity be threatened, a light splint must be applied. If matter is detected it should be evacuated. These affections usually soon yield to treatment; but the mercurial course should be continued for two or three months after the symptoms have disappeared, in order to guard against a relapse, which otherwise is prone to occur. In young and weakly infants, however, if several joints are involved, death by exhaustion is by no means rare.

CHAPTER XII.

THE JOINTS IN HÆMOPHILIA (THE HÆMORRHAGIC DIATHESIS).

Hæmophilia, according to the valuable researches of Dr. J. Wickham Legg and other observers, is met with in England chiefly, though not exclusively, in individuals of German descent, and is confined to males. Female members of bleeding families, though they frequently transmit the affection to their male offspring, do not themselves suffer from it. The main character, I may remind the reader, of the condition is that its victims, who are often termed Bleeders, are liable, as the result of a wound, or even a slight abrasion, to continuous oozing of blood from the broken surface, which it may be difficult or impossible to arrest.

They are subject also to obstinate spontaneous hæmorrhages from the various cavities that are lined with mucous membrane (namely, the interior of the nose, the mouth, the lungs, the stomach, and the intestinal canal, the blood being either vomited or passed by the bowel), and from the kidney or bladder. Bleeding may also occur into the subcutaneous tissues or the intermuscular spaces of the trunk or limbs. Though the sufferers from this affection are sometimes brought to death's door by the large hæmorrhages that recur at varying intervals, it may be of several years, the bleeding usually at length is arrested. Yet many fatal cases have been recorded. An example is related in the Transactions of the Pathological Society (1885),* by Dr. Legg, in which a boy, aged 13, died in St. Bartholomew's Hospital of epistaxis, hæmorrhage having

* Vol. xxxvi. p. 488.

persisted for five days, in spite of plugging the nasal cavity and all other means that could be thought of to arrest it.

It is in the course of this formidable condition that the large joints may be the seat of hæmorrhage into their synovial cavities, either spontaneous, or resulting from an injury, such as a blow or a wrench. The knee, elbow, and ankle, so far as I have seen, are the articulations most often involved. In the case above mentioned Dr. Legg has given a description of the condition of the two knees and the left ankle, which I copy *in extenso*, as it affords the best account of this kind of articular hæmorrhage that I am acquainted with. "The changes in the joints differ in degree, so that the ankle shows the earliest, and the right knee the more advanced, effects of the disease. Fresh, dark blood, with a small amount of clot, is found in the ankle, without any structural change in the joint: the cartilage is pink from *post-mortem* staining. In the left knee no recent blood is found; but its traces are seen in the deep russet-brown colour of the lining membrane. The cartilages preserve their pearly-white aspect. At the under surface of the external femoral condyle, where it meets the pressure of the tibia, the cartilage is worn, thin, and granular over a space of half an inch in diameter. The ligaments are unaltered. In the right knee the connective tissue of the joint is also deeply stained of a brown colour; but the changes in the cartilage are far more advanced. The cartilage is wanting over the point of pressure, and bone thinly covered by cartilage has developed at the periphery of the joint. At the under surface of the femoral condyle about the central parts, the cartilage is thin, worn, and rough. It is fissured in various directions, and laminated. It has lost its close attachment to the bone, so that a knife can be passed beneath it here and there for the distance of two or three lines. The edges of this partly detached cartilage, when raised, are seen to be ragged and fibrous,

and split into layers like that in the joint of chronic rheumatic arthritis. Around each condyle is a prominent bit of bone, somewhat nodular, and thinly covered with cartilage. The same description holds good for the articular surfaces of the tibia and patella. In the femur there is a gap in the cartilage of the external condyle on its front surface. The gap extends to the bone. The edges of the cartilage bounding the gap are smooth and rounded. Mr. Bowlby reported that, under the microscope, the cartilage showed fibroid degeneration of the hyaline matrix, with multiplication of the cells and breaking up of their capsules. The minute, like the grosser, changes bore a marked resemblance to the alterations which take place in rheumatoid arthritis." The joints are in the museum of St. Bartholomew's Hospital (No. 740, B, C, D), and there is a microscopic section of the cartilage (Series lv. No. 86).

In the case of Charles S——,* a boy of 9, apparently of pure Irish descent, who was under the care of Mr. T. Smith, in St. Bartholomew's Hospital, in 1881, and who died of hæmorrhage from a slight wound of the lip, Dr. Legg reported that there had been swelling of the right knee when the boy was a year and nine months old, which had subsequently remained more or less marked. When the boy was six, his ankle suddenly became swollen, and an incision made, in one of the London hospitals, to which he was taken, was followed by bleeding for a week.

On *post-mortem* examination the knee was found to be slightly flexed. The patella was fixed to the front of the femur by a slight adhesion; the cartilage on the patella had been absorbed and replaced by fibrous tissue. The synovial membrane was stained of a yellowish brown or faint saffron colour. The ends of the bones, where not covered with cartilage, were tinted in like manner. A similar condition was found in the right ankle.

* Trans. Path. Soc., vol. xxxiii. p. 412.

These cases, which are far more complete than any that have previously been published (I know of no other specimens than those above described), show that the joint affections met with in hæmophilia are the result of synovial hæmorrhages. These hæmorrhages produce more or less articular swelling (which, though it usually slowly subsides, is sometimes permanent), and are followed by a low form of inflammation and the development of adhesions, by which movement is interfered with or entirely prevented; and also by degenerative processes, consisting of fibrillation and absorption of the cartilage, and other changes closely resembling those met with in osteo-arthritis. In some instances the joints became considerably deformed. If suppuration ever occurs it is certainly very rare.

Symptoms.—While bleeding is already taking place elsewhere, or as the first event in a hæmorrhagic attack, one of the joints (the knee is a convenient example) is found to be the seat of a suddenly developed enlargement, sometimes only amounting to a slight puffy swelling, but often distinctly fluctuating, and evidently caused by fluid in the synovial cavity. There is little increase of heat, but the joint is often painful on movement, and tender, as if affected with subacute rheumatism. Subsequently the swelling gradually subsides, and the joint may entirely recover; but in many cases puffiness and stiffness, varying in amount in different cases, remain, and are accompanied by frequently relapsing pain and tenderness, which prevent the patient from walking. In some instances the joints become more and more impaired and crippled by repeated hæmorrhages and the changes to which they give rise, and deformity may be slowly developed.

Treatment.—In respect of treatment, the importance of recognising the nature of these cases must first be pointed out. An oversight may lead to a fatal result. Indeed,

Poncet* records a case in which a boy, aged 8, died of hæmorrhage, following the application of the actual cautery to the joint; and Charles S—— (page 166) bled for a week from an incision made into his enlarged ankle joint. The danger of overlooking the disease is greatest in cases in which joints have been damaged by repeated slight relapses, unattended with hæmorrhages in other parts. In the case, therefore, of male patients suffering from obscure subacute relapsing swellings of the joints, resembling subacute rheumatism or osteo-arthritis, inquiry as to the presence of hæmophilia should always be made before any proceedings involving a breach of surface, even by a blister, or any forcible manipulation for the restoration of movement is adopted. Fortunately, parents, or the patients themselves, are generally so alive to the dangerous consequences of a wound or other form of injury, that they mention the fact that they are Bleeders.

The best course is to keep the limb at rest on a splint, to apply evaporating lotions or ice, if hæmorrhage is still going on, and subsequently to cover the joint with mercurial ointment or with oleate of mercury (ten per cent.), and a Martin's indiarubber bandage not too firmly applied. Gentle frictions and massage may be used if the swelling remains indolent, but they must be used with great care, or further hæmorrhages will be produced; and the patient should walk with a crutch or a stick, so as to avoid the chance of wrenching or spraining the joint. Aspiration of the joint, with even a fine needle, must certainly not be ventured upon, nor should blisters be used. Iodine liniment —not, however, strong enough to produce much irritation of the skin—may be applied. During attacks of hæmorrhage from other parts, any joint that has already suffered ought to be scrupulously guarded against even slight mechanical injury.

* *Lyon Médical*, 1871, tome viii. pp. 785, 798.

CHAPTER XIII.

DISEASES OF BURSÆ.

It may be useful to introduce this subject by a brief reference to the anatomy of the bursæ, near the principal joints, which are liable to become diseased, and to require surgical treatment. Their position, and the fact whether or not they communicate with the interior of the articulation, are the two main points respecting them.

The shoulder.—There is a large bursa under the deltoid, which runs for some distance beneath the arch formed by the acromion and the coraco-acromial ligament. It rests on the supra- and infra-spinatus muscles as they pass to be inserted into the greater tuberosity of the humerus. Though it usually does not, it nevertheless may, communicate with the joint. The large bursa between the subscapularis and the neck of the scapula is formed by a direct prolongation of the synovial membrane through an opening in the capsule. This bursa is said to become enlarged in some instances, and to form a swelling to be felt in the axilla. I have, however, never met with an example of the kind.

The elbow.—The bursa about the elbow of most importance from a surgical point of view is that over the olecranon. It has no connection with the joint. The bursa situated beneath the insertion of the triceps into the olecranon is usually small; but it is occasionally enlarged, so as to project upwards between the tendon and the back of the humerus. It does not communicate directly with the joint, but it is so near the capsule that great caution would be required in treating it. In miners and persons engaged

in writing, whose left elbow rests on the table, and is thus subject to pressure, a bursa may form over the internal condyle. I have seen such a bursa as large as an egg.

The wrist.—There are various bursæ in connection with the different tendons. The "ganglia" that occur on the dorsal aspect are familiar to all. So also is the compound palmar ganglion, in connection with the flexor tendons. None of these communicate with the wrist joint. They must, however, be very carefully treated, for otherwise septic inflammation may occur, and result in damage to the free action of their associated tendons.

The hip presents the large bursa which lies between the ilio-psoas tendon and the front of the capsule. It generally communicates with the interior of the joint, through an opening which is often of considerable size. Two cases have lately been seen at St. Bartholomew's Hospital in which this bursa formed a swelling of the size of a small orange. It protruded in both instances from beneath the inner border of the tendon of the psoas, and raised the femoral vessels so that they were placed immediately beneath the skin. In one case the hip joint appeared healthy, in the other the joint was the seat of osteo-arthritis. Another bursa is that between the gluteus maximus and the great trochanter. It is often large and multilocular. Another bursa lies over the tuberosity of the ischium. Neither of these two involves the joint.

The knee.—Here are numerous bursæ; but only some of them are of any surgical importance. That most often diseased is the bursa patellæ. It lies over the patella and the upper part of the ligamentum patellæ. It has no connection with the joint; but *see* page 174. Two others lie upon the front aspect of the knee. One is placed beneath the quadriceps extensor muscle, just above the level of the condyles. It varies very much in size, but is sometimes very large. It often communicates freely with the synovial

cavity. The other is beneath the ligamentum patellæ at its insertion into the tubercle of the tibia. Though not connected, usually, with the synovial membrane, it is so close to it that it must be handled very cautiously. In the popliteal space is the bursa beneath the semi-membranosus muscle. It rests on the internal condyle of the femur and the inner head of the gastrocnemius. It so frequently communicates with the interior of the knee that a puncture of, or an incision into, it must be considered as probably equivalent to a wound of the knee joint. The orifice of connection is, no doubt, often small, but there are no means, generally, of ascertaining what the size of the opening really is. There is a bursa lying beneath the tendons of the sartorius, gracilis, and semitendinosus as they pass round the inner side of the head of the tibia. It has no connection with the joint.

In the neighbourhood of **the ankle** the only bursa constantly present is that beneath the insertion of the tendo Achillis into the back of the os calcis. It is not very rarely enlarged. It is wide of the joint. Bursæ are occasionally met with in connection with the peroneal tendons, or with those which pass round the inner ankle. They do not involve the articulation.

The diseases to which bursæ are liable are chiefly of an inflammatory type, and are often produced by mechanical injury. In many cases, owing to repeated attacks of slight inflammation, they become considerably enlarged, and their interior becomes occupied by fibrinous exudation, as in the ordinary instance of an enlarged bursa patellæ. At the same time, owing to slow deposition and organisation of fibrin on its inner surface, the wall becomes thickened and indurated. In some instances the process gradually leads to the obliteration of the cavity of the bursa, and its conversion into what is virtually a lowly-organised fibrous tumour. Sometimes the bursa remains as a thick-

walled sac, containing shreds and ragged fragments of fibrin, which are gradually converted, by pressure, into "melon-seed-like bodies," and which, under the microscope, present merely a granular or dimly fibrillated structure; or the fibrin may become organised into tendinous cords or bands. In other cases bursæ become acutely inflamed, and constitute tense and very painful swellings, attended, as in the instance of the bursæ over the olecranon and the patella, with inflammation of the surrounding skin. Bursæ are also the seat of inflammation of either tuberculous, or rheumatic, or gouty character. These affections, especially the latter, are attended with excessive pain, and entirely prevent the use of the limb. I recently saw a patient who, two days after he was attacked with acute gout in the right great toe, was seized with intense pain in the left heel. On examination, I found the inflammation was situated in the bursa beneath the insertion of the tendo Achillis; the tendon itself was normal. I have also seen acute gout of the bursa under the ligamentum patellæ.

Sometimes bursæ are affected with syphilitic disease. The following is an example: A patient three years ago in the out-patient department of St. Bartholomew's Hospital had a large, hard, irregularly-lobed swelling over the great trochanter of the femur, together with tertiary eruption and a node on his tibia. The swelling subsided gradually under the use of potassium iodide in ten-grain doses, at the same time that the node and skin eruption disappeared. The bursæ most liable to syphilitic inflammation are, besides the subgluteal just mentioned, the bursa patellæ and those over the olecranon and the tuberosity of the ischium. If the enlargement is recent, it will subside under the influence of potassium iodide. But when the walls have become much thickened, excision is usually the best treatment. In other instances bursæ are the seat of tuberculous

disease. The so-called compound palmar ganglion is, in many cases at least, of this character.

In another group of cases, bursæ become distended when effusion takes place into the joints with which they communicate. This is best seen when the bursa under the semimembranosus in the popliteal space enlarges as fluid collects in the knee joint. In some of these instances the condition of things is at once apparent; the joint is obviously distended, and fluctuation between the joint and the bursa can be distinctly felt. In other cases, however, the joint may be so little swollen that the fact that it is involved, and that the bursa is filled from it, may be overlooked, unless care is taken, with the result that a diseased joint is unwittingly opened.

Treatment.—Counter-irritation either by blisters or the biniodide of mercury ointment, pressure, evacuation, or evacuation and pressure combined, are methods of treatment which are uncertain and often useless. To obtain a satisfactory result some more radical proceeding must generally be employed. In dealing with bursæ unconnected with a joint, Morton's fluid may be injected, or a seton of two or three strands of sterilised silk may be passed through the sac and left in position, under an antiseptic dressing, for twenty-four or forty-eight hours. Suppuration will not occur unless the seton is left in place too long; but by the organisation of coagulable lymph the cavity will be obliterated. This plan will sometimes succeed with such bursæ as that over the patella if the walls have not become much thickened. But in subjects whose general health is sound, and who suffer material inconvenience either from the size of the swelling or from recurring attacks of inflammation, the best course is to remove the sac. I have, in the course of the last few years, adopted this course on several occasions. For example, a bursa, holding about two ounces, connected with the tendons

which pass round the inner side of the knee to be inserted into the tibia, was treated in this way. A thick-walled bursa over the tuberosity of the ischium was dissected out, and in two cases, one of a woman of 27, and the other in a man of 54, bursæ beneath the semimembranosus were excised. In the man, the bursa contained nearly three ounces of glairy fluid, and formed a large swelling in the popliteal space. It proved to have a wide orifice of communication with the knee joint. When its neck had been divided the edges were brought together, so that the cavity of the joint was shut off. The wound in both these cases healed by primary union. As the treatment of this bursa by other means is usually unsatisfactory, removal under full antiseptic precautions seems the best proceeding. Should distension of a bursa, however, be secondary to disease of the joint with which it communicates and into which effusion has taken place, no operative treatment should, of course, be adopted.

When bursæ, as the result of repeated attacks of inflammation, have become converted into what are virtually fibrous tumours, or when, though they still form a considerable cavity, their walls are thick, they should be dissected out. The operation for the removal of the bursa over the patella must be performed with care, for where the bursa projects laterally, so as to pass beyond the sides of the ligamentum patellæ, a situation in which the joint capsule is extremely thin, the articulation will be opened if the knife is used at all freely. There is, indeed, a tradition that a surgeon, when he had completed the removal of the bursa, discovered that he had removed the patella also.

When bursæ are inflamed, they must be opened as soon as matter has formed, as indicated by increased swelling, pain, and tenderness, by the appearance of inflammation of the skin, and by the occurrence of dusky redness, œdema,

and pitting of the surface on pressure. In cases of doubt, an exploratory puncture with a large hypodermic syringe should be made. If incision is delayed, the distended sac will give way subcutaneously, and pus, unable to make its way to the surface through the thickened integument by which bursæ are generally covered, will become extravasated into the neighbouring areolar tissue, and lead to widespread cellulitis. Every year cases are seen in the hospitals in which, from the rupture of an over-distended bursa patellæ, the whole vicinity of the knee has become the seat of diffuse suppuration, rendering extensive incisions necessary, and producing a condition of parts from which recovery is always tedious and slow.

Should it be suspected that enlargement of a bursa is of syphilitic origin, potassium iodide, alone or in combination with mercury, should be prescribed; or, if the sac wall is very thick, the swelling should be excised.

CHAPTER XIV.

ON THE FORMATION OF CYSTS IN CONNECTION WITH THE JOINTS.

The above forms the title of two excellent papers by Mr. Baker,* in which the author describes a group of cases which had not previously attracted the attention they deserve. Cysts may be developed in connection with the joints in various circumstances.

Hernial protrusions.—1. Sometimes, in a joint which is perfectly healthy, a small bud, or hernial protrusion of the synovial membrane, may occur through some weak spot of the capsule. A woman of 20 was lately in the hospital with an irregularly-lobed elastic swelling, as big as half a walnut, situated over the outer aspect of the knee joint, about an inch behind the external border of the ligamentum patellæ. It gave no pain, and had been slowly increasing for about three months. It was found to consist of a pouch of synovial membrane protruding through a narrow opening in the capsule, and containing glairy fluid. When defined by a careful dissection, the neck was tied with fine silk, and the sac was removed. The wound healed by primary union.

2. *Cysts in osteo-arthritis.*—A patient, aged 53 (I quote from Mr. Baker), was admitted under Mr. Holden in 1875, having a month previously noticed a swelling in the calf of his right leg, especially prominent at the upper and inner part, three or four inches below the knee. This was punctured by the house surgeon, under the belief that, as there had been redness and tenderness, it was an ordinary abscess

* St. Bartholomew's Hospital Reports, vol. xiii. p. 245, and vol. xxi. p. 177.

in the calf. A greasy fluid, containing flakes of lymph, but no pus, escaped. Suppuration followed the puncture, and the knee joint a few days later became tensely distended, and, on pressure being made over the articulation, fluid escaped from the puncture. It was thus evident that a free communication existed between the joint and the cyst in the calf. The fluid discharged consisted of pus mixed with synovia. Subsequently the material flowing from the opening resembled synovia. The wound slowly healed, and the patient left the hospital a month later, with the knee somewhat flexed and stiff. On examining him at the end of a month from that date, Mr. Baker found the joint in a condition of osteo-arthritis. There was some swelling; flexion and extension could be performed through a considerable range; there was grating on movement; and the ligaments were weakened or in part destroyed, so that the tibia admitted of free rotation. The joint was so weak that the patient could not walk on it.

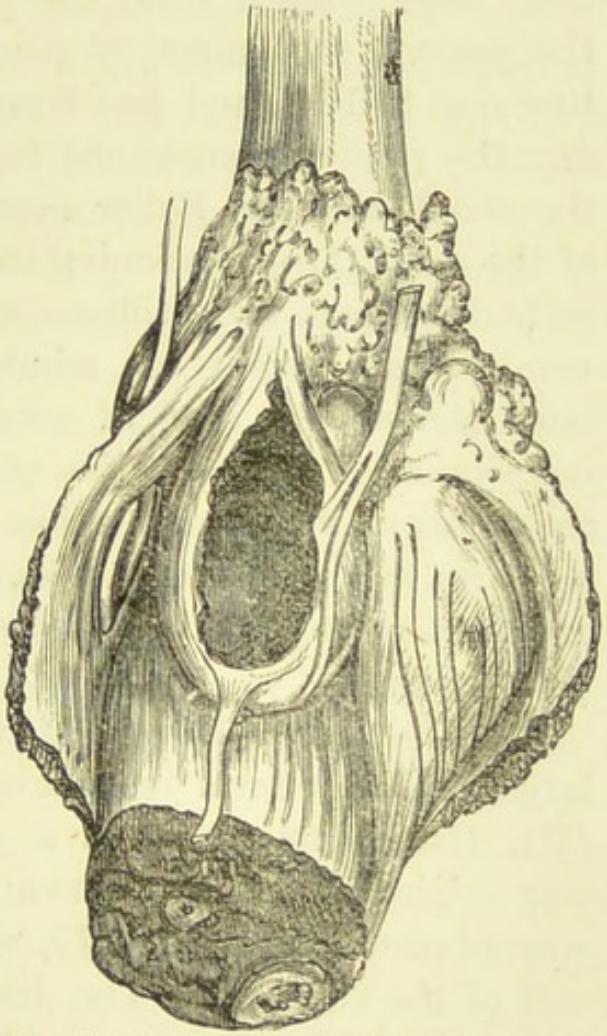

Fig. 24.—Cyst in the Popliteal Space connected with the Knee Joint. (From specimen, No. 1205*a*, in the Museum of St. Bartholomew's Hospital.)

In his second paper Mr. Baker recorded the formation of similar cysts in the neighbourhood of the shoulder, elbow, and hip. A man, aged 24, had a swelling about as

large as a hen's egg in the middle of the arm in front of the biceps. This, which had the appearance either of a cyst or a chronic abscess, was punctured. About two ounces of fluid, straw-coloured, and mixed with curdy lymph, escaped. For three or four days a good deal of clear fluid drained from the puncture. On the fifth day the patient complained of pain in the arm, his temperature rose to 104°, and pus flowed from the wound. Next day the patient complained for the first time of pain in the shoulder. Mr. Baker now suspected the real nature of the case. On questioning the patient, it transpired that he had felt pain and stiffness about the shoulder joint for many weeks before his admission. About two months later the patient died of cerebral disease. No detailed description of the dissection of the limb was recorded, but there was no doubt at the time that the synovial fluid had made its way from the shoulder joint to the middle of the arm by tracking in the course of the long tendon of the biceps muscle.

3. *Cysts in Charcot's disease.*—Cysts, often of very large size, may form in Charcot's disease. The following (Mr. Baker's first case) is a good example (the patient was originally under my own care):—Mary B., aged 38, was admitted in July, 1873, with a large swelling in the calf of the right leg. The limb was slightly œdematous, the superficial veins were dilated and tortuous, and the leg from the ankle to the knee was twice as large as its fellow. The swelling was nearly uniform, but was especially marked in the calf, where deep-seated fluctuation could be detected. There was some effusion into the knee joint. The patient complained of very little pain or tenderness in the limb. She said that the swelling had commenced after a slight injury five months previously, and had continued slowly to increase. Two or three days after her admission I punctured the swelling

in the calf with a fine tubular needle, and drew off several ounces of a translucent, pale red, viscid, alkaline fluid, containing chlorides, and a large amount of albumin; but neither pus nor blood. Considerable thickening of the upper part of the calf remained. The fluid quickly reformed beneath the gastrocnemius, but then gradually diminished again, so that in September it was noted that there was "still some thickening in the upper part of the calf." From the date of her admission the patient was unable to retain either urine or fæces. Towards the end of September she was discharged, but it was observed that the knee had gradually become much swollen, and that the leg had assumed a position of abduction and eversion. In August, 1874, the patient was admitted under the care of Mr. Baker. The swelling of the knee had to a great extent subsided; but after a fall, two months before her admission, the leg had been "out of place," and had become loose, and quite useless. There was little pain. The tibia was now dislocated outwards and backwards, and the leg was loose and flail-like, so that it could be replaced in fair position, though deformity returned as soon as restraint was removed. The synovial membrane was very much thickened; the bones grated as if the cartilage was lost; there was no tenderness or pain even on free movement. The whole extremity was wasted. No trace of the former swelling of the calf could be detected. In January, 1875, the limb was amputated. On dissection the joint surfaces were found denuded of cartilage, eburnated and "lipped" at their margins. A cyst containing four ounces of curdy pus was found beneath the popliteus muscle (Fig. 24). Portions of the cartilage that remained were soft and pulpy. The ligaments had been almost entirely destroyed. The synovial membrane was thickened. The joint contained a considerable amount of viscid fluid.

4. *In tuberculous disease.*—A man, aged 40, was in St.

Bartholomew's Hospital, under the care of Sir W. Savory, in 1885, with a fluctuating swelling on the inner side of the elbow, about an inch above the internal condyle. This swelling, which was somewhat larger than a pigeon's egg, was fixed to the deeper structures. The elbow could not be extended beyond an angle of 120°, nor fully flexed. The swelling had been first noticed about six months previously, and had so rapidly increased that the patient at once applied as an out-patient. The limb was placed on a splint. By continued rest the joint so far improved that the patient returned to work; but a week before his second admission he again noticed pain and swelling, and the arm could not be extended. A few days after he came in, the tumour was punctured and about three drachms of thin, glairy, and curdy fluid escaped. At the time the swelling almost disappeared; but as, a few days later, it had reaccumulated, another opening into it was made, when some yellow glairy fluid escaped. The patient shortly afterwards left the hospital, wearing a plaster-of-Paris bandage. In July, 1886, he returned to the hospital. The elbow joint was found to be extensively diseased, and Sir W. Savory performed excision. At the operation the synovial membrane was found to be the seat of tuberculous disease. The ligaments were softened and the cartilages destroyed by ulceration.

Mr. Norton* has described "gangliar disease of joints." In this affection, in a woman of 40, he observed a large ganglionic swelling extending from the wrist, on the dorsal aspect of the limb, to the middle of the fore-arm. There was evidently fluid in the wrist joint; the hand hung down and the patient was unable to raise it. As the disease was increasing, and the hand was quite useless, Mr. Norton performed amputation. On examination he found that the large ganglionic swelling extended into

* *British Medical Journal*, 1884, vol. ii. p. 413.

the wrist joint. The ligaments were distended so as to allow free lateral movement. All the bones of the carpus were rarefied and so softened that a knife could be easily pushed into their substance. The articular cartilage was thinned. In 1885 I had under my care, in St. Bartholomew's Hospital, a woman, aged 34, both of whose wrist joints were stiff, and distorted with the ordinary features of osteo-arthritis. In both fore-arms ganglionic swellings of considerable size, and apparently multilocular, extended for some distance on both the palmar and dorsal aspects of the limb. I believe this case was similar to those recorded by Mr. Norton, the important point in each being that the ganglionic swellings communicated with the wrist joint, a connection not present in the instance of the common ganglia associated with the sheaths of the tendons in this situation. Mr. Walsham has lately had under his care in the hospital a child, aged 7, with an affection of the right foot. Seated over the instep were three fluctuating tumours of the size of walnuts, presenting the characters of bursal swellings, but not apparently communicating with each other. On puncturing one of them Mr. Walsham let out the usual glairy fluid contained in ganglia. On introducing a probe, the instrument plainly entered the ankle joint.

The main clinical point in this group of cases, and it is a highly important one, is that swellings presenting the characters of cysts may have an entirely unsuspected connection with one of the large joints, with the result that their puncture may, unless strict means to prevent sepsis are taken, be followed by inflammation of the articulations with which they are associated. Several examples of this occurrence have been recorded, and in some of them amputation has been required. The manner in which these synovial cysts are formed is well illustrated by the case recorded by Mr. Baker (*see* page 178), in which, as the result of disease of the shoulder joint, synovial fluid had tracked its way

along the tendon of the biceps to the middle of the arm. The primary joint disease appears often to be of the nature of osteo-arthritis. It is, however, by no means invariably so. In the case first noticed the affected knee was the seat of Charcot's disease, while in one instance (in Mr. Walsham's case) the patient was a child, and the exact nature of the affection was obscure. In Sir W. Savory's case the affection

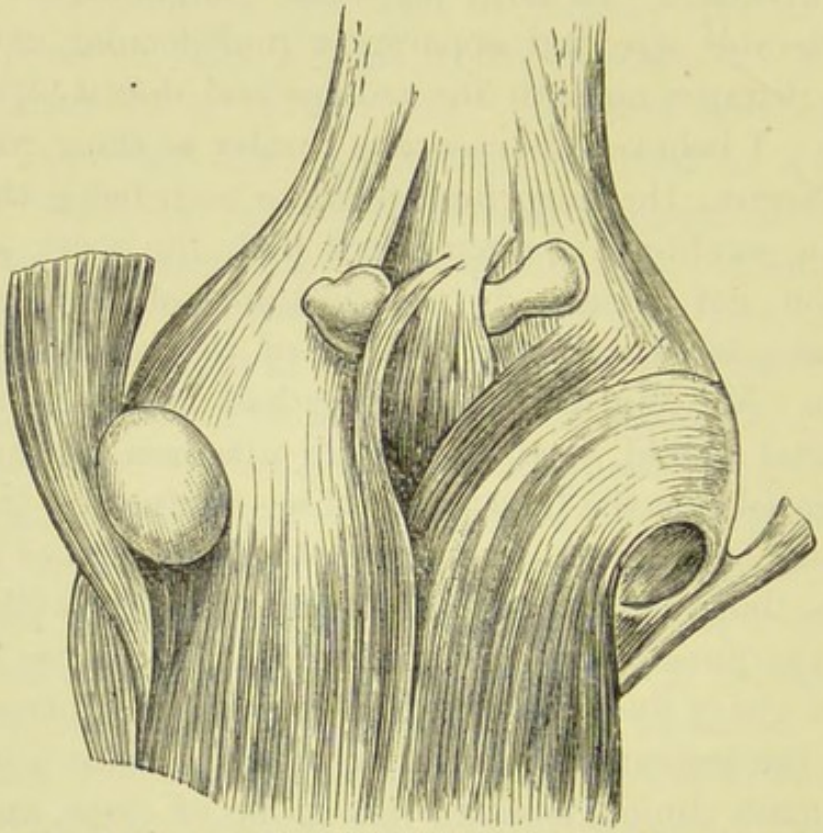

Fig. 25.—Cysts connected with the Knee Joint. (After Billroth.)

was tuberculous. Probably further observation will show that these cystic swellings may be occasionally met with in any instance in which joint disease is attended with chronic effusion into the synovial cavity. The fact to be most carefully borne in mind is that there is often nothing to indicate, or even suggest, the connection of the cyst with the joint, nor any *primâ facie* evidence of joint disease. The cyst may be at a considerable distance from the articulation; there may be no intervening swelling; there may

be no effusion into the joint; there may be, and commonly is, no fluctuation to be obtained between the joint and the cyst, and fluid cannot be pressed from the cyst into the joint. In fact, it is here, as in so many other instances, impossible to avoid falling into a serious error, unless the surgeon is forewarned by having become familiar with these cases, either by personal experience or by having had the advantage of reading such clear and full accounts as those which are contained in Mr. Baker's papers.

In two communications to the Pathological Society * Mr. D'Arcy Power, late Curator of the Museum of St. Bartholomew's Hospital, has given the results of the dissection of several of these "intermuscular synovial cysts," and has discussed the manner in which they originate. In some instances fluid, the result of effusion into the joint, escapes either into some bursa (often in the case of the knee into that under the semimembranosus) which communicates with the articulation, or through a hernial protrusion of the synovial membrane (Fig. 25). In some cases, however, enlargement of the bursa, Mr. Power remarks, seems to precede the joint disease, and to be its predisposing cause. The cysts occurred in the course of tuberculous arthritis, osteo-arthritis, and Charcot's disease, and were met with in all the large joints.

The *treatment* of cystic swellings of this character must have reference, not only to the tumour itself, but also to the joint disease with which it is associated. Fluid may be safely evacuated if the same care is taken that is used in the removal of a loose cartilage, to prevent the introduction of septic agents, and if the limb is maintained at rest upon a splint. The puncture should be made with a small sterilised trochar and canula on the first occasion; but if the fluid is thick and curdy, or if "melon-seed-like bodies" are present, a free incision and drainage may be required. The

* Vols. xxxvi. p. 337, and xxxviii. p. 381.

treatment of the affected joint must depend upon the nature of the case, and can be determined only when a careful diagnosis has been arrived at. It is important to notice that the prognosis, as to the joint itself, is, as a general rule, unfavourable. Setting aside Group 1 (mere hernial protrusion of an otherwise healthy synovial membrane), two of the joint affections in which cysts are developed—osteo-arthritis and Charcot's disease—tend steadily to advance; while in the third—tuberculosis—the mischief, occurring, as it generally does in these cases, in individuals who have reached or passed middle life, repair is very little likely to take place.

CHAPTER XV.

LOOSE BODIES IN JOINTS.

Loose bodies found in joints are of the following kinds:

1. Masses of fibrin condensed and roughly pressed into shape. These are either mere hardened portions of blood clot, or fibrinous concretions derived from inflammatory exudation, and resembling both in their general appearance and in their granular, or dimly fibrillated microscopic structure, the "melon-seed-like bodies" met with in bursæ.

Fig. 26.—Enlarged and indurated Fringe of Synovial Membrane, attached by a Pedicle. (From specimen, No. 713, in the Museum of St. Bartholomew's Hospital.)

2. Blood effused into a synovial fringe may become organised, and form a pedunculated body, which, when its stalk gives way, falls loose into the joint cavity. A few years ago, one of the St. Bartholomew's Hospital football team violently sprained his knee. The accident was followed by synovitis, and when this subsided the symptoms of a loose body in the joint were observed. On proceeding to remove this, Mr. Langton found it attached by a narrow pedicle, which he divided. On examination, the body was found to consist of recently effused blood clot, covered with a layer of synovial membrane.

3. A synovial fringe, or a portion of synovial tissue, may become (whether from injury or some other cause) enlarged and indurated, and is then apt to be caught and drawn out, by the movements of the joint, into a pedunculated body (Fig. 26). This may remain attached, or its

stalk may give way, and it may fall free into the articular cavity. Bodies of this origin consist of connective tissue and fat, often mingled with inflammatory products, and covered with synovial membrane. In some cases, all the symptoms of a loose body are produced by the presence of a small but indurated toughened synovial fringe, which, having lost its power of free gliding, is liable to be caught and pinched between the bones. Two years ago I removed such a fringe from the elbow joint of a man of 30, and

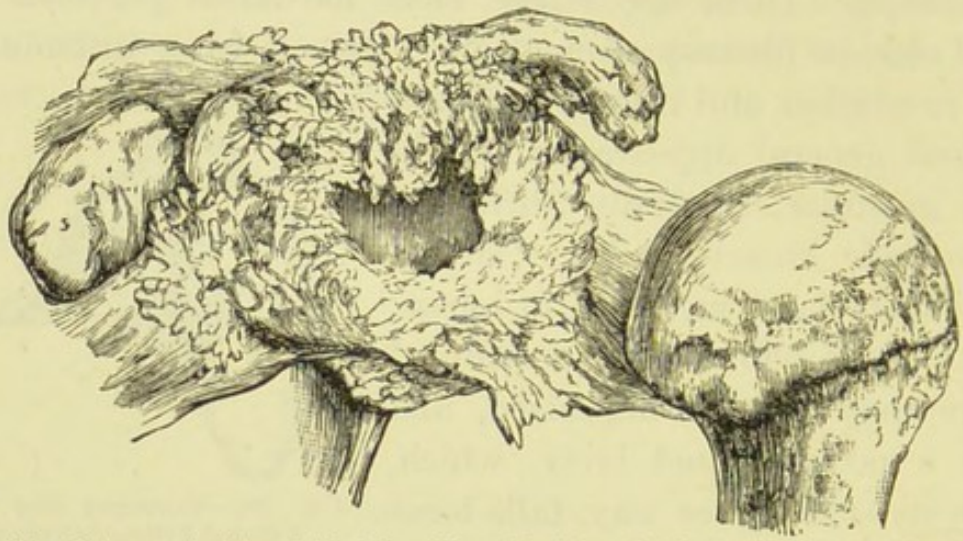

Fig. 27.—Osteo-arthritis of the Shoulder Joint, in which the Synovial Membrane is studded with Tufts, many of which contain Nodules of Cartilage. (From specimen, No. 666, in St. Bartholomew's Hospital Museum.)

Mr. Smith one of like character from the knee joint of a young woman. (*See* Internal derangement, page 198.)

4. The fine villous processes of the synovial membrane normally contain, as Rainey and Kölliker pointed out long ago, a few cartilage cells embedded in their structure. In the course of subacute synovitis of long standing, due either to rheumatism or osteo-arthritis, or provoked by injury, these processes enlarge, and many of them are converted into nodules of cartilage (Fig. 27). These, becoming pedunculated, may be accidentally detached (Fig. 28).

5. Pieces of articular cartilage, with or without a portion of the underlying bone, may, after injury, as pointed

out by Teale, Sir James Paget, and others, exfoliate and drop loose into the joint without the symptoms of inflammation usually observed in cases that end in necrosis (Figs. 29 and 30).

6. Or a piece of cartilage, or of cartilage and some of the adjacent bone, may be chipped off and fall into the joint.

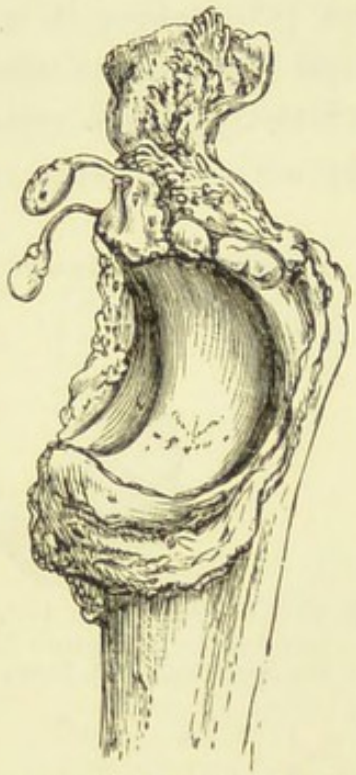

Fig. 28.—Nodules of Fibro-cartilage, attached by an elongated Pedicle. (From preparation, No. 712, in the Museum of St. Bartholomew's Hospital.)

In the museum of St. Thomas's Hospital, specimen D. 110[1] is thus described* by Sir J. Simon:—"*Broken-off bit of condyle loose in the knee joint.* A young man who, in falling, had wrenched his knee, came into St. Thomas's Hospital to be treated for some inconsiderable synovitis which followed the accident, and while under treatment was found to have a loose body in the joint. As soon as all acute symptoms had subsided (about three weeks after the accident) Mr. Simon operated for this loose body, and having removed it, found that it was a broken-off bit of the articular end of the femur covered on one side with its natural cartilage and about the size of a bean." I am indebted to Mr. Shattock for the following report of this loose body:—"The cartilage in Mr. Simon's specimen has every character of healthy articular cartilage, in arrangement of cell-groups and homogeneity of the matrix. There can be no doubt whatever that the loose body is a portion detached from an articular surface."

Mr. Bruce Clarke has recorded the following example:†

* Path. Soc. Trans., vol. xv. p. 206; 1864.

† Path. Soc. Trans., vol. xlii. p. 273.

A man, aged 28, slipped as he was getting upon an omnibus, and struck his knee cap against the edge of the steps. While he was in the hospital, on account of a sharp attack of synovitis, it was found that his internal semilunar cartilage moved freely in every direction. An operation was therefore undertaken to suture it in position. During this proceeding it was discovered that a piece of cartilage from the under surface of the patella had been knocked off, evidently quite recently, so that the subjacent bone was exposed. At this moment the missing piece of cartilage

Fig. 29.—Portion of the Articular Cartilage of the Femur, which exfoliated and was removed by operation from the Knee Joint. (From preparation, No. 721, in the Museum of St. Bartholomew's Hospital.)

was floated up into view and picked out. It was carefully compared with the abraded surface. Into this surface it exactly fitted. Mr. Clarke remarks, "It would appear, if the history of the accident is correct, that the patella was knocked by the step of the omnibus and partially dislocated, so that the cartilage on its under surface was abraded by the edge of the condyle of the femur."

7. Osteophytic growths around the articular borders in osteo-arthritis may break off into the joint cavity (Fig. 32).

8. Mr. Shaw* has published a case in which a loose body was found, on removal, to contain the point of a broken needle. Probably the needle, accidentally embedded in the subsynovial tissue, had, by causing irritation, led to

* Trans. Path. Soc., vol. vi. p. 328.

the formation of the body which had subsequently become detached.

9. Tuberculous loose bodies. — In excising a knee for tuberculous disease, in a girl aged 17, I found five loose bodies in the joint. They were about the size of almonds, glistening, and perfectly smooth on the surface, of a pale yellow colour, and consisted apparently of fat. On examining the section of the femur which had been removed during the operation, I found two similar bodies still attached to the synovial membrane. These bodies were found, after being hardened in alcohol, to consist of a shell or capsule, enclosing a central mass with an intervening space. The capsule was firm, and of the consistence of coagulated fibrin (Fig. 31). The central portion resembled those shaggy masses of fibrin which are often found in bursæ. I am indebted to Mr. Edgar Willett, lately the Curator of the St. Bartholomew's Hospital Museum, for the following report. The outer layer (or capsule) is composed of a uniform collection of granular cells, without stroma, or definite structure The kernel has an imperfect and irregular structure, the most striking feature of which is the presence of a considerable number of well-defined cells, either circular or oval, and recalling at once the look of giant cells found in tuberculous deposits. Although no tubercle bacilli were found, Mr. Willett regarded these bodies as certainly tuberculous. The case is described in the Path. Soc. Trans., vol. xlii. p. 276.

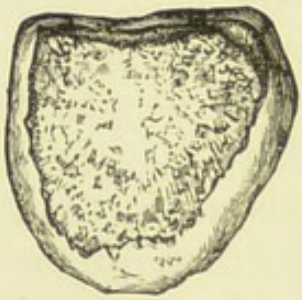

Fig. 30. — Portion of the Articular Surface of one of the Condyles of the Femur. It consists of articular cartilage and a layer of subjacent bone. Removed from the knee joint. (From preparation, No. 722*a*, in the Museum of St. Bartholomew's Hospital.)

In an able and interesting essay on tuberculosis of the bones and joints, Mr. Alexis Thomson remarks that in cases of nodular tubercle of the synovial membrane (as

described by Reidel) pedunculated excrescences and nodular masses, often of considerable size, may project from the surface of the membrane. These, rendered pendulous by the movements of the joint, may at length be detached, and constitute loose bodies similar to those above described.

Fig. 31.—Tuberculous Loose Bodies from a Knee Joint. (From specimen, No. 712*d*, in the Museum of St. Bartholomew's Hospital.)

The number of loose bodies in joints is subject to great variety, and depends on their mode of origin. They are frequently single; but when they are formed in joints affected with osteo-arthritis there may be as many as from six to twenty or more. Abernethy found fourteen in the hip of an old woman in the dissecting room (Fig. 32).

Lately Mr. T. Smith removed 415 bodies from a knee joint; all were of about the size of large peas, and composed of hyaline cartilage; only five or six were attached; the remainder were entirely free in the synovial cavity (Fig. 33).

Mr. Berry has recorded* the case of a woman, aged 22, from whose knee joint he removed 1,047 loose cartilages, exactly resembling those described by Mr. Smith.

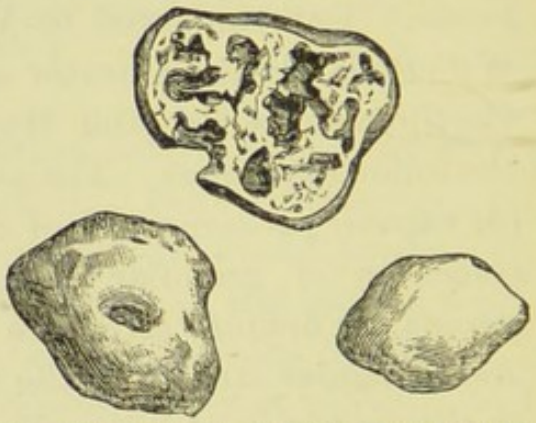

Fig. 32.—Masses of New Bone (Osteophytes) detached from the Articular Margin of the Hip Joint in a case of Osteo-arthritis. The joint, when opened in the dissecting room by Abernethy, contained fourteen loose bodies of this kind. (From specimen, No. 723, in the Museum of St. Bartholemew's Hospital.)

Fig. 32A shows a patella to the inner side of which a pedunculated lipoma is attached. The history of the case is unknown.

* Path. Soc. Trans., vols. xlii. p. 275, and xlv. p. 138.

Symptoms.—It will be clear from what has been said above, that under the name of loose bodies in joints, several forms are included which differ from each other alike as to their origin, the condition of the joint in which they occur, and the degree in which they are movable in the articular cavity. It would, therefore, be expected that the different kinds must present considerable differences in the symptoms to which they give rise. As this is actually the case, it will be best, in the first place, to describe a simple and characteristic example, and then to allude to instances in which the diagnosis may be attended with difficulty.

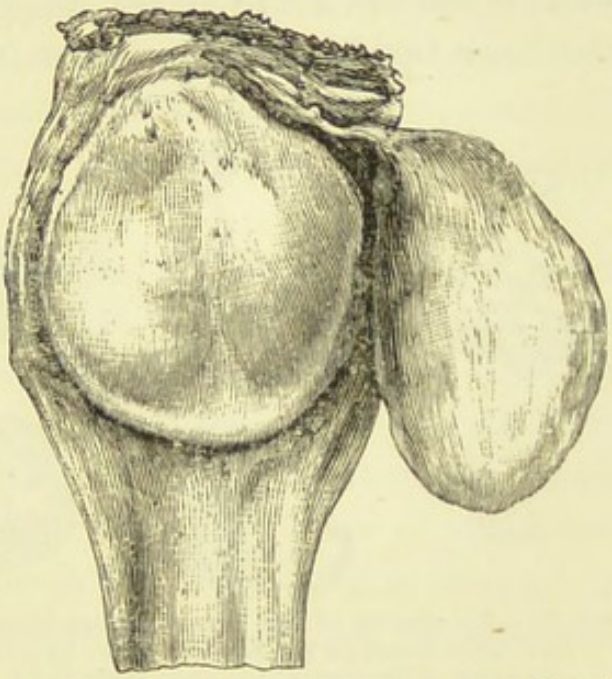

Fig. 32A.—Pendulous Lipoma attached to the inner side of the Patella. (From specimen, No. 716, in the Museum of St. Bartholomew's Hospital.)

In a case in which a loose body derived from a hypertrophied fringe has become detached, and is free in the cavity of an otherwise healthy knee joint, or in which a piece of the articular cartilage has been shed (*see* Fig. 29), the first symptom of its presence generally is that the patient, while in the act of walking, is seized with such intense pain in the joint, coming on as suddenly as if it were due to a blow, that, losing all power in the limb, he falls to the ground, overcome with a momentary sensation of faintness. Sometimes the joint remains freely movable, and the patient is able to walk, when, after a few minutes, the pain has somewhat abated. In other instances he

finds that the joint is fixed in a position of more or less flexion, often combined with rotation of the tibia outwards, while any attempt to move it is attended with great suffering. This fixed condition may remain for some hours, and then on some slight movement suddenly disappears; or it may continue till the limb is subjected to surgical manipulation. The accident is followed by a sharp attack of synovitis, lasting three or four days. On examining his joint when the acute attack has gone off, the patient detects the loose body, and learns that it shifts its position, so that he finds it now in one situation, now in another, while at other times he is unable to discover its locality. On account of the manner in which these bodies change their site, and slip out of reach, the Germans have suggestively called them "joint-mice" (*Gelenk-Mäuse*). The frequency with which the symptoms recur varies in different cases. In some instances the patient feels no inconvenience for three or four weeks, or for several months at a time. Especially is this the case when the loose body is of such a size or shape that it is only in certain movements of the joint that it can be caught. In others, however, the attacks are of more frequent and even of daily occurrence. The symptoms are usually more severe at first than at a later period, when the joint appears to become more tolerant; but, in some cases, the frequent repetition of the injury leads to chronic effusion into the synovial cavity.

Fig. 33.—Specimens of the Loose Bodies found in the Knee Joint in Mr. Smith's case. (From the Museum of St. Bartholomew's Hospital.)

In cases of osteo-arthritis, in which osteophytes become detached (page 188), as the movements of the joint are usually considerably interfered with by other changes, the symptoms are less typical. The patient, however, experiences a sharp and often excessively painful catch or sudden locking of the joint (which becomes fixed against movement in certain directions), and a body that changes its place may be discovered. When several are present, movement of the joint is very painful and restricted, and attended with a peculiar cracking or grating sensation. The patient also complains of a feeling of insecurity in the joint, which often gives way, so that he is in danger of falling.

In some instances, though the symptoms of loose cartilage are well marked, the patient may never have discovered the presence of the body. In such cases all the parts of the joint that are within reach should be very carefully examined. Probably in some instances in which the symptoms are ascribed to slipping of one of the semilunar cartilages (p. 198 *et seqq.*), a loose body is present in some part of the joint at which it cannot be detected. Thus in a specimen in the Museum of the College of Surgeons one is attached by a pedicle to the anterior crucial ligament in a position in which it could not be felt on external examination, but in which it might easily have impeded the action of the joint by becoming nipped between the ligament and the neighbouring condyle of the femur. A gentleman complained that his knee often "caught" and gave him sharp pain; and he could not completely extend it. After a violent wrench of the limb these symptoms entirely disappeared, and a loose body, which, however, caused him no inconvenience, was found slipping freely about in different parts of the joint. No doubt the "catch" experienced was produced by this body, which had been at first attached, but was separated by

the wrench. The symptoms are equally obscure when the body is merely an indurated synovial fringe. Whenever this is pinched there come pain, limitation of movement, and subsequently some synovitis, yet no direct evidence as to the origin of these symptoms will be apparent. But such a condition may be suspected if, between the attacks, the joint is found to be normal in appearance, and if it will sometimes move freely, while at others, during some trivial movement, it suddenly "catches." The patient often knows which movements produce the symptoms, and also how, when it has become fixed, he can disengage the joint.

Treatment.—There are doubtless a certain number of cases in which no operative interference is advisable, *e.g.* those in which either the loose body causes but slight inconvenience, or is easily kept from passing between the ends of the bones by the application of a knee cap or a pad and bandage. The form of apparatus for accomplishing this varies with the case; but that which is most often useful consists of a laced knee cap with a pad arranged to take effect at some point which experience has taught the patient, or the surgeon, that pressure will fix the loose body. In some instances one or other of the knee clamps shown at pages 216 and 217 will succeed. In other cases, especially of osteo-arthritis, the joint may have become so irremediably stiff and crippled that little would be gained by removing any loose body that was detected. In other cases, again, the whole synovial membrane is so loaded with cartilaginous growths that the case is clearly beyond the reach of operative treatment.

In the great majority of instances, however, operative interference is called for, and may be very safely adopted. Moreover, most of the cases of loose cartilage occur in persons between the ages of twenty and fifty, whose joints are otherwise healthy, or at least not extensively diseased,

and in whom, if performed with care, an operation entails very slight risk.

Whatever the operation that is selected, it must be performed with every attainable guarantee against subsequent disturbance of the joint, and against the admission of septic material by the wound. The operator has the choice between two methods: the direct and the indirect. By the first an incision is made directly into the joint, and the loose body is there and then removed. By the second a valvular opening is made into the joint, and the cartilage is slipped out into the sub-synovial fat, and allowed to remain there till the wound of the joint is healed. If it gives no trouble it may be left where it is, or it may be extracted on some later occasion.

The direct method is thus performed:—The loose body must be found, and fixed in the spot at which it is proposed to remove it. It may save disappointment if the trick of fixing the body has been practised beforehand by the assistant to whom this office is to be entrusted. When the patient is insensible, one or two strong sterilised needles in handles should be used to transfix and steady the cartilage. This should now be exposed by a careful dissection, and removed, any bleeding having been stopped before the joint is opened. The wound in the capsule should then be accurately closed with a fine continuous aseptic suture of fine silk. The external parts should also be brought together by sutures passed down to, but not including, the capsule; and an aseptic dressing applied. Should the cartilage accidentally slip away during the operation, it must, when the joint has been freely opened, be either searched for with the finger, or be washed out by a strong current of warm aseptic lotion, introduced by means of a syringe or with an irrigator. If interference with the joint has been free, a fine drainage tube should be introduced for twenty-four hours. A splint should then be

applied to maintain the limb at absolute rest, and the wound covered with an ample aseptic dressing.

The following is the indirect method: a knife, resembling a large-sized tenotome, mounted on a long shank, is introduced at a distance of an inch and a half from the cartilage, and is passed on till its point is in contact with it. It is then moved horizontally in contact with the surface of the cartilage, so that the synovial membrane is opened widely enough to allow the cartilage to pass out. When the surgeon believes that he has effected this, he partially withdraws the knife, and moves its blade in the subcutaneous tissues from side to side, so as to form a large space or pocket, into which the cartilage is slipped. Here it is left, either permanently, or for removal at a later period, as already described.

As to the choice between these two operations. There can be no doubt that, whereas the direct method is, if care be taken to fix the cartilage, a proceeding of no difficulty, the indirect method is not only often difficult, but also uncertain. Surgeons have often failed to remove the cartilage, and have been obliged to discard the operation; and have renewed the attempt, with no better success, at a future period. The great difficulty is to press the cartilage from the synovial cavity into the periarticular fat. This difficulty arises because either the synovial membrane has been imperfectly divided, or a sufficiently large and clean-cut pocket has not been prepared. But even when these points are borne in mind, it often remains very difficult to carry out the operation, and much more injury is inflicted in persistent attempts to complete this proceeding than is involved in the shorter and more manageable direct method. The indirect method is now very generally, and, I venture to add, properly, discarded.

In those cases in which the body is attached, as in Fig. 28, to the synovial membrane, or in which it consists of a

tough fringe, such as is shown in Fig. 26, the direct method must necessarily be selected. When the synovial membrane is studded with many large cartilaginous nodules, so that the movement of the joint is seriously impeded, those masses which are thought to be the source of most trouble may be excised, while others are left for subsequent removal, should this prove necessary. In the after-treatment nothing is required but to keep the limb at complete rest on a splint, and protected by antiseptic dressings, until, and for a week after, the wound is completely healed.

CHAPTER XVI.

INTERNAL DERANGEMENT OF THE KNEE AND OTHER JOINTS.

In a paper which has since become classical, Hey,* as long ago as in the year 1803, described five examples, selected from many he had observed, of what he called internal derangement of the knee joint. The name was a good one ; for, without involving any theory as to the manner in which the condition was produced, it served as a clear heading for the group of cases he had to relate. From a clinical point of view, also, the phrase was appropriate. It exactly conveys what can be seen, and what the patients themselves describe, in many of these cases, namely, that something has occurred in the joint which has reduced it to a condition which may be compared to that of a hampered lock, or, as some have said, to a gate with a stone in its hinge. Such a joint will move freely in one direction ; but in the other, when it has reached a certain point, its motion is suddenly arrested. Very generally the joint is locked in a position of slight flexion and eversion of the leg, so that the limb cannot be completely straightened. The patient can usually walk on the limb, but he does so with an obvious limp.

The idea of internal derangement also well accords with the suddenness with which, on some trivial movement, or slight twist of the limb, the accident may be produced, and equally well with the manner in which, during some trick of handling the joint, or in some casual or unconscious movement, something is felt to slip, or a snap is heard, and the impediment is found to have suddenly and

* "Practical Observations in Surgery," by W. Hey, 1803, p. 327.

completely disappeared. One patient told me his knee was very apt to slip if, forgetting himself for the moment, he crossed his leg over the other while he was sitting; another, that his knee would always slip if he sat on his heels with his limbs abducted; a third that his knee went out if, when the limb was nearly extended, his toe was suddenly turned outwards; and all these patients knew exactly by what equally slight counter-movement the lock could be removed.

Hey's account is so concise, and his cases are so well selected, that with the double purpose of paying a tribute to the memory of one of the ablest and most sagacious of English surgeons, and of adding largely to the value of the present chapter, I have drawn up a short abstract of his paper.

Hey remarks, "Though so firmly supported by tendons and ligaments, the knee joint is not unfrequently affected with some internal derangement of its component parts, and that, sometimes, in consequence of trifling accidents. In cases unattended with contusion, the joint, in respect to its shape, appears uninjured; at most the ligamentum patellæ appears rather more relaxed than in the sound limb. The leg is readily bent or extended* by the hands of the surgeon, and without pain to the patient. At most, the signs of uneasiness caused by this flexion and extension are slight. But the patient himself cannot freely bend or extend the limb in walking; he is compelled to walk with an invariable and small degree of flexion. Though the patient is obliged to keep the leg thus stiff in walking, yet in sitting down the affected joint will move like the other."

* My own experience does not confirm this statement. As a general rule, so long as the displacement is present, although under passive movement the limb can be flexed, it cannot be fully extended. When it is found, under manipulation, that full extension can be effected, it will prove, when the patient tries to walk, that the displacement has been corrected.

The condition, Hey believed, is dependent on some alteration which "prevents the condyles of the femur from moving freely in the hollow formed by the semilunar cartilages, and articular depressions of the tibia. An unequal tension of the lateral or cross ligaments of the joint, or some slight derangement of the semilunar cartilage, may probably be sufficient to bring on the complaint."

Case 1.—Hey's first case has already passed its centenary, for it occurred in 1782. A gentleman, while turning himself in bed, felt a sudden pain at the insertion of the biceps into the head of the fibula, and that tendon seemed rather on the stretch. In other respects the joint appeared perfectly natural. When Hey examined the knee he could bend and extend the limb as freely as the sound one. There was no swelling in any part of it. There was no protrusion of the semilunar cartilage. The patient had twice before had similar lameness, which on both occasions had left him instantaneously. After walking a few steps, and while he was talking to Hey, the patient suddenly cried out, "I am quite well!" and immediately was able to walk without the least degree of lameness.

Case 2.—In 1784 a young lady, while standing on one leg, and stretching forwards to lift a child, strained her knee, as she supposed, and became immediately lame. Five or six days later, Hey, on comparing the two knees, could find no difference, except that when the limbs were placed in a state of complete extension, the ligament of the patella of the injured joint seemed rather more relaxed than the corresponding ligament of the opposite side. Passive movement caused no pain; but the patient in walking could neither fully bend nor fully extend the knee; and she walked with the limb bent, and with pain and a considerable limp. Placing the patient on a high seat which had nothing underneath it to prevent the leg from being fully flexed, Hey, after he had extended the limb,

suddenly moved it into full flexion. After repeating this movement (extension followed by complete flexion) he found the patient could immediately walk without lameness. Three days later she danced without inconvenience or receiving any injury from the exercise.

Case 3.—Two years subsequently the young lady produced the same injury in rising hastily out of bed. After the lameness had continued about a week, Hey was again consulted. His method of treatment described above was made use of, with the same immediate success.

Case 4.—A schoolboy, while climbing into a chaise, had his leg caught in the wheel and his knee was severely twisted. The joint swelled and became very painful, but after a week's rest in bed he was able to move about. From this time he could run, but it was in a very awkward and imperfect manner, for he could not put his foot flat upon the ground. He was obliged, in walking, to rest upon his toes whenever he raised the sound limb from the ground, and to keep the knee a little bent, being incapable of extending the limb in a progressive motion. "A person, observing the manner in which he performed this exercise, would have thought his knee to be stiff; yet there appeared to be no rigidity in the joint when it was moved by the hands of another person while he himself sat in the chair." Hey saw the boy a fortnight after the accident. He extended, and then bent the limb to a considerable degree, repeating the operation twice or three times. The patient was enabled immediately to walk naturally, and in a few days regained the perfect use of his limb.

Case 5.—A clergyman fell from his horse, and bruised his knee. A violent pain was brought on, which continued for an hour and a half, and the joint became stiff and discoloured. In a week the swelling subsided. "At the end of a month his power of walking was not at all increased, yet the injured knee appeared like the other. I could bend

and extend the limb without difficulty, and without giving him pain; but when he walked he could give the joint no motion by the natural effort of the muscles. He walked, to use his own expression, 'as if he had no joint in his knee.' I extended and bent the joint with rather more force than I had used in the preceding cases; yet on a first trial he could not use the joint as well as I had wished. I repeated the operation after an interval of a few minutes, and he immediately regained the power of walking as well as usual, except that he felt a little weakness for a few days."

Such is Hey's account of this accident, and subsequent observation has confirmed the general accuracy of his description.

In the following paragraphs I shall first relate, and remark upon, a selection from the examples which have come under my own observation, or which I have found recorded—including varieties of the accident not known to Hey—and then the general question of treatment will be discussed.

Simple displacement :—

Case 1.—Mr. Todd White relates * the case of a man, aged 33, who, after kneeling for some time on the floor, in a posture as "if sitting on his heels," was seized while in the act of rising with sudden and severe pain in his right knee, and found that he was unable to straighten his limb. Three days afterwards Mr. White saw him. The knee could be considerably bent, and there was no swelling; but any attempt to straighten it caused great pain. There was great tenderness over the inner tuberosity of the tibia; none over the outer. When the patient was under an anæsthetic the limb was bent and then forcibly extended, at first without result; but when this movement was repeated (the thumb being firmly pressed over the tender point) a slip was felt, and the limb was found to be again freely movable.

* *Lancet*, 1856, vol. i. p. 11.

Case 2.—W. R., aged 33, slipped off a plank a few inches from the ground and wrenched his knee. He immediately found that the joint was locked in a partially flexed position, and that any attempt to straighten it gave him severe pain. The displacement was corrected by flexion and rotation of the tibia inwards and outwards on the femur, followed by extension. Two years later, when he was superintending the building of a house, and as he was stepping across some rafters, his foot slipped, and the knee again became locked in a bent position. I saw him two days later. The knee was flexed at an angle of about 110°, and any attempt to walk upon the limb produced severe pain. He had no power of moving the joint. When he had taken ether I completely flexed the limb, and rotated the tibia on the femur; but, on attempting to straighten the limb, I found the joint was still locked against full extension. On repeating, however, the movements of full flexion and rotation, followed by extension, a sharp snap was heard, and the limb was then found to be freely movable. On recovering from the ether the patient could move the limb in a perfectly natural manner. A year later there had been no return of the displacement. I am unable to say which cartilage had slipped in this case.

Case 3.—I have notes of a case in which a young lady at a dancing lesson was reprimanded for not turning her toes out sufficiently, and was made to stand at the end of the room with her heels together and her feet strongly everted. Being ordered by the master to turn the toes out still farther, in making the effort to do so she felt something give way, and suddenly fell to the ground, having dislocated her internal semilunar cartilage.

Laceration of the normal attachments, followed by displacement :—

Case 4.—There is in the Museum of St. Bartholomew's

Hospital a cast (Fig. 34) representing displacement of the internal semilunar cartilage. Over the situation of the cartilage there is a deep depression. The man had been knocked down, and had fallen with his knee bent under him, and from that instant was unable to bear any weight on the limb. During an examination of the limb, whilst the knee was bent to its utmost, a sudden snap was heard; the depression on the inner side of the joint disappeared, and free mobility was restored.

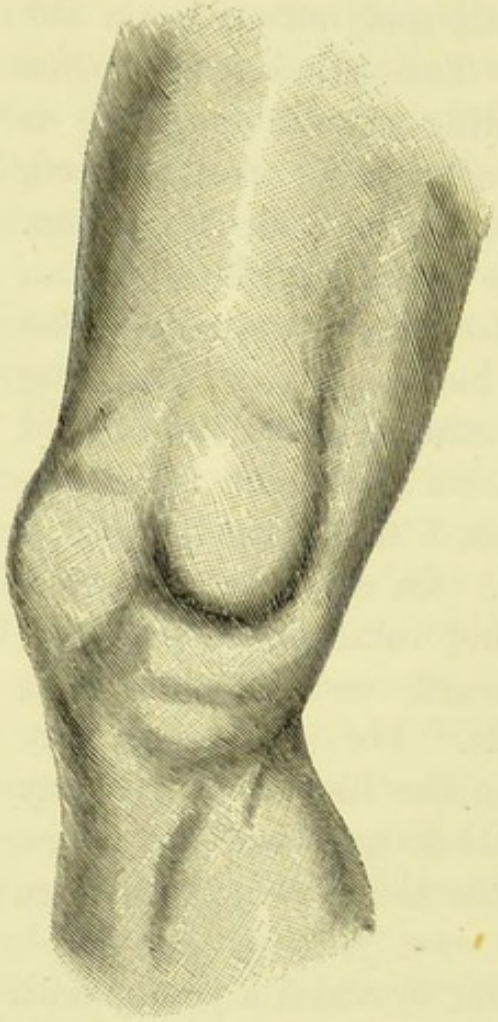

Fig. 34.—Displacement of the Internal Semilunar Cartilage of the Knee Joint, with the formation of a deep sulcus in the skin, indicated by dark shading.

Case 5.—Sir William Fergusson* found, in a subject brought to King's College for dissection, "that one of the semilunar cartilages had been torn from the tibia throughout its whole length with the exception of its extremities, so that during flexion and extension it occasionally slipped behind the articular surfaces. The cartilage was flattened on its outer margin, and when it passed behind the condyle of the femur seemed to fit to the articular surfaces as accurately as the internal cavity does in the natural condition of the parts."

Fergusson does not state which cartilage was thus displaced, nor is there anything in his description to settle this point.

* "Prac. Surg.," p. 360. 4th ed. 1857.

Case 6.—Dr. Reid* exhibited a specimen, taken from the body of a patient who died in the Edinburgh Infirmary. His history could not be traced. While in the Infirmary he had made no complaint of his knee, nor did the nurse remember to have observed any limp in his walk. The fibrous tissue connecting the outer margin of the external semilunar cartilage with the edge of the tibia was torn through in its anterior half, and the semilunar cartilage was found thrown inwards and backwards, and placed between the spine of the tibia, the posterior crucial ligament and the posterior ligament of Winslow. The transverse ligament was entire. The cartilage itself was considerably flattened and broadened, and the remaining portion of the fibrous tissue connecting its outer margin with the tibia was much thickened, and had assumed somewhat of a fibro-cartilaginous appearance. The motions of the articulation seemed sufficiently free, as far as could be judged in the dead body.

Case 7.—Mr. Godlee exhibited a specimen at the Pathological Society† found by Professor Thane in an old anatomical preparation at University College, in which the external semilunar cartilage was displaced. The cartilage had been torn away, at its circumference, from its attachment to the capsule of the joint, and had become displaced inwards, so that it lay in the notch between the two condyles of the femur. The displacement, Mr. Godlee remarked, must have occurred some time before death, for the cartilage remained stiffly in its abnormal situation, and appeared to have somewhat shrunk from its natural size; it was also obviously flattened by the pressure of the inner part of the condyle. A drawing accompanied Mr. Godlee's description of this specimen.

Case 8.—A labourer, twenty-one, was under Mr. Lucas at Guy's Hospital in 1879. He stated that two

* *Edinburgh Med. and Surg. Journal*, vol. xlii. (1834), p. 377.

† Path. Soc. Trans., vol. xxxi. p. 240.

years before, in an attempt to get out of a hole in the ground, he had thrown the whole of his weight on the inner side of his right leg and foot, and had thus injured his knee. He was weak in the joint for some weeks afterwards, but felt no permanent ill effects. Three weeks before applying at the hospital he twisted his knee in descending a ladder. The joint, he said, became suddenly locked, so that he lost power in the limb. He complained of little pain; but on flexing and extending his joint a curious phenomenon occurred. When the knee was about half flexed, the leg and foot moved inwards with a sudden jerk, and at the same time a projection occurred on the outer side of the patella, which could be seen and felt. On extension the leg and foot jerked suddenly outwards, and the semilunar cartilage went back into its proper place. The joint was enclosed for four months in plaster of Paris, and subsequently treated by passive movement. At the end of six months after he was first seen the patient was discharged, the movements of the joint being free and smooth, and there being no longer any tendency to displacement. Mr. Lucas believed that "when during flexion the leg and foot received a sudden twist, and a shock was communicated to the hand, the convex part of the external condyle of the femur had slipped behind the posterior rim of the semilunar cartilage; and that when, during extension, the leg became straight with a similar, though less evident jerk, the condyle had slipped back over the cartilage, and the parts had resumed their normal position." *

Case 9.—A girl, aged 14, overbalancing herself as she was seated in a dogcart in rapid motion, had her leg caught in the wheel and her knee violently wrenched. The accident was followed by severe pain, and considerable ecchymosis and swelling of the joint. She was confined to bed

* *British Medical Journal*, 1879, ii. p. 774.

for a fortnight, but then she was able to walk, and, a few days later, appeared to have recovered. As soon, however, as she began to use the limb actively, she found that her knee frequently "slipped." Thus, when she was walking upstairs, or even, as was often the case, on level ground, the joint suddenly gave way under her, so that she nearly fell. She had extreme pain, and became unable to bear any weight on the limb. After the "slip" she could sometimes move the limb, but sometimes it was fixed till on some slight movement "something went in," and free motion was restored. The slips occurred sometimes twice or three times in a week; sometimes not more than once in a fortnight or three weeks. After a slip the joint was hot, painful, and swollen for a time, and then it entirely regained its natural appearance. She had been recommended to keep the knee at rest, but latterly she had disregarded this advice, for she found the joint was as likely to slip when she turned in bed, or on any casual movement of the limb, or as she was sitting in a chair, as it was during active exercise. She would sometimes dance all the evening and feel nothing of her knee, either at the time or afterwards, yet it often went out if she moved her limb as she lay on a sofa, or if she crossed the knee over the opposite limb. When I examined the joint, there was nothing abnormal to be observed in it; the patient could freely flex and extend the limb; and it was perfectly cool and free from swelling. She could both walk and run without any trace of lameness. So lately, however, as four days previously, the knee had slipped, and she had been confined to the sofa till pain and heat had subsided. She pointed to the inner side of the joint, in the interval between the femur and the tibia, as the spot at which she felt pain when the slip occurred, but she had never detected any protrusion or any depression in this or any other part of the joint.

Laceration of one of the semilunar cartilages:—

Case 10.—Mr. Brodhurst gives the following case:* A clergyman, aged 25, kicked at a football, and, missing it, swung round, and fell to the ground. On rising he found he could not walk. Six weeks later, and when the swelling of the left knee which followed the accident had subsided, he was still unable to walk except with two sticks. On examination the joint presented a loose body on its inner side, immediately in front of the internal lateral ligament. During the operation for its removal the body was found to be held *in situ* by a small band of ligament. It proved to be three-quarters of an inch in length, and to consist of the anterior portion of the internal semilunar cartilage, retaining in every respect its normal appearance.

Case 11.—In a subject lately in the dissecting room of St. Bartholomew's Hospital a considerable piece had become partially detached from the rim of the internal semilunar cartilage, and was found standing up like a tongue, so that it would have had the effect, when it was nipped between the bones (as it was in certain positions of the joint), of locking the knee. A deep groove on the cartilaginous edge of the femur had been formed, by long pressure, for its accommodation.

One of the cartilages may not only be relaxed in its attachments, but may slowly undergo inflammatory enlargement, so that it becomes a source of mechanical difficulty.

Case 12.—Emma T— is now 27. When she was 14 she fell down some steps, and severely bruised her right knee. After lying on the sofa, however, for two or three days she lost all pain, swelling disappeared, and she thought no more of the accident. Two years later, when, as an apprentice to a draper, she had to stand many hours in the day, she found the knee become painful and swollen. For

* St. George's Hospital Reports, vol. ii. p. 142.

this condition she was recommended to rest the joint. Two years later, the joint, which in the interval had continued weak, painful, and often swollen, began to slip and lock. At first the slip was only to a slight extent, and the knee righted itself spontaneously, and at the moment. But the lock soon became more complete, and she grew into the habit of asking her friends to help her to correct it, and get the joint in. This she found could always be done by "raising the heel and shaking the knee." She presented herself in the out-patient room at St. Bartholomew's Hospital two years ago. The joint was freely movable and quite cool, and nothing abnormal could be observed except on the outer side in the interval between the femur and the head of the tibia. Here, situated in a horizontal position, between the two bones, was a swelling about three-quarters of an inch in length from before backwards, and about half an inch from above downwards, which seemed evidently caused by enlargement of the external semilunar cartilage and thickening of the synovial membrane. When the knee was fully extended this swelling protruded nearly to the size of a ring finger; when the knee was flexed it receded, and was lost sight of, leaving the outline of the joint quite natural. The slip occurred at this period once or twice in every week.

I regarded the case as one in which the external semilunar cartilage had undergone gradual enlargement in consequence of injury, aggravated by over-long standing. The slipping was probably due to the gradual increase of the size of the cartilage, and the stretching of its attachments, which resulted from the manner in which the bones, as they moved one upon the other, forced it out from between their opposed surfaces; while the lock occurred whenever the cartilage, instead of gliding out, was caught between the bones.

The clamp described below (Fig. 36) was applied. From this time, though the joint occasionally gave way to

a slight extent, it never slipped as it had previously done, and no manipulation was required to set it right. She is still wearing the clamp. The joint looks natural except at the outer part, where, as before, when the limb is extended, there is a swelling in the situation of the external semilunar cartilage about as large as a small walnut, embedded in thickened and indurated synovial membrane. On flexing the joint the swelling disappears. She says she has a good deal of pain in the joint, and considerable swelling occurs when she is long on the limb, or after a long walk.

This case appeared to be similar to one recorded by Malgaigne.* The patient was a female who had previously severe inflammation of the joint, which ended in enlargement of the external semilunar cartilage. One day, on attempting to put the limb to the ground she fell down, and Bassius, who was called in, found the cartilage greatly enlarged and projecting outwards. It was reduced by pressure, but required a plaster and bandage to retain it in its place.

A curious condition of the knee, apparently congenital, and depending on very wide slipping of one of the semilunar cartilages in its relation to the corresponding femoral condyle, is sometimes met with.

Case 13.—Many years ago, a girl, aged 9, was under my care at the Hospital for Sick Children for her knees. In the left knee exactly the same phenomenon as that described by Mr. Lucas was observed when the limb was flexed and extended; and the jerk of the leg was accompanied by a dull snap. The right knee occasionally jerked during flexion and extension in the same manner as the left. The condition had been noticed very soon after the child's birth. Both joints were very loose, and the head of the tibia could be moved from side to side on the condyles of the femur when the limb was flexed. I kept the left joint

* Traité des Fractures et des Luxations, 1855, ii. p. 968.

fixed on a splint in the extended position for four months, but without benefit. I then lost sight of the case.

I have seen two other apparently precisely similar cases:—One in an infant (*Case* 14) only a few months old (shown to me by Mr. Thomas Smith), in whom the condition seemed to be due to some congenital abnormality; and one in a boy (*Case* 15) of 12. In this instance the knee clamp (Fig. 36) was applied, and a few weeks later the boy was admitted with an acute attack of synovitis, partly due to his having drawn the strap above the patella too tightly, and having walked about with the knee thus constricted. When the synovitis had passed off, I found that the knee no longer jerked on movement. No doubt the cartilage had become (at least for the time) fixed in its normal position by adhesions.

Thus it will be seen that "internal derangement" must now be regarded as a general term, including many conditions which differ considerably from each other. These are chiefly: (1) mere displacement of one of the semilunar cartilages in relation to the bones between which it lies without laceration—but often with some relaxation—of its attachments (Cases 1 to 4). This condition of relaxation may either be such as is naturally present in those who are "loose-jointed," or it may result from chronic synovitis following injury, or from chronic rheumatism, or osteo-arthritis. (2) Displacement of one of the semilunar cartilages, after more or less wide laceration of its attachments (Cases 5 to 9). This is the most common form, and is frequently met with in football players and other athletes. (3) One of the semilunar cartilages may be extensively lacerated, or even torn completely across, so that it can be felt as a loose body (Cases 10 and 11). (4) The cartilage may become enlarged, and interfere with the movements of the joint (Case 12). (5) Some congenital malformation may apparently exist (Cases 13 and 14). In what this consists, however, I am unable to state, as I know of no dissected

specimen. In some instances the symptoms of internal derangement depend on the presence of an indurated fringe of the synovial membrane, which is caught between the bones.

The joint that is by far the most liable to internal derangement is the knee. I have, however, seen it produced in the elbow by a toughened synovial fringe, and I have heard of the case of a lawyer, whose jaw, at some critical moment in the middle of a speech to the jury, would suddenly slip and become locked, so as to fix his mouth in a half-open and unsymmetrical position. Overtaken by this accident, casting an appealing glance at "my lud" and the gentlemen of the jury, and looking unutterable things at his learned friend opposite, who loaded him with amiable condolences, he would bury his face in the folds of a large handkerchief, with which he was always provided, and rush into the privacy of an adjoining room, whence, having, by a trick he had acquired, got his jaw in again, he would return and continue his address.

In the knee the internal cartilage is involved more frequently than the external; but the latter is, beyond doubt, often concerned.

Age.—The accident is most common in persons between twenty and fifty, but it may occur (in chronic inflammation of whatever form or in osteo-arthritis) in people above this age. It is sometimes met with in children. A few years ago (Case 16), a little girl, aged 9, was under my care at St. Bartholomew's Hospital for lameness of four months' duration, clearly resulting from displaced internal cartilage. The symptoms disappeared on manipulation. I have lately seen a case (Case 17) in a schoolboy of 13.

Diagnosis.—This condition of internal derangement of a joint is apt to be overlooked. (*See* page 213.) Yet its recognition is usually, when care is taken, not a matter of any real difficulty. The symptoms bear a general resemblance to those of loose cartilage, but they differ widely in the various

groups of cases noticed above. The most clearly marked instances are those (Cases 1, 2, 3, 8 and 9) in which a person, on wrenching or twisting his knee, is attacked with sudden and severe pain, and finds his joint is "out," or locked, so that he is unable to straighten it. On examination, nothing to account for this condition can generally be either seen or felt; but sometimes either a depression (Case 4) or a protrusion is detected in the situation of one of the semilunar cartilages. The accident is usually followed by a sharp attack of synovitis, lasting three or four days. When one of the cartilages is torn from its connections, or torn across, the symptoms noticed in Cases 10 and 12 will characterise the injury.

In the less marked examples in which the cartilage, owing to relaxation of its attachments, has a too free range of movement, or in which an enlarged and toughened synovial fringe is nipped between the bones (page 186), the patient states that, although his knee between the attacks is perfectly free, he often finds that it suddenly locks or "catches;" that he feels pain, which is, in some cases, though this is rare, so severe as to induce faintness, or to bring him to the ground, in others only slight; that the lock is only momentary or that it remains till the knee is manipulated; that the "slip" is followed by two or three days of pain, swelling, and heat of the joint. In these instances there is usually no visible displacement. In cases of rheumatic disease, or of osteo-arthritis, diagnosis will turn on the account the patient gives of the sudden "lock," attended with the symptoms I have mentioned. The pain is not always situated in the neighbourhood of the semilunar cartilage, but is felt at the back of the joint or near the head of the fibula.

The cases most apt to be overlooked are those in which the injury which leads to displacement of one of the cartilages is severe enough to induce an acute synovitis; or in which the displacement itself leads to the latter compli-

cation. In such instances, unless the possibility of displacement is borne in mind, the case will be regarded as one merely of synovitis, and the stiffness remaining after the inflammatory attack has subsided will be attributed to this cause. Oversights of this kind are to be regretted. They prolong the time—it may be for several months—during which a person, to whom it is of the first importance to regain the use of his limb (a labouring man, for instance) is allowed to remain crippled; and it drives the patient to a bone-setter, with the result that the movement employed, however rough it may be, is very likely to produce a cure, to the no small discredit of surgery. A gentleman some time since remarked that he wished surgeons would be more careful in the management of their cases. When I asked him to reduce this sweeping complaint to the particular instance he had in view, he said that his gamekeeper had been for a month in a hospital for lameness, and had been discharged no better, and that on leaving the hospital he had gone straight to a bone-setter, who told him his knee was out, and there and then "put it in." When, my censor continued, the man expressed surprise that the doctors did not find that his knee was out, the bone-setter replied, "Oh, doctors understand the big bones, but they know nothing about the little ones"—a remark which seemed to the patient, and also, I found, to his master, a full explanation of what had occurred. From what I subsequently learnt, there seemed no doubt that the case had been one of internal derangement, followed by synovitis, in which the latter complication had led to an oversight of the displacement, which remained to cause lameness after the synovitis had subsided. There was a clear history that the joint had slipped on a previous occasion.

Treatment.—This consists of two parts. First, the reduction of the displacement, when the "lock" persists; and, second, the prevention of a repetition of the accident.

1. As I have already said, in many cases the displacement is only momentary, while in others the patient either knows how to effect reduction himself, or is able to instruct a passer-by how to do it for him. A gentleman told me that sometimes in his country walks his leg "went out," and he had to sit by the roadside till someone came past, and, carrying out his directions, put the joint in for him.

The manipulation most often successful consists in bending the knee to the fullest extent on the thigh: drawing upon the tibia as if to separate the articular surfaces; rotating the tibia on the condyles of the femur inwards and outwards, and then extending the leg upon the thigh quickly, but not with any undue violence. At the same time pressure with the thumb should be made on any part of either semilunar cartilage which seems to be abnormally prominent. Reduction may sometimes be effected without the use of an anæsthetic. In some cases, however, an anæsthetic is necessary; while it is often highly advisable, not only in order to relieve pain, but also to abolish muscular resistance, and so limit the amount of force that is used. The movements described often succeed on the first trial, but they may have to be repeated once or twice; or they may have to be varied, extension being made while the foot is strongly everted or inverted, or while the tibia is abducted or adducted. Instances have been recorded in which reduction could not be effected, though repeated attempts were made. This is easily understood when such cases as 5, 6, and 7, related at page 204, are borne in mind. Still, with the help of an anæsthetic the displacement can very generally be corrected. Should the first trial fail, it should be repeated in a few days, when the joint has become cool. Often when reduction takes place a distinct "snap" is felt or heard. But often, again, this is not noticed, and the reduction of the displacement is known to have been effected only by the disappearance of all resistance to full extension of the leg.

2. In some cases, in which, in a sound joint, one of the cartilages becomes displaced as the result of a strong wrench, or a twist of the leg upon the thigh, but without laceration of the cartilage or of its attachments, the knee, either spontaneously or under manipulation, may go in with a snap, and the displacement may never recur. Very frequently, however, as the result either of more or less laceration, or relaxation of its connections, the cartilage slips from time to time—sometimes several times a day, sometimes only once in three or four months. In these circumstances some mechanical appliance is called for. Rest and lotions are obviously useless. Two clamps have been invented, one or other of which will very generally succeed in preventing the "slip." Neither interferes with flexion or extension of the joint. The first (Fig. 35) consists of a steel band ending laterally in two plates, which, passing from side to side across the back of the joint, clasp the joint and skirt the edges of the patella, a pad being placed beneath the plate, should either of the semilunar cartilages be felt to project. In slight cases this clamp may be efficient. Generally, however, the appliance shown in Fig. 36 had better be used. It scarcely shows if the trouser is cut a little full at the knee. I have used this clamp in a number of instances, and in a large proportion of them it entirely prevents displacement. Some persons have been able to dance and play

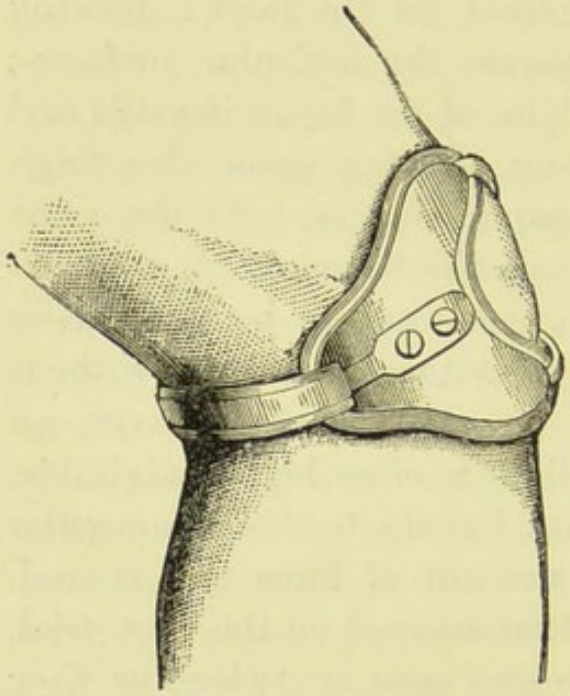

Fig. 35.—Clamp for cases of Displacement of the Semilunar Cartilage.

tennis or cricket in it without inconvenience, and without any renewal of the slip. These clamps are made by Messrs. Spratt and Brooke, of New Bond Street, and by Mr. Ernst, Charlotte Street, Fitzroy Square.

The period during which they must be worn will obviously vary with the case. When displacement has followed partial laceration of the connections of the cartilage, if a renewal of the slip is prevented for six months

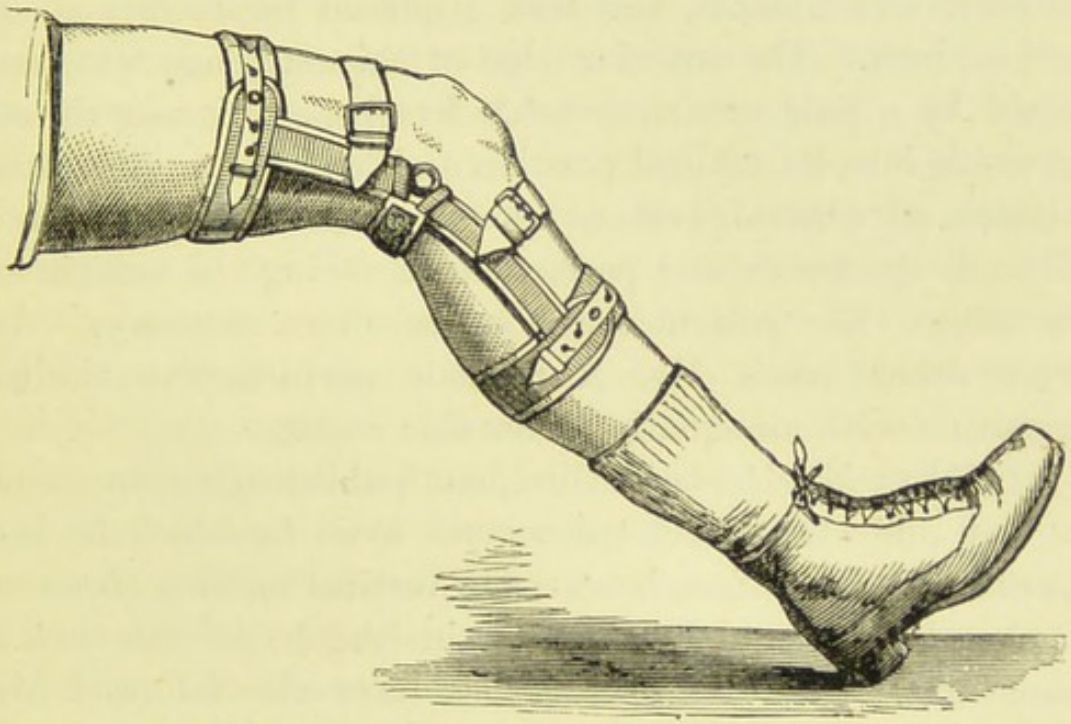

Fig. 36.—Clamp for cases of Displaced Semilunar Cartilage.

the torn structures may heal, and at the end of this time the support may be discarded. The same may be the case when the attachments of the cartilage have become relaxed during synovitis which has passed off. In instances, on the other hand, in which laceration has been extensive, or in which the joint is the seat of chronic change, the clamp may have to be worn for a more extended period. I have known several patients recover after using the clamp for eighteen months or two years.

In cases in which the normal attachments of one of the semilunar cartilages have been extensively lacerated so that

displacement is frequent and such as to cause the patient serious inconvenience, the cartilage should be fixed by suture. This proceeding was introduced by Mr. Annandale, who first employed it in 1883.* "An incision," Mr. Annandale states, "was made along the upper and inner border of the tibia, parallel with the anterior margin of the internal semilunar cartilage. It was then seen that this semilunar cartilage was completely separated from its anterior attachments, and was displaced backwards about half an inch. The anterior edge of this cartilage was now seized by a pair of artery catch forceps, and it was drawn forwards into its natural position and held there until three stitches of chromic catgut were passed through it and through the fascia and periosteum covering the margin of the tibia. The patient made an excellent recovery." In three other cases Mr. Annandale performed a similar operation with an equally favourable result.

In 1889 Mr. Herbert Allingham published a monograph on the subject, and related several cases in which he had operated. He prefers, however, a vertical incision (from an inch and a half to three inches in length) to one that is transverse. Many other surgeons have also followed Mr. Annandale's practice, and during the operation have found the cartilage involved so extensively separated from its normal attachments that no means short of suture could have prevented its continued displacement. There can be no doubt that in aggravated cases Mr. Annandale's operation ought to be performed. If strict asepsis is maintained, the risk involved is very small. The joint is freely opened, the cartilage drawn into place and fixed by one or more sutures to the periosteum and fibrous structures covering the tibia, and the joint is thoroughly irrigated with an antiseptic solution. Generally the wound in the synovial membrane may be closed by fine, continuous sutures of

* *Brit. Med. Jour.*, i. 1885, p. 779; and i. 1887, p. 319.

either catgut or silk; but if the joint has been much disturbed, it is best to introduce a small drainage-tube and to remove it at the end of twenty-four hours. It may be added that in the cases operated on the proportion in which the internal and the external cartilages have been involved has been about four of the former to one of the latter.

Some important cases bearing on the treatment of abnormal conditions of the semilunar cartilages by removal are recorded by Professor Kocher, of Bern.* This author gives three instances of what he terms meniscitis fungosa, or fungous disease of the internal meniscus. In one of these cases, occurring in a man of 65, the disease had lasted nearly nine months, and had obstinately resisted treatment. Effusion into the knee joint was present. The patient was cured by the application of the actual cautery over the swollen and tender meniscus. In the other two patients, one aged 21 and the other 6, the disease had gone on to suppuration and the formation of sinuses. In each case the diseased semilunar cartilage was excised, and the patients recovered with free movement of the knee joint. The recognition of this affection is difficult. In Professor Kocher's cases the most marked swelling and tenderness were not limited to the site of the diseased cartilage, and before the operation the internal condyle of the femur, in one case, and the head of the tibia in another case, were thought to be the main seats of disease. In a fourth case, of thickening of the external semilunar cartilage, in a lad of fifteen, accompanying inflammation of the knee joint, the enlarged body prevented complete extension, interfered with flexion, and caused loud crepitus. Excision of the cartilage was followed by primary union and by good movement of the joint. This case seems to have been similar in its nature to the two instances I have related at page 208.

* *Centralb. für Chir.*, 1881, pp. 689 and 708; and *London Medical Record*, 1882, vol. x. p. 15.

CHAPTER XVII.

ON BONE-SETTING.

CHIRURGERY, or handicraft, began, we may well believe, in attempts to pull-in dislocated bones, to straighten distorted joints, and to restore movement to stiff limbs. In this dawn of the art nothing was known of anatomy or pathology; it was only seen that a limb was bent or stiff, and force was employed to overcome the defect, just as it might be used to straighten a crooked bar, or loosen a rusty lock. Soon, however, the primitive operators of those early days became ranged in two groups, the mere empirics who went straight to the point of trying what force would do, and those who endeavoured to ascertain the nature of particular cases, and the difference between one case and another; those, in other words, who cultivated pathology and diagnosis in order that they might use force with safety and advantage. The results of practice conducted on these different lines can easily be imagined. The empirics, applying force in all cases alike, and thus involving their patients in a mere game of chance, did good whenever such untempered force as they could use was appropriate, and harm wherever it was out of place; while those who used force only when they could see a reason for doing so, and when they thought it was safe, while they did little harm, often, as their diagnosis was very rudimentary, missed an opportunity of producing a cure. Under these conditions the empirics frequently had the best of it. Regular, but as yet very ill-informed, practitioners were so often beaten in their encounters with disease, that they lost credit in the public eye; while the

empirics, making the most of their cures, and not seldom laying the blame of their failures on the surgeon whose previous treatment they alleged had done all the mischief, were credited with powers that approached the miraculous. And we can understand their success, for every surgeon now well knows that instances are common enough in which pain and limited motion, resulting from sprains and other injuries, may at once be set right by even rough and unskilled movements, or, indeed, by an accidental wrench. Of this latter fact some illustrations are given below (pages 228 *et seqq.*).

At the present day irregular practitioners still continue to enjoy no small reputation by curing cases which, though they are a source of great inconvenience to patients, have been passed over by surgeons as too trivial for either careful diagnosis or serious treatment. Thus, although they are much less common than they were ten years ago, such cases as the following are still to be met with. A patient whose shoulder, three or four weeks after an injury, remains stiff and painful, as the result of the formation of slight adhesions around the joint, consults a surgeon. The surgeon examines him, and, finding that there is neither fracture, dislocation, nor inflammation—finding, in short, that there is nothing seriously wrong—prescribes rest and a liniment, and says that all will come right in time. But this is small comfort to a man who can neither dress himself nor raise his hand to his head, and whose rest is broken by pain in the limb. So, having waited in vain for the promised recovery for three or four weeks, or even for six months, he takes the advice of his friends, and goes to a bone-setter. The bone-setter says that the small bone of the shoulder is out, or that the "deltoid has slipped round to the front," and forcibly overcomes the resistance to movement, with the result that the patient finds himself cured, while the bone-setter triumphantly draws his

attention to the snap which occurred when the bone "went in." The conclusion from these plain facts is, in the eyes of the patient, obvious enough. He has, he believes, clear evidence, with every link complete, that the surgeon has displayed great ignorance and the empiric marvellous skill, and he is never tired of relating all the particulars of his extraordinary case. The explanation of such cases, which is very simple, is given at page 229.

Taking much interest in manipulation as a means of surgical treatment, I have been at some pains to ascertain the manner in which bone-setters conduct their practice, and to learn in what cases it is that they succeed. Bone-setters, as would naturally be supposed, are a very miscellaneous group. Some are blacksmiths on the Cumberland hills, or shepherds in the sequestered valleys of Wales. Practitioners of this order, standing in the same relation to surgery that herbalists bear to medicine, have existed in these remote districts from time immemorial. At the other end of the scale are operators of a less unsophisticated stamp. Residing in large towns, and thought, without unwillingness on their part, by many of the public to be qualified surgeons, they equip themselves with the names of the principal bones and muscles, and with a few picturesque medical phrases; they procure a skeleton on which they undertake to show patients the precise nature of their complaints; they employ anæsthetics freely, and make full use of daily passive movements and massage; they apply instruments, and in spinal cases they put on Sayre's plaster-of-Paris jacket. These individuals, however, are in the same position as the most homely of their order in this particular, that diagnosis, properly so-called, forms no part of their system. They merely say that a bone, or one of the "buttons of the back" (their name for the spinous processes) is out; that some muscle, such as the deltoid, has slipped round to the front; or that the fibula

has slipped round to the back. Often, if pressed for particulars, they reply, "I can cure you: what more do you want?" A well-known operator, near London, now dead, used to say, "Don't bother me with anatomy; I know nothing about it;" and in a recent trial a bone-setter who was asked in open court to articulate the tibia with the fibula was unable to do so. This system of throwing all cases into a single class, and treating all alike by wrenching, though it leads to many cures, must, of course, present another side, of which the following illustrations have come under my own observation.

A lady with a very large subperiosteal sarcoma of the lowermost third of the femur was told that her knee was out, and must be put in, and all the preparations for the operation were made, when a surgeon was consulted, and the necessity of amputation was explained.

A man, aged 32, was sent to St. Bartholomew's Hospital for an opinion about his shoulder. I found a large sarcoma of the upper end of the humerus. The patient had been told by a bone-setter, under whose treatment he had been for two months, that his shoulder was out and could be put in as soon as the swelling was reduced by the lotions that were being applied.

In a case of far-advanced angular curvature of the spine in a little girl, the "buttons of the back" were said to be out; the spine was straightened to put the buttons in, and the patient died a fortnight afterwards. I have three times been compelled to amputate tuberculous knee joints which had been forcibly wrenched by a bone-setter, to put the bone in.

Some of the cases, though the treatment does no harm, are equally clear evidence that diagnosis is not a part of the bone-setter's system.

A lady with an enlarged bursa over the tuber ischii was informed that her bone was out, and the part was

manipulated to put the bone in. Another who was suffering from hæmorrhoids and pain about the sacrum, was told that the last bone of her spine was out, and she went through the process of having it put in.

A boy was brought to the Children's Hospital with an old sinus that was discharging near the hip. The mother stated that she wished to have this closed because then she could go back to the bone-setter, who told her that the hip was out, and that when the place was healed he would put the bone in. The case, however, was one in which the hip joint had already been excised.

With these and similar instances before me I wished to investigate the subject a step farther, and I sent three cases to a well-known bone-setter, since deceased, for treatment. None of the three had anything the matter. The first was informed, on showing his elbow, that his ulna was out, and, having paid half a guinea for the consultation, he was told to come back in a couple of days with two guineas, when the bone would be put in. A second was told that his ankle-bone was out, and, having paid his fee of half a guinea, was instructed to come back to have the bone put in. The third received exactly the same opinion, and directions for the operation. The complaints from which patients are told they are suffering are often sufficiently alarming. A young man, suffering from slight lateral curvature of the spine, the result of inequality in the length of the lower extremities, was told that his pelvis had opened and both his hips were out.

Some are disposed to credit the empirics with very skilful manipulations, and, no doubt, they acquire much facility in the mere handling and moving of the various joints ; they know how to seize the limb, with all the art of a wrestler, and at such an advantage that, *coûte que coûte*, all resistance can be overcome. This kind of skill many bone-setters are complete masters of, but it is a skill

limited to the application of mere physical force. This is their strength. Their weakness is that they do not know whether they are applying their force in a suitable or an unsuitable case, in a case of sarcoma or tuberculous disease, or in a case of simple adhesions about an otherwise healthy joint.

That the practice of bone-setters is entirely empirical and independent of diagnosis may seem an unreasonable view to those who have been benefited by their treatment. On this point, however, some evidence has been already given in Cases 1 and 2, related above (page 223). At least, the alternative construction that they knew what these cases really were, and yet proposed to subject the patients to forcible movement, would involve a much graver conclusion. Nor can it be questioned that excellent results may sometimes be obtained by haphazard wrenching and movement. Indeed, many cases might readily be furnished in which forcible movement, entirely fortuitous and unguided by any element of diagnosis, has suddenly produced a cure. A few examples may be shortly stated. A man, aged about 60, after bruising his shoulder and breaking a rib in a fall, was unable to put his hand on his head or to move his arm to put his coat on. Three months afterwards, as he was climbing up to the front seat of an omnibus, he slipped and hung for a moment by his stiff arm, which consequently was suddenly wrenched, so that his elbow was carried above his head. He was in great pain for a few hours, but next day he found that he had recovered the free use of his limb. A woman, after a fall on her shoulder, found the limb so stiff that she could not raise her elbow from her side. One day, about a month afterwards, she slipped as she was going downstairs, and clutched the bannisters. Her arm was wrenched, and, though she had severe pain for some hours, she completely regained the use of the limb. A schoolboy, aged 18, as the result of an injury some years before, had his elbow-joint fixed, so that

he could not extend his fore-arm beyond an angle of 130°. When playing, one of his companions caught him by the hand and jerked him suddenly forwards. He had severe pain at the elbow, lasting some minutes, but when this subsided, he found that he had regained the power of extending his fore-arm, and the stiffness never returned. A patient told me the following highly instructive case. Many years ago, while he was at Harrogate, a gentleman was taking the waters for the relief of pain and stiffness about his shoulder, which was said to be out. While walking in the meadow in which the springs are situated, and which was then surrounded by a hedge and ditch, he was attacked by a cow. In this emergency he endeavoured to escape by taking a running jump at the hedge and ditch. In doing so, he made a spring, and involuntarily carried his arm upwards and forwards, with the happy result of not only escaping from the infuriated cow but of "putting his shoulder in," for, from that time, he regained full power of movement. Who can doubt that this was a case of slight adhesions, ruptured by the sudden movement of the limb, or that the bone-setter would have cured the patient just as the cow did, and with as little knowledge of the condition to which the pain and stiffness were really due?

Undoubtedly a great advance has taken place since the attention of the profession was first pointedly drawn to this subject of forcible movement by Sir James Paget in 1867.* Nevertheless, though many surgeons are fully alive to the value of manipulation, there are some who are still apt to let cases escape their notice which this method would readily cure.

A main influence in checking the use of manipulation has been the impression that the force employed may often do more harm than good. Undoubtedly this is a real

* "Clin. Lect. and Essays," 2nd edition, p. 87.

danger unless care is taken in the selection of appropriate cases. Here, as in so many other instances, everything turns on a proper choice of cases. And the key to this lies in the fact that whenever a joint itself is, or has been, seriously diseased, manipulation is generally either useless or mischievous, for no amount of force can restore the structures to a condition in which they can resume their functions, while any force that is used is apt to provoke a renewal of disease. On the other hand, there are numerous cases in which the joint itself is healthy, or not materially damaged, but the movements of which are restricted by some abnormal condition chiefly affecting the surrounding structures, in the form of adhesions about the capsule, the sheaths of tendons, or the intermuscular connective tissue. These adhesions, although they are sufficient, by the pain they induce on movement, to prevent the use of the limb, are as slight and as easily ruptured as are the adhesions found, *post-mortem*, in cases of recent pleurisy or peritonitis. It is in these cases, and in some other instances given below, that manipulation is so strikingly successful. Indeed, it may be regarded as an axiom that the good to be obtained is, in the great majority of cases, inversely proportionate to the amount of force that is required.

When manipulation is to be employed an anæsthetic should be given for all but the slightest cases. Gas is usually sufficient. By abolishing muscular resistance, and enabling the surgeon to bring the greatly diminished amount of force which is required, when the muscles are relaxed, to bear directly on the obstacle to motion, whatever that may be, anæsthetics have rendered manipulative treatment an entirely different operation from the rough proceedings which in former times were so often followed by unfavourable results. Cases are frequently met with in which force that could be exercised almost with the

finger and thumb, when muscular relaxation has been secured, is sufficient to restore free use to a limb that has been for months entirely disabled by stiffness and pain on any attempt at movement. On the other hand, in those instances in which a joint can be moved only by considerable force, the synovial membrane has been destroyed, and the articular cavity obliterated by fibrous adhesions. Here, although the cicatrix by which the joint is replaced may be torn through, little or nothing is gained. Manipulation, of course, can do nothing to restore the lost synovial membrane or its functions, and the lacerated cicatrix will obstinately tend to reunite, even if it does not, from the violence to which it has been subjected, become the seat of a renewal of active disease. When the supreme importance of differential diagnosis is fully recognised, and the point is realised that in cases which are suitable for this method (and they are of almost daily occurrence in the practice of any large hospital) only very slight force is required, manipulation will reach the position it deserves, and will be regarded as one of the most valuable and most indispensable forms of treatment to be found in minor surgery. It is necessary, however, to observe that a single manipulation is frequently useless. If left to itself, the joint will soon be as stiff as ever. Manipulative treatment must be followed by hot douching and daily massage. The full value of these accessories has met with somewhat late recognition. In many cases they are quite essential to a successful result. When as the result of a dislocation the soft parts around a joint, *e.g.* the shoulder, have been extensively lacerated and firm adhesions have formed, a second, or possibly even a third, movement under gas may be required.

The following are the principal groups in which manipulation should be practised :—

1. Cases in which, after sprains or other injuries,

adhesions have formed around a joint which is itself in a healthy state. A boy, aged 10, fell and wrenched his hip. For a fortnight he was in bed at home, lying with his knees drawn up to his chest. His mother then found that, though the pain had ceased, the boy kept his thigh flexed upon his trunk. Afterwards he was sent into St. Bartholomew's Hospital, with the suspicion that he had developed hip disease. Mr. D'Arcy Power, then house-surgeon, found that though it was freely movable in every other direction, and though the head of the femur rotated freely in the acetabulum, the limb could not be extended beyond a right angle without severe pain. When ether was given, and I proceeded to extend the thigh, the resistance suddenly gave way with an audible tear, which I also distinctly felt, and the limb fell by its own weight into a line with the trunk. A few days later all the movements of the limb were absolutely free and painless. Here, in the accident, some laceration of the capsule or other soft parts in front of the joint had occurred, and, as the boy lay with the limb flexed, adhesions, preventing extension, had formed. These were readily separated by manipulation, and complete recovery ensued. This case affords a good illustration of all the main features of a highly important group.

A man, aged 45, slipped and sprained his ankle, and was laid up for three weeks. He then began walking with sticks, but was very lame. Some improvement gradually took place, but the ankle remained, month after month, shapeless from chronic swelling, the skin was tense and shining, and the joint was so weak that he could bear no weight upon it. Nine months after the injury he came to the hospital, walking with a stick and leaning on his wife's arm for support. The joint was stiff, shapeless, and "weak"; but it was perfectly free from heat; indeed, it was colder to the touch than the opposite limb.

The foot was in a position of slight talipes equinus. When he had inhaled gas I carried the foot through all its normal range of movement. At first I met with elastic resistance, and, as this yielded to very moderate force, I felt numerous adhesions giving way, and minute deep-seated snaps and cracks were heard. No pain followed, and the patient the same afternoon walked about the ward. A week later he reported himself as being quite well.

Many similar examples, were it necessary, could be related, but these may be regarded as typical.

2. Cases are often met with in which subacute rheumatism is followed by stiffness and severe pain (greatly aggravated on the slightest movement) about the shoulder, but in which gentle passive motion through a limited range of rotation, or movement of the elbow backwards and forwards, but without any attempt to raise it, shows that the articular surfaces glide smoothly on each other ; in other words, that the stiffness and pain are due not to defect *within*, but to adhesions *outside*, the joint itself. In these instances manipulation, followed by massage, will usually lead to complete recovery.

A man, aged 46, came with what he had been told was rheumatic disease, of four months' duration, of his shoulder joint, the skin over which was of a rich mahogany colour from prolonged painting with iodine. He could not move his elbow for two inches in any direction, and every attempt gave him severe pain. He could not lie on that side, and pain at night was so severe that he could obtain but little sleep. The surrounding muscles were considerably wasted. I found that when the limb rested quietly in my hand, the head of the humerus rotated with perfect smoothness through a slight range, in the glenoid cavity, and that the elbow could be moved forwards and backwards for some three or four inches. Having thus learnt that the joint itself was healthy (free movement, though limited in its range,

conclusively established this), I proposed to manipulate the limb. The mere suggestion of such a step, however, so alarmed the patient that he declined the treatment; but, getting no better, he returned a fortnight later. I then, when he was under gas, first rotated the humerus in the glenoid cavity to its full normal extent, and then carried the limb through its other movements, *i.e.* forwards, backwards, and upwards, performing the upward motion by a series of carefully graduated short jerks. Numerous adhesions readily gave way. The patient suffered a good deal of pain for ten or twelve hours, but within a week he was able to put his coat on. Three weeks later, as some stiffness remained, he inhaled gas, and I again moved the arm in the directions in which I found resistance. In a month from this time, massage having been regularly used in the interval, he reported that he had lost all pain, and that only a slight restriction of movement remained.

A lady, between 40 and 50, had been suffering, as she was told, from rheumatic disease of her left shoulder joint for six months. When first seen, her arm was fixed to her side; the slightest movement gave her intense pain, and she often suffered with such severe spasm in the muscles of the arm that she was obliged to cling to any firm object near her, in order to avoid falling down. Pain rendered her nights almost sleepless. She could use the limb only from the elbow. Finding by the indications just mentioned that the joint was sound, I manipulated the arm, under gas. Many adhesions were felt to give way. Pain was severe for some hours, but a chloral draught relieved this. Next day she said the former pain and spasm had entirely left her, though the joint felt sore. Within a week she could get her dress on, and sleep on that side, and in a fortnight she considered herself cured.

In these cases diagnosis must be very carefully made, for if an instance of progressive rheumatic disease of the

joint itself is mistaken for one of adhesions around the joint, no benefit, but rather a severe aggravation of the disease, will be produced.

3. Cases in which joints have been left stiff after acute or subacute rheumatism, owing to the formation of intra-articular adhesions. These adhesions are often slight and will easily give way, and manipulation is followed by the restoration of completely free movement. It must, however, be remembered, that the adhesions which form after rheumatic inflammation of the joint are sometimes so firm and extensive as to constitute complete fibrous anchylosis. In such instances, as the joint is practically obliterated, the only result of forcible movement will be to tear through a cicatrix. Stiffness will return, and the joint will probably long remain hot, painful, and weak. In this group of cases, the best course is to examine the joint under an anæsthetic, so as to ascertain whether it will yield to a moderate degree of force. Should it not do so, the proceeding must be abandoned, and hot douching and massage be employed. Cases of joints stiff after gonorrhœal arthritis are mentioned at page 27. In these, manipulation is often attended with good results.

4. Cases in which joints remain stiff and painful after fracture in their neighbourhood. James R——, aged 28, labourer, met with Colles's fracture, and after being treated at an infirmary for five weeks was told the fracture was repaired, and he was discharged. Three months later he came to the hospital, saying that he was unable to use the hand, and that he was starving in consequence. The wrist and fingers were stiff, and the muscles of the fore-arm much wasted. The fingers were manipulated when he was under gas, so that each joint was bent, and the wrist also was carried through the full normal range of its various movements. Two days afterwards he began work, and in a fortnight had regained free

use of his limb. This case represents a very numerous class, in many of which, however, the impediment to motion is so slight that movement of the joints under gas, which would facilitate the later stage of recovery, and add much to the patient's comfort, is omitted even by those who in other cases are fully alive to the value of manipulation. All would do well to follow the excellent rule laid down by Mr. Christopher Heath,* that our duties in a case of fracture should be considered to end, not when the bone is found to be united, but only when the functions of the limb have been, as far as possible, restored. At present patients are sometimes allowed to remain disabled for several weeks or months, whose limbs might be restored to usefulness in a few days by manipulation. Nor need it be feared that this treatment will do any injury to the recently united fracture. It should not be practised until after the lapse of a month in children, or six weeks in adults. Then, if the limb is grasped in such a way that the fracture is supported, and if no undue force is used, the proceeding is perfectly safe.

5. Cases in which a joint after dislocation remains stiff, either as the result of extensive laceration of the surrounding soft parts, and the subsequent formation of adhesions; or because the limb, after reduction has been accomplished, has been kept too long in a fixed condition. Of this the following is a good illustration.

C. M., aged 50, dislocated his humerus by a fall. Reduction was easily effected, and the arm was bandaged to the side in the usual manner. I first saw him nine weeks afterwards. He could not move his elbow from his side three inches in any direction; the limb ached so much at night that he could not sleep, and, if the arm was jarred, he cried out with pain. Two operations of manipulation—with an interval of a fortnight between them—

* "Minor Surgery," p. 297. 8th edition.

and massage restored the full use of his limb, and removed all his pain.

6. In old unreduced dislocations manipulation, especially when combined with massage, is often followed by relief of severe pain and by improved position and greatly increased freedom of movement.

In cases of dislocation, as of fracture, Mr. Heath's rule of not only attending to the primary injury, but of relieving the patient as far as possible from the resulting impairment of the use of the limb, should be borne in mind.

7. In instances in which bruised or over-strained muscles remain passive and rigid, or in which the patient is afraid to exert a strong mental effort to move the limb. Robert D——, aged 22, came to the hospital with his right knee, which he had wrenched eight weeks before, in a position of full extension, and covered with neatly applied moleskin strapping. He said that he had attended for two months at a hospital, and had applied many different lotions, but without benefit. At length the joint had been, as I found it, skilfully strapped, and he had been told to rest the limb. On removing the plaster I noticed that the joint was cool and perfectly normal in appearance. Under gas it moved into full flexion, with the mere guidance of the hand, unaided by any appreciable force. No adhesions were felt to give way. On being told that the joint had thus been moved, the patient cautiously attempted to bend it, and, gaining courage, was able to flex it completely, and to walk freely on the limb. Next day he went out walking naturally, and said he was cured.

A lad of eighteen fell from his bicycle, and bruised his arm. Three weeks later I found his fore-arm fixed at an angle of about 110°, and his elbow stiff. The joint, however, was perfectly natural in appearance, and free from both heat and swelling. Under gas the arm moved as readily as a healthy limb can be moved during sleep, and

on recovering from the anæsthetic the patient found that he had regained complete command over the part, and next day he was discharged.

8. A similarly inert condition of the muscles, requiring the same treatment, is met with in cases in which a limb has been too long maintained upon a splint.

9. Manipulation should be employed when from the history of the case it is believed that a tendon or muscle has become displaced. A boy of eighteen came to the out-patient room with his head strongly turned towards his left shoulder, and his chin elevated. He said that while washing his face and neck that morning, he felt a sudden "catch" below his right ear, and his head became fixed in its present position. Any attempt, I found, to restore the head to its normal attitude gave him severe pain about the transverse processes of the upper cervical vertebræ. Believing one of the tendinous slips connected with the transverse processes had been thrown out of place, gas was administered, and I extended the head, and brought it into its normal position, and also manipulated the muscular substance of the upper part of the neck with the finger and thumb. On recovering from the gas the patient reported that all his symptoms had disappeared, and, turning his head about in all directions to demonstrate the fact, cheerfully wished us all good day.

The following was, I believe, a very similar example, though at the time I was quite deceived as to its real nature. A. B——, aged 17, was sent with a suspicion that he had hip disease. He was very lame, and walked with a crutch and a stick, bearing no weight on the limb. The thigh was slightly flexed, abducted, and rotated outwards. There was deep-seated pain at the back of the joint on movement, and tenderness on pressure in this situation. There was no swelling. On examination I found that the hip joint was movable in every direction, and evidently

sound, and I concluded there was tuberculous periostitis of the ilium beneath the external rotator muscles. I advised blisters, cod-liver oil, and three months' rest. At the end of this time he was no better ; indeed, his condition was wholly unaltered. His friends now took him to a bone-setter, who, after examining him by passing his hand under his trousers, pointed to a spot in the thigh directly in a line with, and four inches below, the anterior iliac spine, at which he said a bone was out. At the request of the boy's mother he "put the bone in" by moving the limb, a snap being heard at the moment.* The patient could now move his limb freely, and walk upon it, with only slight pain, and this disappeared in two or three days, and left him quite well. Just twelve months later, having in the interval remained quite sound, he was asked, while at breakfast, to cut some bread, and, rising quickly to do so, was suddenly attacked with his former symptoms. He had severe pain in the old spot, and felt sick and faint. The limb was locked in a similar position, and he had severe pain if he threw weight upon it. Getting no better, he was brought to London at the end of a fortnight. The limb was then stiff, slightly flexed, and abducted, and he walked with a crutch and a stick. Movement of the limb brought on very painful spasmodic contraction of the muscles, and he suffered severely at night from startings and twitchings of the thigh. There was no swelling, but pain was excessive on pressure over the neighbourhood of the sciatic notch. Having heard how he was cured before, I put the boy under gas, and moved the limb through all its natural range of flexion, extension, abduction,

* The snap often heard, when a joint that has long been fixed is suddenly moved, is pointed to by bone-setters as a plain demonstration that the bone has gone in. These snaps, however, are not due to the concussion of two joint surfaces as they are returned into contact ; but, on the contrary, to the separation of surfaces which have become stuck together by dried and inspissated synovia. Many persons can make their fingers crack by pulling at them till the joint surfaces suddenly separate.

adduction, and rotation. I felt nothing give way, and nothing seemed to slip; but when he recovered from the gas all his symptoms had disappeared. He could move his limb freely, and in a few days had lost all his lameness and pain. He has had no relapse. This case seems a very instructive one. Looking back on it, I think there cannot be much doubt that it was an instance in which one of the external rotator muscles had slipped out of place.*

Probably, however, the instances in which a joint is disabled by displacement of surrounding muscles are very rare.

10. Cases of slipped semilunar cartilages and their treatment by manipulation are described at pages 200 *et seqq.*

11. Manipulation, with the strong mental impression it produces, is a very good method by which to treat cases of so-called hysterical contraction of the joints, such as the following:—A girl, aged 14, who had fallen and wrenched her limb, was brought with her knee so tightly flexed that the heel touched the tuber ischii. Feeling sure the contraction was due merely to neuromimesis, I manipulated the limb as described at page 278, and complete recovery followed.

A servant, aged 17, after she had accidentally pricked her third finger, had kept it tightly flexed on the palm for two months, and protested that she could not straighten it. Seeing there was nothing the matter, I pretended to pass electricity through it by pressing two sponges in holders (but not connected with the battery) upon it. She immediately straightened her finger, and was quite cured. Although movement under gas was not the method adopted in these two cases, they belong to a group in which that treatment is highly efficacious.

*In Sir James Paget's "Clinical Lectures and Essays," reference is made to the displacement of tendons (pp. 88, 469). Want of space forbids me to follow out this subject in the present work.

This subject might be followed at much greater length, but space will not permit; and I can only offer a few remarks as to the symptoms and general aspect presented by cases in which the surgeon should practise manipulation.

The first step must be to ascertain that the joint itself is not at the present time diseased, and that it has not at any former period been the seat of disease by which the structures composing it have been seriously impaired. An opinion on this point must be drawn from the history of the case, and a very careful examination of the part in respect to the amount, character, and disposition of the swelling, and as to the degree of movement. Another highly material point is whether the joint is hotter than normal. Joints that are suitable for manipulation are either free from abnormal heat (many are abnormally cold, and the circulation of the skin is sluggish, so that the skin is of a dusky-blue tint), or, if any heat follows exercise, it quickly subsides with rest.

The absence of the evidences of disease in the joint, together with the fact that the limb is nevertheless disabled, should induce the surgeon to resort to manipulation. I have seen many cases in which, though a precise diagnosis of the exact condition present could not be arrived at, but in which serious disease of the joint could be excluded, manipulation produced immediate recovery. This was notably so in the case of A. B. (page 235). At the time I manipulated the limb, although it was clear that his hip joint was sound, I was quite unable to say to what his symptoms were due.

A man, aged 28, whose ankle was stiff eight months after a severe sprain, came to the hospital in 1880. The joint was manipulated, and within an hour he could walk with scarcely a limp. Next morning he walked from Hackney to Smithfield; he reported himself cured, and had already applied for work under his former master.

Six months after this, he returned to the hospital with his ankle again out of order. He said that since the manipulation he had been at work, and had felt no inconvenience till within the last three weeks, when the joint had become stiff and weak, and so painful under any weight that he was very lame. On examination, neither heat, swelling, nor any appreciable defect of movement could be detected. He was, therefore, told that manipulation would do him no good, and that he had over-worked the joint, and had better have it strapped and give it a week's rest. He looked disappointed, and said that his joint felt just as it did when he was laid up before, and that he believed that if it was moved again he would be all right. This was an appeal to which, as manipulation would do no harm, it seemed unfair not to yield. He took gas, and the ankle was flexed and extended. When flexion was being performed, some adhesions, which, however, were slight, and offered scarcely any appreciable resistance, were felt to give way. He left the hospital an hour afterwards, and the next morning wrote, "I have had enough travelling on my foot to convince me that it is wonderfully better, by my being able to walk without *pain* or *limping*" (he had underlined these words), "which might seem strange, but it is a fact." The adhesions which disabled the joint were so slight that I failed on careful examination to detect any limitation of movement.*

A girl, aged 12, came to the out-patient room with reported hip disease, following a fall nine months previously. She walked on her toe, kept the joint habitually a little flexed, abducted, and rotated outwards, and complained of pain when weight was thrown on the limb. On examination I was surprised to find that the movements of the joint were perfectly free in every direction, except that adduction was very slightly restricted, and produced

* Clin. Soc. Trans., vol. xiii. p. 221.

a little uneasiness. Enarthrodial movement was perfect. There was no muscular wasting, a feature incompatible with hip disease of nine months' duration. Not knowing on what the symptoms depended—whether on slight adhesions after the fall, a displaced muscle, or "hysteria"—I had the child put under chloroform, and I moved the limb in all directions. Nothing was felt to give way. Next day every trace of restriction of motion had vanished, and the girl went out of the hospital. The symptoms never returned. I believe the case was one of slight adhesions that had formed after the fall.

Many are, I believe, in doubt whether the stiffness left after recovery from tuberculous disease of the hip and other joints should not be treated by manipulation under an anæsthetic. I venture to say that no such step should be taken. I have never, I think, seen it succeed. The joints so treated usually become stiff again, and, in many, a renewal of disease is excited, and suppuration is extremely likely to follow. I have amputated three limbs in children on account of acute arthritis following the manipulations of bone-setters; and the following is a further case in point. A girl, aged 7, had been lame for six months after a mild attack of inflammation of the hip joint. The limb was considerably drawn up, so that the toe did not touch the ground. She walked with a crutch, but had no symptom of still-present disease. A bone-setter said her hip was "out," and put it "in" under chloroform. She was said to be cured. The immediate result was satisfactory, for the limb was now very nearly straight, and she could walk without her crutches, though she still limped. The father told me afterwards that, at the time, he thought it a providential thing that the surgeon he had proposed to consult was away from home, so that his steps had been turned in another direction. In the course, however, of three weeks, pain and night startings came on, and

the child could not put her foot to the ground. Two months later, when I first saw her, the limb was considerably flexed, and there was a large abscess in front of the joint.* The deformity in this case might probably have easily been removed by the method described at page 407 *et seqq.*

As a very general rule, manipulation will do harm rather than good if employed in joints affected with chronic rheumatism (but *see* page 232) or osteo-arthritis. (*See* page 382.) The value of gentle passive movement is alluded to at page 70.

* St. Bartholomew's Hospital Reports, vol. xiv. p. 208.

CHAPTER XVIII.

CONGENITAL DISLOCATION OF THE HIP.

THE general subject of congenital dislocation of the joints falls under the head of orthopædic surgery, and will not be considered in the present work. I shall, however, offer an account of congenital dislocation of the hip, for this condition occupies an exceptional position. It is far from uncommon, and is met with in individuals who are otherwise healthy; while congenital dislocation of other joints is very rare, and is found chiefly in combination with other grave malformations, or with arrested development of the central nervous system (*e.g.* in acephalous monsters). Moreover, on account of its reputed rarity and the obscurity of its features in many instances, it is apt to be overlooked or mistaken for some affection of an entirely different kind, whereas congenital dislocation of any of the other joints is characteristic and offers no difficulties in diagnosis.

It is to the great French surgeon, Baron Dupuytren, that we are indebted for the first detailed description of this affection; and he it was who termed it original or congenital, to distinguish it from those displacements which are due to accident, and those which result from disease. As is so often seen when a novelty is being dealt with, Dupuytren's description was drawn from the most obvious examples, and contained no reference to instances which, although they are less marked, yet constitute a much more numerous group. Hence, too narrow a conception of this affection has been accepted, with the result that many instances are overlooked, or mistaken for some other

condition. I shall, therefore, have varieties to describe to which Dupuytren in his paper does not allude.

The main points which Dupuytren observed* are the following :—The condition is much more common in females than in males. Usually both hips are affected. The gait is peculiar and, to the experienced eye, characteristic. It consists of a rocking or rolling movement of the trunk from side to side—which has been compared to the waddle of a duck, or the motion of the hind legs of a cow during a trot. In the most severe cases the limbs are adducted, inverted, and somewhat flexed at the hip and the knee, so that the heels are drawn up and the individual walks on the heads of the metatarsal bones, and with the feet turned in. The trunk oscillates from side to side at each step, being inclined to that side upon which the weight is, for the moment, thrown. With each step, also, the pelvis sinks upon the corresponding thigh bone, and all the signs of dorsal dislocation on that side become well marked. The

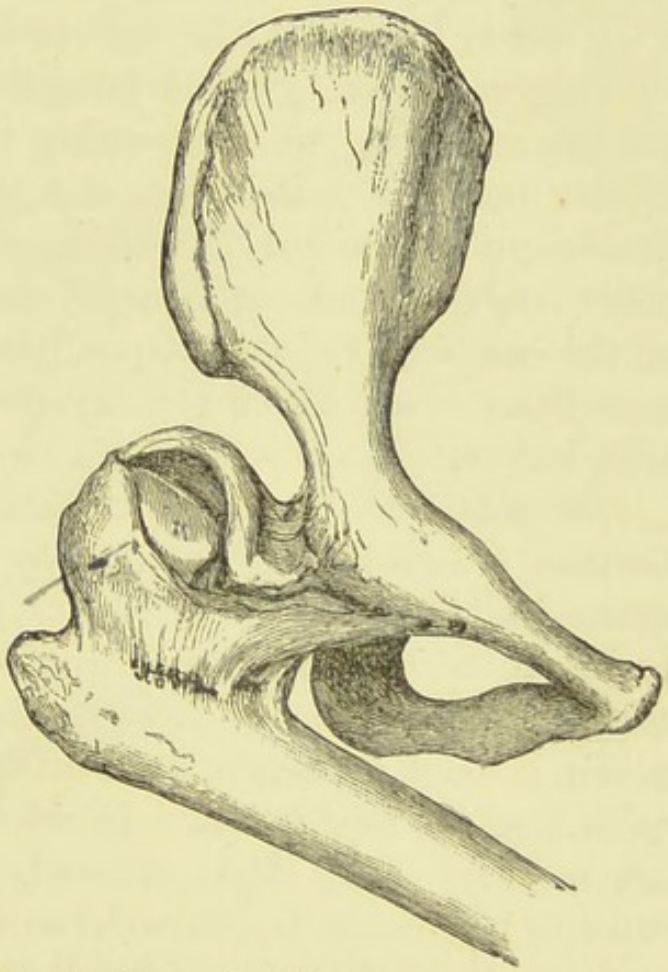

Fig. 37.—Congenital Dislocation of the Hip Joint. The Acetabulum is absent, and the Femur moves loosely upon the Pelvis. The head of the bone, however, is enclosed in a very strong capsule. (From a preparation in St. Thomas's Hospital Museum.)

* Dupuytren : "Diseases of the Bones." Sydenham Soc., 1847.

shoulders are thrown back and the abdomen forward, and there is marked lordosis. The patient is short in stature, and, when the arms hang down, the finger-tips reach nearly to the knee instead of corresponding, as they naturally do, with about the middle of the thigh. "The labour," Dupuytren remarks, "with which these individuals walk would naturally lead one to expect that the acts of running and leaping would be still more difficult to them; yet this is not so, for in executing these efforts the energy of the muscular contraction, and the rapidity with which the weight of the body is transferred from one limb to the other render the effects, arising from the unstable condition of the heads of the thigh bones, almost inapparent." It is true there is an unusual rocking of the body from side to side, but even this is less seen in the act of leaping.

On examining the hips in an extreme case, all these peculiarities are easily explained. The natural ball-and-socket connection of the lower extremity with the trunk is found to be entirely wanting (Fig. 38); so that the upper end of the femur can be moved freely about on the side of the pelvis, through a range in different cases of from half an inch to as much as four inches. In children, and in adults who are not very stout, it can generally be ascertained that the head of the femur is somewhat small. When, in the erect position, the weight of the trunk is thrown upon one limb the pelvis sinks, so that the great trochanter is high above Nélaton's line, and the trunk is apparently shortened. Viewed from behind, the hips appear very broad, in consequence of the projection of the trochanters much above their normal level, and the displacement and bulky fulness of the gluteal muscles. As the head of the femur is situated not only above, but considerably behind, the natural position of the acetabulum, the centre of gravity of the trunk is displaced forwards, and the pelvis undergoes rotation on its transverse horizontal axis, with the result that

not only is lordosis produced, but, in order to preserve his balance, the patient is obliged to throw his shoulders far back, and consequently to protrude his abdomen. The waddle is due in part to the existence of double dorsal dislocation, and the altered direction of the thighs; but to a large extent also to the fact that when the body is thrown alternately from one limb to the other it oscillates widely

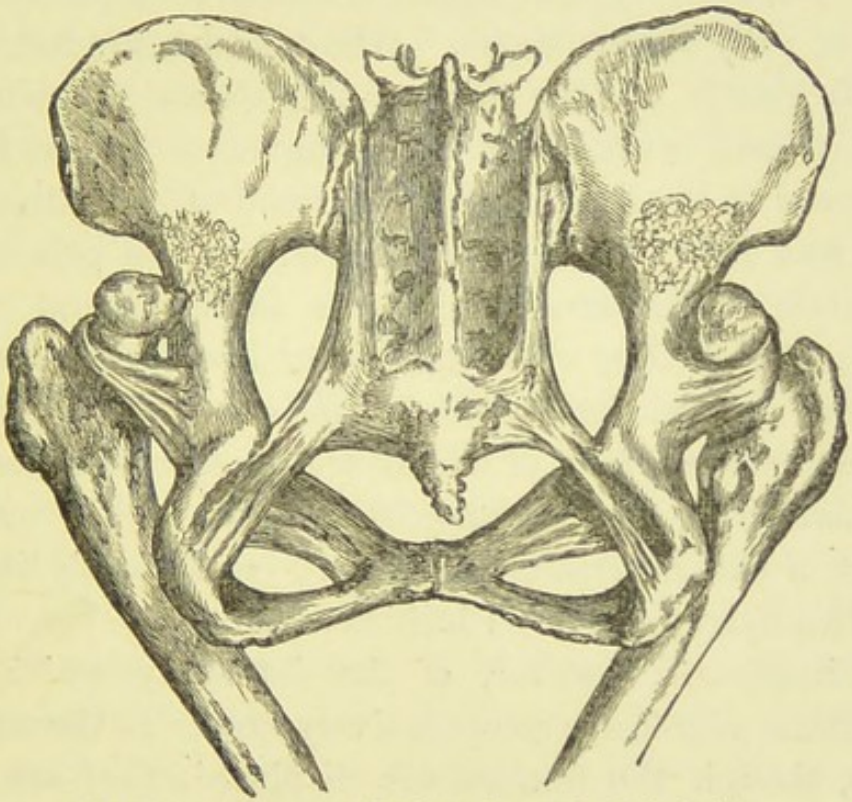

Fig. 38.—Congenital Dislocation of the Hip Joints.

before it meets with firm support, owing to the want of any bony connection between the trunk and the lower extremity. The lower limbs are seen to be somewhat small and wanting in muscular development, and have the appearance of being unnaturally short. Fig. 38, taken from a specimen (1050) in the Museum of St. Bartholomew's Hospital, illustrates in a striking manner all the principal features of the condition in extreme cases. The history of the patient is not known. The pelvis is that of an adult female. The head of each femur is dislocated upwards on

the dorsum of the ilium. The capsular ligaments, which have been partially removed, form strong sling-like bands, by means of which the pelvis was suspended between the two thigh bones. There is no trace of the ligamentum teres. The heads of the femora are small and irregular in outline. In the position of the acetabulum on each side is a shallow irregular depression, much smaller than the natural joint cavity, and filled to the level of the surrounding bone with fibrous tissue. Above and behind this is an irregular patch on the dorsum ilii, where the bone has evidently been worn down and roughened by the friction of the head of the femur, which, instead of being fixed in a socket, was free to slide on the side of the pelvis. The thigh bones, which are slender, are adducted and rotated inwards, so that they cross each other above the knee, and the lineæ asperæ look directly outwards. The lumbar vertebræ, three or four of which are preserved, show, from their relation to the sacrum, that lordosis was extreme. The gait of this individual must have been exactly like that which Dupuytren observed in his cases.

The instances, however, of the deformity which reach this extreme degree are comparatively rare. In the majority of cases, though the femora are displaced, they are either retained in their abnormal position by a more or less perfect false joint; or they are connected with the pelvis by a strong and short capsular ligament, so that they slide on the dorsum ilii to only a limited extent. When the latter is the case, or when there is no sliding at all, the roll from side to side and the difficulty and labour of progression are very largely diminished, and the adduction and inversion of the lower extremities to a great extent or entirely disappears. The following is an example :—

C. K., a girl four years old, was first observed to be the subject of some peculiarity at the hips when she began to walk at the age of about two. On examination,

displacement of the thigh bones was found to be double and symmetrical. Their upper ends could be felt resting on the dorsum ilii above and behind the normal site of the acetabulum. The heads were fixed so that they could not be made to slide on the wall of the pelvis. The hips looked unnaturally wide and prominent when viewed from behind, and lordosis was well marked. The lower limbs were in due proportion to the trunk and arms, and fairly muscular; and there was no tendency to adduction or inversion. Though the patient had a characteristic waddle, this was not very conspicuous, and she could walk and run without difficulty or fatigue.

The position which the head of the femur occupies in relation to the side of the pelvis has an important influence alike on the amount of deformity, and on the patient's power of locomotion. When the femur is situated far back on the dorsum ilii, lordosis is well marked, for the line of gravity of the trunk is displaced. It lies in front of the heads of the thigh bones, and, consequently, the pelvis undergoes rotation on its transverse axis, and the curve of the lumbar spine forwards is increased. In many examples, however, the false joint is situated immediately above, or it may be even slightly in front, of the normal position of the acetabulum; when this is the case, lordosis, and the throwing back of the shoulders and protrusion of the abdomen, are either absent or very slight, and instead of being flexed, adducted and inverted, causing the patient to go on his toes, the lower extremities admit of extension so as to occupy a vertical line with the trunk, and are free from adduction and inversion, and the heels come easily to the ground, and locomotion is but little affected.

In these milder cases the only symptoms are that the patient has a peculiar gait, with more or less of a roll from side to side; that walking and running are performed with more than natural effort (but this defect may be very

slight), and that movement is a little insecure, so that the patient is apt, especially during early childhood, to trip, or tumble about. On examining the hips, the trochanters are found above Nélaton's line, and either just above or above and a little behind the natural position of the acetabulum, or close to the anterior superior spine of the ilium. Sometimes, by inverting the limb, the head of the femur, which may be apparently either normal, or small and misshapen, can be readily felt rotating in a shallow false joint. Sometimes, also, a little sliding may be detected on one or both sides, especially when the thigh is flexed on the trunk. The general direction of the limbs, however, is perfectly natural, and their muscular development shows but very slight defect. Movement is free in every direction, except that abduction and rotation outwards are a little restricted. As the position of the head of the femur on the two sides is sometimes not symmetrical, one limb may be a little shorter than the other. The following is an illustrative case :—

M. B., aged 5, began to walk when she was about sixteen months old. She is very healthy, and able to walk and run as actively as other children. Her carriage is somewhat peculiar, and there is a slight roll from side to side ; but this might easily escape notice unless it was especially looked for. As she stands, the only deformity seen is slight lordosis. The pelvis and limbs are fairly developed, the heels are flat on the ground, and there is no inversion of the feet. When she is recumbent the limbs look natural in every way except that the left is a little shorter than the right. On examination, the trochanter is felt upon each side on the dorsum ilii on a level with the anterior superior spine, and about three-quarters of an inch behind it. The neck of the femur is shorter than natural, and the head, which appears to be small and flattened, is closely held down by short and strong ligamentous tissue.

Movement of the limb is free in all directions, except that rotation, both internal and external, is somewhat limited.

Even when the thigh bones are free to slide widely on the side of the pelvis, the actual symptoms may be so comparatively slight that the nature of the case may be misunderstood. The following is not only a remarkable example of congenital dislocation, but it is a good illustration of the above remark. The notes were taken in 1874:—

Mrs. B. is now 36. She says that she could not walk till she was two and a half. She was then found, and she has since continued, lame, and was noticed to walk with a peculiar roll. When seven, she was taken to Sir Benjamin Brodie, whose opinion was that she had congenital dislocation of both hips, and that she should be treated first by confinement for six months in the horizontal posture in combination with some means for keeping the limbs extended, and afterwards by the use of instrumental supports. This scheme was never carried out, and she was left for whatever improvement in her walk might come with time and exercise. As she grew up she was gradually able to walk much better, and her lameness troubled her less and less. When old enough, she was employed to serve behind a counter, and she followed this occupation till a few years ago, when she married. She is now robust and strong. She says she has always been active, and has frequently walked distances of ten miles, feeling then, as well as after standing many hours at her counter, only moderate fatigue. At the present time, her carriage, though peculiar, would, as she has grown stout, scarcely attract the eye, unless particular attention was drawn to it; but then it would be noticed that the shoulders are thrown back, the abdomen is prominent, the loins hollow (lordosis), and the lower limbs too short to be in due proportion to the trunk and arms, so that the hands come nearer than is natural to the knees. Her gait presents

little of the rolling movement from side to side that is usually seen. There is no adduction, the heels come fairly to the ground as she stands or walks, and the feet are not turned in. As the connection of the lower extremity with the trunk is essentially the same on the two sides of the body, one description will suffice for both. The upper end of the femur is so movable that, as she stands on one leg, the patient can, by a muscular effort, shift the opposite femur on the dorsum of the ilium, first drawing it vertically upwards for nearly four inches, and then letting it suddenly drop down again. When she does this, surfaces of bare bone are felt rubbing upon each other. As she stands, the pelvis sinks down between the two uprights formed by the thigh bones till it is suspended, and then the trochanters may be felt about three inches behind the anterior iliac spines, and nearly on a level with the highest part of the iliac crests. Lordosis is very marked. The glutei, pushed up by the femur, stand out in a mass, which gives the posterior aspect of the hips an appearance of remarkable width. When the patient is recumbent, the femur so readily slides on the pelvis that the length of the limb may be varied through a range of nearly four inches. The limbs lie in a position of complete extension, and there is no inversion of the feet. The pelvis is of ample size, and the patient's confinements have followed a natural course. Mrs. B. was the mother of M. B. (page 248). The hereditary transmission of this defect is alluded to at page 256.

In all the cases I have hitherto related the deformity has existed on both sides. Many instances, however, are met with in which only one hip is affected. From what I have seen, indeed, I should say that single is more common than double dislocation, a circumstance that I wish especially to direct attention to, for cases of unilateral deformity are those that are most often misunderstood, and

are mistaken either for infantile paralysis or old-standing hip disease. In these patients the affected side presents precisely the same anatomical variations as those observed when both hips are involved. There may be an entire absence of anything like a joint, and the head of the femur may either slide freely about, or be firmly retained in a false joint, close above the natural site of the acetabulum; while between these extremes of defect all intermediate degrees are met with. The patient's carriage and powers of progression will, of course, vary with the condition of the hip. When there is no joint, and the thigh bone is free to slide about, the child drops towards the affected side with a limp as marked as that accompanying a minor degree of infantile paralysis; while in cases of slight anatomical defect the use of the limb is very little impaired and lameness is proportionately diminished.

The two following cases are instances respectively of the severe and slight grades of this form of dislocation. Fanny B——, aged 3, seen in 1872. Her history as given by her mother was that she began to walk at fifteen months, when she was found to be, as she has since continued, lame on the left side. She can now walk and run fast, and has never had pain or any other symptom of defect at her hip joint, except her lameness. Her gait is like that of a child who has one limb shorter than the other, and flexed on the pelvis as it might be in the later stage of hip disease. Lordosis is well marked, and her body drops to the affected side when she bears weight upon the limb. She is very lame. The limb, which is somewhat ill-developed, is found, when the child is recumbent, to be about three-quarters of an inch shorter than its fellow, and it can, if it is thrust by moderate pressure upwards, be made an inch shorter still, and the trochanter is then felt above and a little in front of the sacro-sciatic foramen. The upper end of the femur appears to have only very

loose connections with the pelvis, for it can be brought outwards so that it projects very distinctly beneath the glutei and the integument. As it moves on the dorsum ilii, grating can be felt as if rough bony surfaces were being rubbed together. The usual movements of the hip joint are quite free in all directions, except that abduction is limited and the limb cannot be brought into complete extension. The upper end of the femur feels shapeless and knob-like, as if the neck were short and the head flattened and rudimentary. As the child lies the posture of the limb is quite natural, except for slight flexion on the pelvis, and there is no inversion of the foot. When this patient was seen three years later her condition was unchanged, except that her walk had been much improved by the use of a boot with an inch of thickness added to its sole.

Emily W——, who is now (when seen at the Hospital for Sick Children in 1875) five, was found, when she began to walk at the age of sixteen months, to have some defect at her right hip joint which made her somewhat lame, but there was no pain in the limb, and till then nothing abnormal had been suspected. The same condition has remained. She is still lame, walking "on her toe;" the limb is small and weak, and an inch and a half shorter than the left. There is no rotation of the femur, so that the position of the foot is natural in this respect. There is slight lordosis. The trochanter is placed vertically above the usual position of the acetabulum, and nearly level with the anterior iliac spine. The head of the femur is fixed, in a false joint to the pelvis, and does not slide. All the movements natural to a hip joint are free, except that abduction is slightly limited. The child has never complained of pain in the limb, which she uses very freely. The lameness was much relieved by the use of a high boot.

It is well to remember that not only may the clinical features of these cases be but faintly marked, owing to the fact that the anatomical defect is, as in the instance last related, comparatively slight, but further, that as the result of anatomical variations on the two sides the symptoms may be so far modified as to throw the true nature of the patient's condition into obscurity until it has been fully investigated. This was well shown in a case lately under the care of Mr. Morgan, in the Hospital for Sick Children, which I have his leave to quote. A girl, aged 9, seen in 1882, had congenital dislocation of both hips. In walking or running there was very little roll of the trunk from side to side; but she moved with difficulty, as if she was suffering from muscular rigidity of the limbs such as is often seen in affections of the spinal cord; and she was much more lame on the left than on the right leg. The two limbs were unsymmetrical, the left knee being maintained in a posture of slight flexion, while the right could be easily extended. She walked on the toe of the left foot, and very insecurely; while the right heel came fairly to the ground. There was very little lordosis. When she was lying on her back the right limb would be fully extended and abducted to a considerable extent on the trunk; but the left could not be extended, and abduction was very limited. Few, I think, would have anticipated the true explanation of these symptoms, and it was only when the hips were carefully examined, and the position of the trochanters ascertained, that it was found that, on the left side, the head of the femur was so loosely connected with the dorsum ilii just in front of the sacro-sciatic foramen that it could slide to the extent of about three-quarters of an inch. On the right side the head was enclosed in a false joint above and a little behind the normal site of the acetabulum.

Until recently the origin of congenital dislocation of

the hip was involved in considerable uncertainty. Three main theories were formerly advanced to explain its occurrence. 1. That it is the result of disease, and is produced by spasmodic contraction, or, according to some, by paralysis of the muscles about the joint, by relaxation of the ligaments, or by hydrarthrosis. 2. That it is traumatic, and is caused either by some injury of the fœtus in utero, or by force used to facilitate birth in a difficult labour. 3. That it is due to an original defect of development. As to the various causes specified under the first heading, they are not only wanting in proof, but are inconsistent with what can be positively ascertained. The muscles in these cases show no trace of spasmodic contraction, and certainly they are not the seat of paralysis; nor is it easy to see how paralysis should produce dislocation; while the view that the displacement is due to muscular spasm has probably arisen out of the now exploded doctrine that the various forms of congenital talipes are thus brought about. As to relaxation of the ligaments and hydrarthrosis, they appear wholly hypothetical—mere speculations indulged in apart from pathological observation.

The opinion that some examples are traumatic in their origin derives some support from cases that have been recorded, such as the following:—Some years ago I saw a little girl, aged about 4, with congenital dislocation of the right hip; and a surgeon, practising at Islington, but now deceased, told me that he attended the mother at the birth of the child, that there was a breech presentation, and that while he was endeavouring to effect delivery by using a blunt hook, he distinctly felt the head of the femur slip out of the acetabulum. He added that he had always blamed himself for not having taken means at the time to reduce the displacement. Though such accidents are probably rare, and although some may even doubt their existence, the possibility of their occurrence should be

borne in mind when force is being used in the manner related.

I have met with two instances in which a fall in early infancy may perhaps have led to injury, the effects of which simulated congenital dislocation. One may be briefly noticed. John W——, when six months old, fell to the ground through a distance of about four feet, striking his face and head, and injuring his right thigh, so that a day or two later a considerable ecchymosis appeared around the joint. The pain that followed was not severe, and only lasted a few days. The injury was forgotten till four months later, when he began to use his limbs in attempts at walking. It was then found that he could not bring his foot to the ground. On examination, when he was nine years old, I found the great trochanter flattened, and drawn up so as to be very nearly level with the anterior iliac spine, and situated between that process and the acetabulum. It may here be mentioned, in passing, that, after acute arthritis occurring in an infant of a few weeks old (*see* "Acute arthritis of infants," page 129), the hip joint may be left completely disorganised. When this is the case, should the patient survive, the condition of the hip may so closely resemble congenital dislocation that it is usually mistaken for it.

But while some cases may not improbably be the result of injury, and while some instances that usually pass for congenital dislocation really belong to an entirely different group, we must look for some other explanation. This becomes apparent when it is remembered that congenital dislocation is very much more common in females than in males; that it is frequently double; that there is often no history of injury of the fœtus in utero, that birth was perfectly normal, and that no force was used; that the position of the false joint is frequently above, or in front of, rather than behind, the normal position of the

acetabulum, and that the deformity is occasionally hereditary, as it clearly was in the case of M. B. (*Vide supra.*)*

There remains the view that the condition is the result of defective development. This subject has recently been investigated by Messrs. Bowlby and Lockwood. Both have produced specimens to show that the upper part of the acetabulum is absent. Mr. Lockwood, in dissecting a microcephalic infant, still-born at full time, found that the cartilaginous rim of the acetabulum was entirely absent, while all the other constituents of the joint were present; and in a male, at full time, born with ectopia abdominis, and other arrests of development, the rim of the acetabulum was absent, and the head of the femur was lying on the dorsum ilii, near the anterior iliac spine. The ligamentum teres was very long, and the capsule capacious and normally attached. In the opinion of this observer, the defect depends on the failure of the pelvic cartilage to grow —as it normally does—round the head of the femur. Mr. Bowlby gives the following account of the dissection of a specimen removed from a girl who died at the age of 18:— "In the position of the normal acetabular cavity is a triangular depression, which, although it represents the acetabulum, is far too small to have accommodated the head of the femur at any time. . . . The edges of the depression are scarcely raised above the level of the surrounding bone. The upper portion of the normal acetabulum, which, from being formed by the ilium, may be called the iliac segment, ... appears to have been suppressed, so that the ill-developed acetabulum represented by the above-named triangular depression is

* Many authors state that congenital dislocation of the hip is sometimes hereditary, but the statement seems to rest mainly on the authority of Dupuytren, who quotes from Maissiat the perhaps doubtful history of a family in Mantua, many members of which, in different generations, are reported to have suffered from this defect.

formed merely by the coalescence of the pubic and ischiatic segments." This is well shown in Fig. 39, taken from a specimen (No. 42, Section D) in St. Thomas's Hospital Museum. Mr. Shattock has described this specimen and furnished a woodcut of it.* It is important to notice that in several dissected specimens in the London museums this triangular outline of the acetabulum is very distinct. I think these examples leave no doubt that it is in defective development that the true explanation of the condition is to be found, and the descriptions which I have quoted appear to show conclusively that the defect may consist either in the suppression of the iliac segment; or in the failure of the pelvic cartilage to grow up and surround the head of the femur, so as to constitute a retaining rim. From what I have seen I am led to believe that the condition most frequently present is that which Mr. Bowlby has described. The great thickening of the capsular ligament which is met with in these cases is illustrated in Fig. 40.

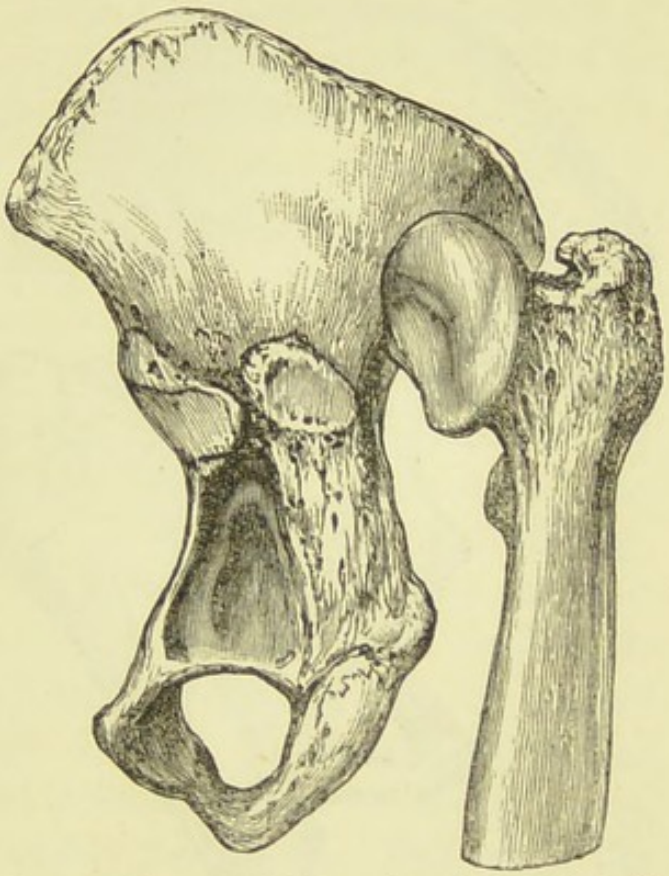

Fig. 39.—Congenital Dislocation of the Hip Joint. The acetabulum is shallow and triangular.

Diagnosis.—Unless a thorough examination is made, it is very easy, especially when the slighter forms are in

* Path. Soc. Trans., vol. xxxviii. plate xii.

question, to mistake this condition for some other affection. In one instance, indeed, the patient, a girl of 9, had been treated for seven months for double hip disease by splints and a long succession of blisters. No one, however, who has met with one of these cases, or who will bear the following points in view, is likely to fall into error. (*a*) The defect is much more common in females than in males. (*b*) Though often affecting both sides, it is by no means rarely confined to one, and it is the unilateral cases that are most likely to be overlooked. (*c*) The history is very similar in all the cases, and is to the effect that the parents knew nothing of the defect till the child, on learning to walk at the age of fourteen or eighteen months (these children almost invariably are late in getting on their feet), was found to be lame, or to roll from side to side, and to be so unsteady that it often fell. (*d*) There is usually no reliable account of any injury, and the child has not complained of pain ; and though easily fatigued, has always shown an inclination to run about as much as others of the same age. (*e*) Though in the worst cases, such as Dupuytren described, the limbs are flexed, adducted,

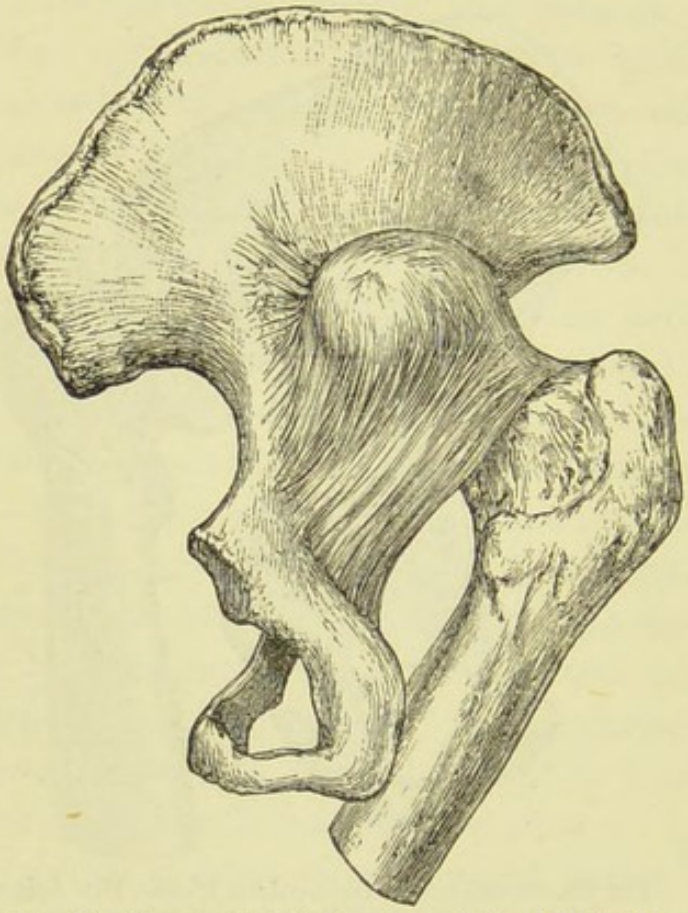

Fig. 40.—Congenital Dislocation of the Hip Joint, showing great thickening of the capsular ligament. (Shattock, Path. Trans., vol. xxxviii.)

and inverted, and the patient walks on the toes, in the much more common and less severe examples the position of the limbs is perfectly natural, and the heels easily come to the ground. (*f*) The limbs are usually somewhat small and thin, and deficient in muscular development. When only one side is involved, the limb, in comparison with its fellow, often looks wasted, as if the seat of a minor degree of infantile paralysis, and in children three or four years old there is frequently an inch or more of shortening. (*g*) Movement in every direction is usually perfectly free, except that abduction is somewhat limited. (*h*) Lordosis, though most authors speak of it as always present, varies considerably in its amount, and is sometimes entirely absent. Both it, and the associated protrusion of the abdomen, and throwing back of the shoulders, depend on the relation of the heads of the thigh bones to the sides of the pelvis. When the thigh bones are free to slide, so that, as the patient stands, an aggravated form of dislocation upwards and backwards occurs, or when the false joint is placed behind the normal site of the acetabulum, the line of gravity is thrown forwards, the pelvis becomes rotated on its transverse axis, and lordosis is proportionately developed. But when the false joint is situated above, or above and in front of the natural position of the acetabulum, the line of gravity is not displaced, and therefore no lordosis and no throwing back of the shoulders are produced. All these particulars should be carefully noted; but the crucial test is (*i*) that, in combination with them, there is displacement of the trochanter.

Sometimes the trochanter is freely movable. It slides about—perhaps with an obscure sensation of grating—when the femur is manipulated, to the extent of an inch and a half or two inches, even in a child; or this sliding may be very limited, and apparent only when the

shaft is pushed, in the flexed position of the limb, directly backwards. Sometimes there is no sliding, but the trochanter lies distinctly, often considerably, above Nélaton's line, in a position either above and behind, above, or above and in front of the normal site of the acetabulum. This altered relation of the trochanter to Nélaton's line is invariably present. But two points must be borne in mind:—First, that the defect is sometimes so slight, and the trochanter is so little displaced, that the real condition of things may easily be overlooked; and secondly, that in rickety curvature of the femur the neck of the bone not infrequently stands at a right angle to the shaft, with the result that the trochanter lies considerably above Nélaton's line. It is, therefore, here, as in so many other instances, necessary to look well to all the points of the case, and to consider negative as well as positive evidence. If the child has been lame ever since he first learned to walk, if there is no sign of any other affection accounting for the symptoms observed, if the gait is peculiar, and if the patient has never complained of pain, then even if a slight fault in the position of the trochanter is combined with limitation of abduction, and with lordosis, and especially if the opposite hip is normal, the case may be regarded as one of congenital dislocation. While if, although the trochanter lies, on both sides, distinctly above Nélaton's line, the history shows that the deformity, absent at first, has been slowly increasing, if the child is rickety, if other bones are curved, and if the muscular system is weak, it may be concluded that the state of the hip, and the waddling and unsteady manner in which the patient walks, are due to rickets.

The conditions for which congenital dislocation is apt to be mistaken are hip disease, the disorganised and "loose" joint left after acute arthritis in infants (page 132), infantile paralysis, and rickets in the form above alluded to. The symptoms of hip disease, which are widely different from

those of congenital dislocation, are fully noted at page 388 *et seq.* The condition of the joint after acute arthritis is related at page 132.

Treatment.—In the slighter cases, in which only one side is affected, in which there is no sliding of the upper end of the femur, and in which shortening of the limb is only moderate, progression is much assisted by a lightly built high boot. In such instances, as the patient grows up and muscular strength increases, the power of walking and running steadily improves. Much, in the less severe cases, may also be gained in childhood by having the patient carefully trained. But when the femur is free to slide, and the muscular development of the limb is defective, a high boot will often be useless, or even a source of embarrassment, in consequence of the unsteadiness and diminished power of the limb. A variety of appliances, of the nature of pelvic belts, have been contrived, both for single and double cases, but they are generally useless. Prolonged confinement of the patient to the horizontal position, combined with weight extension, is reported in some cases to have been permanently beneficial. I cannot, however, think that this method is likely to be of real service. No doubt, in cases in which the femur slides freely on the side of the pelvis, the effect of weight extension, while the patient is in the horizontal posture, will be to keep the head of the bone comparatively fixed in one position. But it seems more than doubtful whether this will be followed either by anchylosis, or by such shortening and thickening of the capsule as will prevent sliding as soon as the patient, after whatever interval, is allowed to bear weight upon the limb. Many attempts have been made to deal with the more severe varieties of this malformation by operative interference. Heusner, having removed the head of the femur, scraped the acetabulum and placed the end of the bone in the cavity. He reports

that in eight weeks the child could stand on the limb, and was able to walk much better. Lorenz, after very free division of the surrounding muscles, including the adductors, hamstrings, and many more, exposes the rudimentary acetabulum—through an anterior incision of the capsule—enlarges it and places the head of the femur in it. Hoffa, in his earlier cases, using a posterior incision, enlarged the acetabulum and replaced the head; more recently he has removed the upper end of the bone. Lastly, Mr. Arbuthnot Lane lately showed a case in which he had endeavoured to anchor the head of the femur close below the anterior iliac spine in order, at the same time, to prevent sliding and remove lordosis. (*See* page 240.) The results to be obtained by these various proceedings appear somewhat unpromising. The operations of Lorenz and Hoffa's earlier proceedings are undoubtedly severe and involve a wholesale division of the surrounding structures; while the possibility of forming an acetabulum deep enough to retain the head of the femur seems very problematical. Heusner's method has the advantage of greater simplicity, and is less destructive to the parts around. Mr. Lane's operation is ingeniously contrived. But in the case he showed the patient's progression could scarcely be termed satisfactory. It is necessary to add that it is only in the more severe forms of this condition that operative interference can be regarded as justifiable. When there is no sliding of the head of the femur, and when there is only moderate inversion and adduction, no operative treatment ought to be adopted.

CHAPTER XIX.

ON THE PREJUDICIAL EFFECTS OF INTEROSSEOUS PRESSURE IN JOINT DISEASE; AND ON THE DANGER OF PRODUCING IT BY SURGICAL APPLIANCES.

All will accept the general proposition that rest is essential in the treatment of inflammatory diseases of the joints. Yet there are some points which require to be insisted upon in order that this principle may be adequately carried out. The first relates to the injury produced by reflex contraction of the surrounding muscles. This reflex contraction is present in the case of all the articulations. In the majority, however, it is only slight, and sufficient merely to secure more or less fixation and protection of the affected joint. Neither in the shoulder, the elbow, the wrist, nor the ankle does it become excessive, so as either to lead to deformity or produce pain. All these joints when first attacked are placed in their respective positions of greatest ease, and these positions are maintained undisturbed by muscular spasm through even long periods of active disease. In disease of the shoulder the arm remains at the side; the elbow is kept at an angle of about 120°; the wrist is slightly dropped; the ankle is fixed in a position of slight talipes equinus. Both the hip and the knee, however, offer a strong contrast to all these instances. They are liable to the influence of constant, and often violent, spasm in the surrounding muscles, which frequently leads to severe suffering and to irremediable deformity. Little can, I think, be said in explanation of this tendency to excessive contraction in the muscles lying round the hip and the knee, but it is one of the main elements that have to be

dealt with in the treatment of these two joints, and one which, as I shall subsequently endeavour to show, asserts its influence in several different ways.

To secure rest for a diseased joint all its component structures must be taken into account, and the different sources of disturbance must be kept in view. The synovial membrane must not only be defended from mechanical disturbance by movements of the joint which would have the effect of dragging upon or compressing its swollen processes and fringes, it must also be relieved, as far as possible, of its function of secreting synovia; while if it has become distended by effusion, appropriate means must be taken to remove this condition. The articular ends of the bones must, in the same way, be relieved of their ordinary functions of sustaining the pressure to which they are exposed, not only when they are engaged in transmitting the weight of the body, but also during muscular action. The latter form of pressure is, of course, well known to every anatomist and every surgeon. The tibia, in the case of the knee, for example, is a lever acted on by the surrounding muscles, and having the condyles of the thigh bone as its fulcrum; and whenever the muscles contract, so as to move the tibia, its upper end is pressed against the femur. Hence, to place the knee joint at rest, it is necessary not only to protect the synovial membrane from disturbance, and to prevent the patient from bearing weight on the limb, it is necessary also to remove interosseous pressure—that is, the pressure of the tibia against the femur which results from muscular action.

Rest both from the weight of the body and from the pressure attending muscular action is secured for a healthy knee joint for a considerable period in every twenty-four hours. During sleep, and in many other circumstances, all weight is removed, the limb is placed in the semiflexed

position, all the ligaments and all the surrounding muscles are relaxed, and the bones touch without pressing upon each other.

The conditions, however, under which a diseased joint is placed are widely different. Pressure depending on superincumbent weight may, it is true, be removed by posture. But, in consequence of reflex irritation, the muscles are kept in a state of contraction, which in the hip and knee is often so spasmodic and so violent that it is attended with extremely painful startings of the whole limb. The force with which the muscles act exceeds normal contraction as pain exceeds natural sensation. Its amount is indicated by the suffering it causes when, as is so often the case, the slightest movement of the limb, or a light step across the floor, brings on a succession of spasms that make the patient cry out with pain; while such violent contractions occur the moment he dozes off that, though he has passed through hours of distress, his chief anxiety is to keep himself awake. In these circumstances the articular ends of the bones are not only deprived of the usual respite from pressure which constitutes their physiological rest, but, diseased as they are, and therefore so much the more in need of rest and protection, they are exposed hour after hour, or even week after week, to an amount of pressure which, in consequence of the power and suddenness with which the muscles act, is in many cases greatly in excess of that to which they would be exposed, except on very rare occasions, in the condition of health.

Any scheme for treating the hip or the knee, therefore, must include a provision for the relief of interosseous pressure. There are at present two principal methods by which this may be attempted:—(1) The joint may be placed in some form of rigid apparatus which prevents movement, and under the influence of which muscular spasm will gradually subside. In all the joints except the hip and

knee, and in many instances in these also, this method is efficient, and leaves nothing to be desired. Improvement is immediate, and the subsequent progress of the patient is in the majority of the cases satisfactory. (*See* Elbow, Knee, etc.) (2) Weight extension may be employed. It is not too much to say that the introduction of extension by means of the weight and pulley has effected a revolution in the treatment of many forms of disease of hip and knee. Instances are constantly to be met with in which, by the help of this method, patients previously in severe suffering, and presenting such marked symptoms as night startings, high temperature, and wasting, are at once relieved, and soon rapidly improve. This fact is so well known at the present day that it is scarcely necessary to confirm it by cases. Yet the contrast between the two following instances may be taken as an illustration of it.

Case 1.—Sir Benjamin Brodie* relates the case of a gentleman who had hip disease resulting from a fall from his horse.

"One morning after the application of leeches he had a paroxysm of violent pain, attended with spasmodic action of the muscles of the thigh. The pain during this attack was so excruciating that, to use his own expression, he wished for immediate death. He took no less than one hundred and fifty drops of laudanum before he obtained relief. From this time, however, he was never wholly free from pain, and he was also liable to repeated attacks of more intense suffering, attended with violent spasms of the muscles of the thigh." He died a few months later (after suppuration had occurred) of phthisis. Brodie believes that the spasmodic condition of the muscles depended on the irritation produced by the formation of matter deep in the thigh, causing pressure on the branches of the anterior crural and obturator nerves, which he found were in close

* "Diseases of the Joints," p. 121. 5th ed., 1850.

relation to the sac of the abscess. But, however produced, this condition would, no doubt, have been relieved had the muscles been controlled pending the evacuation of the abscess by the continuous application of a sufficiently heavy weight to the limb.

Case 2.—I lately attended a patient, aged 23, whose right hip joint was diseased after an injury in hunting. When first seen, he was suffering so severely with spasmodic action of the muscles of the thigh that he was afraid to go to sleep. His temperature varied from 102° to 104°; he had profuse sweating, and was wasting quickly. A weight of seven pounds, increased in two days to fourteen pounds, very soon relieved him, and in the course of a week the spasms became very slight, and occurred not more than once or twice during the night. They subsequently ceased to trouble him, and though an abscess formed in the thigh, and rapidly attained a large size, he had no more severe pain, and ultimately recovered with anchylosis. The efficacy of extension in relieving spasm in this case was also shown by the fact that if the weight was removed, even for a moment, painful muscular contractions immediately returned; while on one occasion, when it became accidentally detached during the night, the patient suffered severely for nearly twelve hours, though the extension was reapplied with the shortest possible delay.

Indeed, the experience of every day shows that, setting aside the pain produced by the formation of an abscess, which, however, is often very slight, the severe suffering attending disease whether of the hip or the knee joint is due almost entirely to interosseous pressure from muscular spasm. When I was house surgeon in 1862 at the Hospital for Sick Children I often made the following observation. Children who on admission presented marked signs of hip disease, including startings

of the limb and frequent night screams, were placed in bed with no other treatment than weight extension, in the manner described at page 406. In almost every instance the acute symptoms at once subsided. When the children had become free from pain, which was usually the case within two or three days, I removed the weight while they were asleep, and found that they became restless, and soon awoke. They, however, immediately fell asleep again when the weight was replaced.

Yet there lies at the bottom of the successful application of weight extension a principle which is frequently overlooked, with the result that, instead of acting so as to relieve interosseous pressure, by drawing the surfaces out of abnormally close contact, extension has exactly the opposite effect, for it brings the articular ends still more firmly together. If the weight is attached to a limb that is in a position of extension (to the leg, for instance, when the knee can be straightened), its tendency is to draw the joint surface apart.* In the majority of cases, however, in

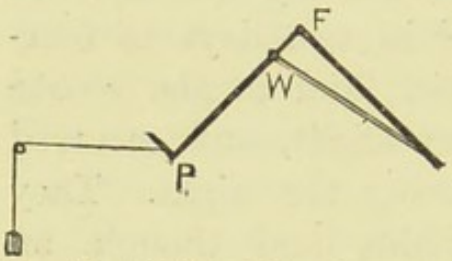

Fig. 41.—Weight Extension acting as Leverage in the Case of the Knee.

P, Power; W, weight; F, fulcrum.

* It is often said that the surfaces of a healthy joint do not admit of separation. The degree to which separation is possible is, no doubt, very slight, and no more than is sufficient to permit the various natural movements. If, however, traction is made on one of the fingers when it is extended, it will be seen that the first phalanx can be distinctly drawn away from the head of the metacarpal bone, so that the capsule is pressed into the interval by the weight of the surrounding atmosphere. It will also be found that the phalanx can be thrust back into contact with the metacarpal bone with a concussion that can be plainly felt, and often plainly heard. The wrist also, in most people, can be so far "drawn out" that the bones return into contact with a very appreciable stroke. But the effect of weight extension is not so much to draw the surfaces apart, so that there is an interval between them, as, by removing muscular spasm, to prevent them from being pressed too firmly together, and constantly maintained in that abnormal condition.

which the weight is used, the joint is fixed in a posture of flexion, and does not admit of extension. Now, if the weight is applied in the usual manner, when the limb is flexed, it will be seen by looking at Fig. 41 that the force called into play is that of leverage of the second order. The traction weight attached to the foot is the power acting on the lever formed by the tibia, the resistance to be overcome is in the contraction of the hamstring muscles and the ligamentous structures at the back of the joint; the fulcrum is constituted by the condyles of the femur. The effect of the traction-weight is, therefore, to bring the head of the tibia into firm contact with the condyles of the femur.

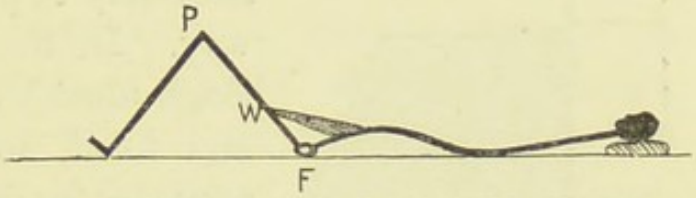

Fig. 42.—Posture of the Limb in Hip Disease in which Weight Extension acts as Leverage.

P, Pulley; W, weight; F, fulcrum.

In the same way, in the case of the hip joint (*see* Fig. 42), the weight attached to the foot acts on the femur as the power tending to overcome the resistance offered to extension of the thigh on the trunk, by the rigid psoas and iliacus muscles, inserted into the lesser trochanter.

If the parts are examined when the weight has been applied it will be found that the limb has come down into the horizontal position, while the pelvis has been rotated so as to produce curvature of the lumbar spine forwards, as in Fig. 43. This change in the position of the limb, however, does not alter the force that is being employed. The force is leverage still, and

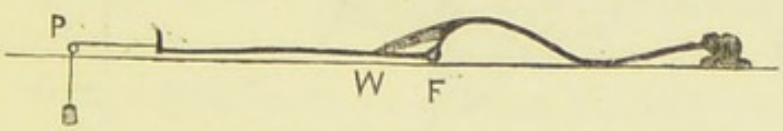

Fig. 43.—Weight Extension acting as Leverage in Hip Disease.

P, Pulley; W, weight; F, fulcrum.

interosseous pressure is still in action. In order to prevent this effect of the weight—in other words, to secure that it shall act by extension instead of by leverage—it is necessary to proceed in the following way. In the case of the knee, the thigh must be flexed upon the trunk and fixed, and the extension must then be made in the long axis of the leg. This is most conveniently done by placing the limb on such a framework as is shown in Fig. 44. The plane for the thigh should form an angle of about 60° with the surface of the bed. If it is more oblique the leg will, if there is much flexion, approach the perpendicular, a position not only inconvenient, but likely to induce œdema of the foot. In order to fix the thigh so that it is not drawn down, counter-extension may be secured on the following plan, suggested by Dr. E. J. Lewis, house surgeon at the Hospital for Sick Children. A trough-like and well-padded splint of leather or poroplastic felt is adapted to the back of the thigh. To this a loop is fixed, with which

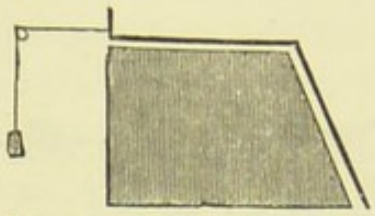

Fig. 44.—Position of the Limb during Extension for Disease of the Knee Joint.

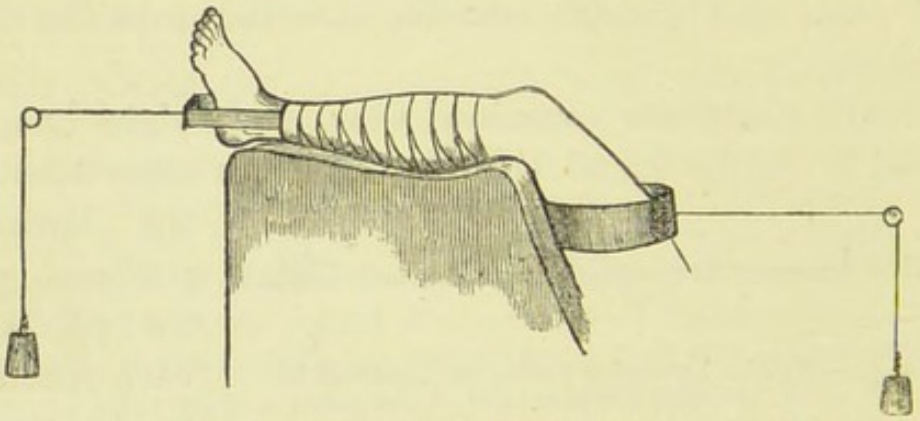

Fig. 44A.—Extension and Counter-Extension in Disease of the Knee Joint.

is connected a cord running to the head of the bed, and there turning over a pulley and supporting a weight of from five to ten pounds (Fig. 44A). I have found this a

very serviceable method; but care must be taken that no undue pressure is made on the back of the thigh. On the same principle, when the hip is the affected joint, the leg being extended on the thigh, the limb must be raised till the spine is free from lordosis, and must then be supported in this position (Fig. 58), the weight being made to act in the long axis of the limb. Then, as the weight gradually reduces the angle of flexion at the joint, the apparatus must be rearranged by reducing the height to which the limb is raised, and by changing the position of the pulley so that traction is still maintained in the long axis of the limb. By following out this process the limb will be gradually brought down into complete extension. (*See* page 410.)

It seems advisable to draw particular attention to this subject. Here is a great principle in the treatment of diseases of the joints to which everyone freely subscribes; the principle, namely, of removing interosseous pressure. Yet there can be no doubt that, though we possess adequate means for carrying this principle into effect, there is some danger that the method may be used in such a manner as to produce exactly the opposite result. I have seen many cases in which weight extension, applied as in Fig. 42, has had the effect of increasing pain, and has therefore been discarded as a failure. In these cases, however, when the limb has been arranged, as in Fig. 58 (page 407), and the weight has been reapplied, pain has been at once relieved and the efficacy of the treatment has been fully vindicated.

But weight extension is not the only method at present in use by which interosseous pressure may be inadvertently produced. Take next the case in which a joint is straightened under an anæsthetic.* In this proceeding,

* As surgery improves, forcible movement is being employed with greater discrimination than formerly. It is rapidly falling into disuse for the straightening of joints that are or have been seriously diseased (page 228).

the knee being taken as a convenient illustration, the tibia is used as a lever to overcome the resistance offered by the contracted hamstring muscles and the various ligamentous structures about the joint, and the head of the bone is made to bear forcibly against the condyles of the femur.*

This operation, as all who have performed it are aware, often produces considerable pain, and not rarely a good deal of subsequent heat and swelling, symptoms in part, no doubt, due to disturbance of the soft structures of the joint and to the rupture of the adhesions, but also, often in great part, to the injury which the articular ends of the bones have inflicted on each other in the relation of lever and fulcrum which they have been respectively made to bear. Nor is the mischief at an end when the straightening itself is completed; but pressure is maintained when the limb is placed upon a splint, with the recently extended muscles and ligaments still in a tense and resisting condition. The continuance of pressure is shown by the pain which persists, in some instances for many days or even for some weeks, after the operation.

Another case in which interosseous pressure is produced in the treatment of joint disease is the general one in which any kind of apparatus, working by a screw, is used for straightening a contracted limb. The best example that can be given of a large number of appliances of this kind is the common back splint, working with a screw, however arranged, for extending the knee joint. In this apparatus the leg piece, as it is made to straighten itself on the thigh

* It will be observed that, while the muscles surrounding the knee and other joints almost all act on levers of the third order, it is the second form that is used when we resort to forcible straightening. It will be observed, also, that while the muscles act at a great disadvantage as to power, owing to the fact that they are inserted so near the centre of motion that their leverage is very short, in forcible straightening the leverage employed is much more powerful, for the lever is formed by one of the long bones grasped at its farther end.

piece, plays the part exactly of the surgeon's hand when he grasps the tibia and forcibly extends it. In both cases alike the tibia is a lever resting against the condyles of the femur as its fulcrum, and the resistance lies in the contracted hamstring muscles; while, in the one case, the force is applied by the hand of the operator, in the other it is applied by the screw tending to carry the tibia towards an extended position. Instruments acting on the same principle of leverage, and intended for the treatment of deformities, both of the hip and the knee joints, are to be found in every illustrated work on orthopædic surgery and in every catalogue of surgical appliances. Many of them are very powerful, and are described as competent to overcome any resistance short of that due to bony anchylosis. I will not deny their power. I am sure, however, they often do very great harm. For contraction of the elbow, also, similar appliances are in use. They consist of an arm piece and a fore-arm piece moving on each other at the elbow, under the action of a screw.

Probably all who have employed it have been impressed by the unsatisfactory effect produced, in cases of disease of the knee, by the kind of splint I have alluded to. The contrast between the result of using this kind of appliance, which creates, and the result of weight extension, which removes, interosseous pressure was well shown in the two following cases:—A woman, aged 27, was in St. Bartholomew's Hospital for the treatment of acute inflammation of the knee joint of six weeks' duration, following confinement. As the joint was bent to within a right angle, a back splint was applied for the purpose of fixing it and keeping it at rest, and every day the screw was slightly turned in order to straighten the leg upon the thigh. This treatment, however, not only failed to relieve the pain of which the patient complained, but had the effect, especially when the screw was turned, of increasing it to such an

extent that she begged to have the splint removed. She was, in fact, quite unable to sleep on account of violent and nearly incessant startings of the limb, which occurred as soon as she dozed off; her temperature was 103°, and she was losing flesh so rapidly that it seemed likely amputation would soon be called for. The limb was now placed in the position shown in Fig. 44A, and a weight of seven pounds was applied. The result was almost magical. The pain and startings were at once almost entirely removed; her temperature went down to 100°; during the following night she slept for several hours without waking, and said next morning this was the best night she had had since her knee was attacked; her appetite and strength returned, and within a week the joint had ceased to pain her, and was steadily passing into a position of extension. She left the hospital two months later with the limb straight and enclosed in leather splints.

A boy, aged 9, was in the Hospital for Sick Children, with a contracted and painful knee. The joint was hot and swollen, the skin over it was tense and shining, the leg was flexed at less than a right angle with the thigh. The limb was placed on an iron back splint fixed at a corresponding angle, and working with an extension screw. This appliance failed to give relief. On the contrary, at the end of a fortnight the pain and heat of the joint were increased, and the boy always complained more after the extension screw had been turned. The limb was now placed as in Fig. 44A. The effect was, as in the other case, very striking; the boy was at once much easier, and he slept well. Within a fortnight pain had entirely ceased, the limb was approaching complete extension, and heat and swelling were both subsiding. In six weeks he went to the convalescent branch of the hospital, free from pain, and with the limb enclosed in splints, in a position of nearly complete extension.

It may be objected that in many cases the unfavourable results I have mentioned of the use of splints for extending joints are not observed; that position is corrected readily and by a painless process. This is, no doubt, true. Such examples are instances of synovial disease, generally slight and not of long standing, in which the articular ends of the bones are normal, and can bear the pressure which the apparatus involves. The pressure, nevertheless, exists, and in the majority of cases is certainly prejudicial.

This interosseous pressure is mischievous, not only in its immediate effect on the ends of the bones, but because, by giving rise to reflex irritation, it tends to maintain and to aggravate spasm in the surrounding muscles. Indeed, these two conditions of interosseous pressure and muscular spasm act and react on each other, and so concur to promote the advance of the disease. The method of weight extension acts in a radically different manner. It has a direct tendency to fulfil the two main indications of treatment. It tends to separate the articular ends, and by its constant and steady action it tires out the muscles so that they soon pass into a condition of repose.

The numerous class of appliances for straightening contracted joints upon the principle of leverage are open to a further objection. The knee will again serve as the best illustration. When the knee is being acted upon by the ordinary back splint working with a screw, the head of the tibia, by pressing firmly against the femur, tends to induce reflex spasm, so that the hamstring muscles are maintained in a condition of contraction. In these circumstances they resist extension of the leg, with the result that in place of the tibia resting upon the condyles of the femur—as the end of a lever should, with a firm bite upon its fulcrum—it tends to slide upon their rounded, polished, and lubricated surface, in a direction backwards into the popliteal space. In other words, instead of the fixed point being

at the spot where the tibia rests against the femur, this fixed point is placed where the hamstrings are inserted; so that the result of the use of the splint is not to produce extension, but dislocation of the bones of the leg backwards. The effect is very similar in the hip. In cases of contracted hip the orthopædic appliance generally used consists of a steel pelvic circlet, and a strong bar working with a screw, and reaching down to the knee. The essential part of this instrument is the thigh piece, which is made to travel towards extension by the action of the screw opposite the hip joint. In this movement it makes a lever of the femur, whose fulcrum is at the acetabulum, so that the head of the femur is pressed firmly against the upper and posterior border of that cavity. Now, in cases in which the upper border of the acetabulum and the head of the femur have not undergone absorption there will be no sliding; but if absorption has already taken place so that the acetabulum has become shallow, and the head of the femur has melted away, the result of the use of this instrument will very likely be the displacement of the femur upwards and backwards upon the dorsum ilii. An instrument acting on so defective a principle should not be used. Much better results will be obtained by weight extension employed in the manner described at page 407 *et seq.*

CHAPTER XX.

NERVOUS MIMICRY AND HYSTERIA.

It is to be regretted that it is still necessary to employ the term "hysteria," either in general surgery or in its more limited application, to diseases of the joints. It, however, maintains its ground, partly because it has been so long in use that it is difficult to expunge it, and partly because everybody is well aware that it is no longer employed in a literal sense, but as a familiar and convenient name for a group of disorders which, in the present state of our knowledge, cannot be placed under any definite heading in pathology. A common, and at the same time main characteristic of so-called hysterical affections is that they depend on some disturbance of the nervous system unassociated with any alteration or defect of structure that can be detected. They nevertheless lead to symptoms identical with those which arise when some obvious structural or organic lesion is present. Sir James Paget, who in his "Clinical Lectures and Essays" has drawn attention to this question, while condemning the use of the word hysteria as absurdly derived, and, being often employed as a term of reproach, worse than absurd, has introduced the term nerve-mimicry, or neuromimesis, to indicate those cases in which a nervous disorder produces an imitation or mimicry of organic disease. The various forms of neuro-mimesis of joint diseases that may be met with will best be illustrated by a few typical cases.

Case 1.—Annie M., aged 14, was brought to the out-patient room of St. Bartholomew's Hospital, with the left knee so strongly flexed that the heel touched the tuber ischii. Her mother said that, fourteen days before, the

child had fallen down upon her knee, and that the limb had contracted two days afterwards. A bruise was still visible over the prominent part of the internal condyle of the femur. On examination of the knee I could find neither swelling, heat, nor tenderness; in fact, the joint looked perfectly normal. Regarding the contraction as of mere nervous origin, I pretended to search for and find a particular spot in the popliteal space, and, pressing my finger strongly in, peremptorily ordered the patient to straighten the limb. She did so at once, and while the finger was still pressed upon the surface she walked round the room. The contraction did not return.

Case 2.—A girl, aged 10, was admitted into the Children's Hospital for the treatment of hip disease, from which she was said to have been suffering for about six months. On investigating I noticed these points:—The limb was drawn up by tilting of the pelvis to the extent of more than three inches, and strongly adducted and rotated inwards, so that the great toe rested on the dorsum of the opposite foot. The whole limb was cold and the skin was mottled and dusky. There was no swelling about the hip; the joint appeared to be stiff, but the patient complained so much of pain on the slightest touch, and threw herself into such a contorted posture by arching her spine forwards, and still further twisting her pelvis, that the real condition of the joint could not be made out. When she had been for a few days under observation, it was ascertained that she never complained of pain in the limb at night, and only when an attempt was made to alter its position; that the position of the limb varied very much, and was sometimes found to be nearly natural; and that she could move herself in bed without pain. She walked apparently with great difficulty, but without pain, and kept the foot of the affected limb in a position of marked equino-varus. There was distinct, though not marked, muscular wasting. When

she was under chloroform every trace of deformity at once disappeared, and the movements of the joint were perfect in every direction. This patient slowly recovered under the influence of careful training and the use of the faradising electric current. The symptoms of real disease that were so strongly imitated were tenderness of the surface, pain upon movement of the limb, loss of motion in the joint, lameness, slight wasting, and deformity induced by contraction of the adductors and other muscles round the articulation. Diagnosis, however, was easily arrived at by observing that although the various symptoms just enumerated are all signs of inflammation of the hip joint, they occurred in a manner that was inconsistent with the view that they depended on real disease. Thus while tenderness was much more acute than it usually is in even severe disease, it was accompanied by no swelling and by no heat, or redness of the surface, as if an abscess was forming. While the patient complained of severe pain on the slightest movement of the joint, she was never disturbed at night, either by pain or starting of the limb—symptoms which would certainly not have been absent had the pain felt on movement depended on inflammation of the joint. Again, although so much pain was produced by movement of the limb, there seemed to be very little when she attempted to walk. The manner in which she walked, too, was not like anything seen in acute joint disease. The limb was swung in a loose and almost flail-like fashion, as if partly paralysed, totally unlike the gait of a person who is using the limb for the purpose of fixing and protecting an inflamed joint. And, further, the wasting of the limb, though present to a slight degree, was much less marked than it would have been in the course of active disease. The suspicion of nervous mimicry, excited by the observation of these features of the case, was confirmed when the limb was found to be perfectly movable

under chloroform, but to become rigid again as soon as the effect of the anæsthetic had passed off.

Case 3.—Mary B——, aged 26, presented herself at St. Bartholomew's Hospital, for advice about her right elbow. She said that three months before she had sprained the joint while wringing a wet cloth. The same night the elbow had become excessively painful, so tender that she could not bear even the slightest touch upon the surface, and stiff. The stiffness and sensitiveness still remained. On examination I found the joint quite free from both swelling and heat; indeed, the surface was dusky from feeble venous circulation. But whenever it was touched the patient shrank away as if pain was severe. The smallest attempt at movement made her scream, and although great gentleness was used she threw herself into a state of nervous agitation during the examination. When she was under ether the joint passed, with the exercise of scarcely any force and without any sign of the giving way of adhesions, into a position of full extension, and was found to move with complete freedom in all its natural directions. It, however, at once became stiff when the patient regained consciousness. Three applications of the faradising electric current completely cured this case.

In some instances, instead of muscular spasm, which fixes a joint in one position, a condition of paralysis may be met with, so that the patient has lost all power of moving the joint. A young woman, of whose case, however, I have only imperfect notes, had complete paralysis of the extensors of the wrist, so that the hand hung at a right angle with the fore-arm in the manner observed in the wrist drop of lead palsy. She complained of considerable aching about the joint, and of a burning sensation over the back of the carpus. The hand could easily be brought into line with the fore-arm, but it dropped as

soon as the support was removed. There was, however, no pain, and no other sign of disease. Electrical reactions were normal. This case, like that just related, was cured by a few applications of faradism. The case was a well-marked example of the condition which Sir James Paget speaks of as one of "want of will, amounting to feebleness or complete negation of will in reference to the supposed seat of disease, while towards other things the will is strong enough. A girl who has will enough in other things to rule the house, has yet not will enough in regard to her limbs to walk a step with them, though they are as muscular as ever in her life. She says, as all such patients do, 'I cannot.' It looks like 'I will not,' but it is 'I cannot will.'" * It will be observed that though the foregoing cases, which are illustrations of a large group, are classified as instances of nervous mimicry affecting joints, they are really examples of nervous disorders of the muscular system, only involving the joints by rendering them rigid or powerless.

In a third group the joints are affected by nervous mimicry in the form of intense pain, which is more or less constant, but which is aggravated whenever an attempt is made to use them. Patients are sometimes seen who, after a slight blow or a sprain of the hip or knee, complain of such severe pain that they are unable to bear any weight on the limb, or even to place the foot on the ground. On examination, however, the joint is seen to be free from all appearance of disease. There is no swelling, the temperature is normal, and the muscular wasting is very slight, or entirely absent; and when an anæsthetic has been administered movement is completely free and smooth. These neuralgic or painful joints are met with most commonly in persons who suffer from cold feet and hands, chilblains, and other signs of feeble circulation, and the joint itself

* "Clinical Lectures and Essays," 2nd ed., p. 188.

is often cold, and the skin over it dusky from venous congestion.

Diagnosis.—A point of considerable importance in the diagnosis of these cases of neuro-mimesis is that, though the limb may be considerably distorted in respect of its mere posture, no real deformity is present, and the natural position, and with it free movement, is at once regained when the patient is under an anæsthetic. Thus, in Case 1, muscular spasm had drawn the patient's heel into contact with the tuberosity of the ischium. This position, however, was merely the extreme degree of natural flexion. In Case 2, the thigh had become considerably adducted on the pelvis, and then the pelvis had become, for compensation, very much drawn up on the affected side (Fig. 57). The position, however, was a mere posture of the limb, which entirely disappeared under ether. These contractions never produce the form of displacement of the bones which is met with, *e.g.* in disease of the knee as the result of organic disease. In some cases, indeed, it is very suggestive of neuro-mimesis affecting the knee, that although the joint may be the seat of severe pain, hyperæsthesia, and complete disability, it remains for many weeks, or even for months, in a posture of full extension. Occasionally two joints may be involved. In one patient both knees, and in another the right knee and ankle were affected: the knee remained fully extended, brawny and hyperæsthetic: the ankle was fully extended in a position of equinus, rigid, cold, and over-sensitive.

Bearing in mind that the principal symptoms of organic disease of the joints are pain, swelling, stiffness, and muscular wasting, it may be useful to glance at each of these in its relation to nervous mimicry.

Pain.—The main features of the pain that accompanies neuro-mimesis are that it is generally out of all proportion to the other signs of disease, and that it is evidently very

largely of mental origin. The surface of the joint is so exquisitely sensitive that the patient will not bear the slightest touch, and any attempt to move the joint produces an amount of suffering which, were it due to inflammatory disease, would certainly be associated with heat and night startings, muscular wasting, and considerable constitutional disturbance. Besides, pain radiates widely, so that it extends, in the case of the knee for example, from the hip to the lower part of the calf. As a matter of fact, however, in these cases the patient looks perfectly well, there is no fever, the general health is quite unaffected, there is no pain to disturb a sound night's rest, and the patient may often be observed to move in bed with a freedom which would be impossible in active joint disease. Moreover, when the mind is diverted the joint bears both firm pressure and some movement (if these tests are not suddenly produced so as to recall attention to the joint), without complaint; and the joint is not only free from abnormal heat, but is often unnaturally cold, and the skin is blue and dusky.

Swelling.—In a large number of instances swelling is entirely absent, so that although the joint is stiff, and the seat of an amount of pain which, were it due to inflammation, would indicate considerable disease, there is obviously no effusion either into the synovial cavity or the soft structures surrounding the articulation. This absence of swelling is a very important diagnostic sign, for whenever inflammation is present in any joint except the shoulder and hip, in which, from their deep situation, it cannot be detected, some swelling is invariably met with. It must, however, on the other hand, be remembered that swelling is occasionally seen about joints in cases of mere nervous disorder or nervous mimicry. Such swelling presents itself, not in the form of exudation into the cavity of the articulation, but as an ill-marked puffy effusion into the

surrounding areolar tissue, often attended with transient heat or flushing of the surface, and with hyperæsthesia of the skin. In two cases this swelling was present not only in the soft structures over the knee itself, but it could be traced for some distance up the thigh in the form of thickening about the lower end of the femur, as if the result of chronic periostitis or even of some inflammation of the bone. For several months it underwent but little change, and at length slowly disappeared. Such swelling is, in fact, very similar to the œdema which is not rarely met with in tic-douloureux, or in other forms of severe neuralgia. Although swelling of this character may at first sight appear to depend on organic disease, a careful study of other symptoms of the case will disclose its real nature.

Heat.—Very important evidence may be derived from the presence or absence of heat. As I have already mentioned, a joint that is the seat of nervous mimicry is not only as a rule free from heat, but is often colder than natural—obviously colder than the corresponding joint of the opposite limb—and this defective temperature is accompanied with a weak condition of the circulation, so that the surface feels cold and clammy; and if pressure is made with the tip of the finger, the displaced blood returns so slowly that the whitened patch is only very gradually reddened again. All this is the rule, yet it must be borne in mind that although the case is one of mere nervous mimicry, the joint may present an unnatural amount of heat. This heat may very easily be distinguished from that which depends on organic disease, for it is inconstant and very variable, absent during the greater part of the day, so that the joint is then perfectly cool, and returning only towards evening or at some particular hour of the day; and it is often associated with flushing of the skin and with transient hyperæsthesia. Sometimes it is noticed that although the joint is usually cool, or even cold, it

becomes hot as soon as an attempt is made to use it, or when the patient's attention is strongly directed to it. In all such cases it is much more important to notice that the joint is generally cool than that it is occasionally over-warm and flushed, for it may be safely concluded that a joint which is often perfectly cool is not the seat of any inflammatory action.

Stiffness.—This symptom must be carefully studied in any case in which nervous mimicry is suspected. It is characterised, in the first place, by the exaggerated degree in which it is often present; for while motion in a joint affected with inflammation is invariably impaired, it is as a rule, at least in the earlier stages, not completely lost, and its defect can be ascertained to be located either in the joint itself or in the muscles immediately surrounding it; while in nervous mimicry it is easy to notice that the joint is stiffened by the firm and, so to say, emotional contraction of all the muscles of the limb. The position, also, in which the joint is found is often very suggestive. When real disease is present the joint is placed in the position of greatest ease (page 263); but in nervous mimicry it is often either rigidly extended or rigidly flexed, or fixed in some other posture which would certainly tend to increase the pain of real disease. In Case No. 1 the limb was maintained in a position of strong flexion. In other cases when the knee is affected the limb is maintained in a position of rigid extension, a posture which in itself is almost enough to exclude the presence of any inflammatory disease. I have notes of one case in which the elbow was thus completely extended, and of another in which, after a slight sprain of the ankle, the foot was held in a position of extreme talipes equinus. In another, the thigh was so strongly adducted that the limb was apparently shortened (page 391) to the extent of four inches. A further point sometimes observed in these cases is that the posture

in which the limb is held is not constant. In a patient who had mimicry of hip disease, the limb was found sometimes apparently shortened, and then a few hours later apparently lengthened. In another, in which the ankle was concerned, the foot assumed at different times almost all the various forms of talipes, being turned sometimes in one position and sometimes in another. Lastly, the stiffness which depends on mere nervous disorder not only completely disappears when the patient is under an anæsthetic, but also, to a large extent, during sleep. In the more severe forms, however, this latter is not the case; rigidity remains, though it may be somewhat less marked than when the patient's attention is directed to the limb.

Wasting.—Here, again, is a sign that demands careful consideration. In any case of inflammatory joint disease, except in the most incipient stage, or when the affection is very slightly developed, atrophy is present; while in many cases of neuromimesis it is entirely absent. Thus, this symptom is often available for drawing a line between these two conditions. Yet it cannot be always depended upon for this purpose, for there are many instances of mere nerve disorder in which some, and it may be considerable, muscular wasting is present. In any case of doubtful diagnosis, therefore, it will be important to notice whether, and in what degree, atrophy has occurred. If, notwithstanding the presence of pain, stiffness, and lameness, there is no wasting, the latter point may be taken as constituting strong presumptive evidence that the affection is only nervous. Especially may this be held if the joint is habitually cold, and if no swelling of the joint is found after careful measurement. If, however, wasting is present, no hasty conclusion that the case is one of organic disease must be formed, but all the other symptoms, as well as the age and general characteristics of the patient, must be taken into account. These last-mentioned points should always

be allowed their full weight; for nervous mimicry is most commonly met with in female patients, in whom there is often a history or some present evidence of hysteria, neuralgia, or some other form of nervous disorder. It is often seen, also, in young male subjects who lead sedentary lives, have a highly-strung nervous temperament, and are frightened and fanciful about their health. In one instance a surgeon, aged about 26, consulted me with a suspicion that he was developing hip disease after a railway accident. He walked very lamely, and the muscles of the thigh were maintained in a condition of contraction, the limb being in a position of slight flexion and adduction. There was, however, no trace of wasting or swelling, and he had no pain or stiffness at night; but he complained of intense suffering on even the slightest touch, and would not tolerate the gentlest attempt to move the limb. Suspecting the nature of the case, I had him placed under the influence of ether, and I then found that the joint moved with the most perfect freedom in every direction. As soon, however, as the effect of the anæsthetic passed off, muscular contraction returned. He recovered quickly under change of air, and when he was strongly assured that no disease was present.

A group of cases, the diagnosis and treatment of which may present considerable difficulty, is formed by instances in which structural joint disease and hysteria or neuromimesis occur together. Such a combination is often met with in female patients between twelve and thirty, and sometimes also in males of a similar age. In such cases a mistake in diagnosis may lead to very unfortunate results. Error can only be avoided by bearing in mind that incipient organic disease is apt to be obscured by hysterical symptoms: and by very closely investigating each case, and repeating the examination a few days later, so that a mature conclusion may be formed. Until doubt has been set aside the patient should be treated as if organic disease were known

to be present. The following example came under notice a few years ago. A girl, aged 19, complained of pain in her knee, and said that she was unable to walk on the limb. On examination, the joint presented a natural appearance, except that it was very slightly puffed on either side of the ligamentum patellæ. The limb was fully extended. There was slightly increased heat of the skin over the joint. The patella was freely movable. On the slightest touch of the surface the patient complained of severe pain, and when an attempt was very gently made to ascertain whether the limb could be flexed she became strongly hysterical. It was found that during sleep the knee was often considerably flexed, but that when she was awake it was always extended. When asked to walk on the limb she became agitated, and instead of attempting to bear weight on the leg she scarcely touched the ground with her heel, but threw herself on the other limb with a violent jerk that must, as it seemed, have inflicted pain on the suspected knee, were it really the seat of disease, but this sudden movement did not appear to hurt her. She was pale and anæmic, and her menstruation was irregular and painful. There was no doubt that this patient was strongly hysterical, and at first her symptoms were ascribed to this condition. But on further investigation it was noticed that the muscles of the thigh were wasted and flabby, that there were night-startings of the limb, that the slight enlargement of the joint was due to pulpy thickening of the synovial membrane, and that when the patient was under the influence of ether, although I could bend the joint without force, some intra-articular adhesions were felt to give way. Moreover, after the bending, although no violence was used, the joint became painful, hot, and swollen. It was, on a review of all these circumstances, believed that though the patient was plainly hysterical, the condition of the joint depended on organic

disease. The limb was therefore placed in leather splints, and the patient was advised to keep it at complete rest. On leaving the hospital, however, she, as I afterwards learnt, discarded the splints and got about as well as she could. Six months later I saw her again, and found her suffering from advanced disease of the joint, indicated by considerable swelling, flexion, heat of the surface, and commencing displacement of the tibia backwards and outwards. Two years later the limb was amputated at another hospital.

In this group of cases the danger is, that finding the patient is hysterical, we may overlook the fact that behind this condition organic disease is present. The important point, however, is to make the diagnosis turn, not on the detection of hysteria, but on the question whether the symptoms of organic mischief can be absolutely excluded. In the case just related it was evident that the patient was very hysterical, and the fact that the limb was kept fully extended, the extreme sensitiveness of the skin over the joint, and the way in which she threw herself about when she attempted to walk, all at first sight pointed to hysteria alone. But, on the other hand, the considerable wasting of the muscles, the starting of the limb at night, and the distinct, though slight, swelling of the synovial membrane, formed a combination of symptoms, which, though each was slight in itself, raised a strong suspicion of organic disease; and this was converted into a certainty when, during the examination under ether, adhesions were felt to give way, and when afterwards the joint became swollen, hot, and painful.

Treatment of hysterical joints.—This must be general and local. General treatment should comprise means for restoring or improving the health. Iron and other tonics must be given if the patient is anæmic, and irregular menstruation must be corrected according to rules to be found in the standard works on this subject. Plenty of

fresh air, and any exercise that can be taken, should be insisted on, though the latter should fall short of fatigue. The patient's mind should be diverted, as far as possible, from her malady, and her attention occupied by pleasant surroundings. She should be strongly assured that there is no serious disease of the joint, and be given to understand that her recovery is certain to take place. I have always observed that the best course is to convey the impression that there can be no kind of doubt on this head. This attitude will strongly encourage a patient who (as many do) really wishes to recover; while in the case of patients who wish to pose as interesting invalids, it affords little upon which they can cultivate their inclinations and morbid fancies. Local treatment consists in the use of warmth, for hysterical joints are usually cold. The part should be covered with flannel, and hot douching morning and evening is often of service. Any abnormal position which the limb may have assumed should be at once corrected, and a splint should be applied to prevent its return. Often an anæsthetic will be required to ensure the necessary muscular relaxation, and plaster of Paris applied in the manner described by Mr. Croft* forms a convenient retention-apparatus. It is often advisable to place the limb, while the patient is under the influence of ether, in the position opposite to that which it has assumed. This has the effect of tiring out the muscles that are at fault. The joint should not, however, be maintained in a rigid position for more than about a fortnight. After this period it should be shampooed, and douched with hot water, and electricity should be regularly applied once or twice a day. In many cases this form of treatment has seemed of much greater efficacy than any other that has been used. Many patients improve steadily when they can be induced to practise movement of the

* *Lancet*, 1878, vol. i. p. 819.

joint, with the assistance of a nurse or attendant, who combines passive motion with that which they are themselves able to effect.

In some instances the distorted condition has been due to paralysis of one group of muscles and the unopposed contraction of their antagonists. The treatment must consist in frictions and shampooing, combined with the use of faradic electricity, to the paralysed group of muscles, the joint in the meantime being supported in its normal position by a splint.

CHAPTER XXI.

TUMOURS INVOLVING THE JOINTS.

VERY important, and often very obscure cases are those in which the question arises whether the patient is suffering from some inflammatory affection of a joint, or from a new growth. Tumours which closely imitate inflammation of a joint occasionally originate in the synovial membrane; but more commonly they are seated in the articular extremity of one of the component bones. In the latter case they spring usually from that end of the bone in which the original growth in length of the shaft mainly takes place. Hence the occasion for diagnosis between tumours and joint disease chiefly, but by no means exclusively, presents itself in the instances of the shoulder, the wrist, and the knee.

New growths involving the articular ends of the bones are for the most part sarcomata. Some are myeloid; others are round-, spindle-, or mixed-celled; in some a large admixture of cartilage is present. A few are simple enchondromata.

Most frequent in subjects between fifteen and thirty, these growths are either periosteal or endosteal. The periosteal sarcomata increase rapidly, infiltrating the bone on the one hand, and the neighbouring soft parts on the other. As they enlarge they impinge upon, and at length project into, the cavity of the joint; and lead to the entire destruction of the synovial membrane, ligaments, and cartilage, and to displacement of the bones and deformity of the limb. The endosteal sarcomata are frequently myeloid; but some present the same structure as the periosteal variety. The growth of these endosteal tumours is less

rapid than that of the periosteal form. They rarely affect the lymphatic glands, and are rarely disseminated. As they increase they expand the bone. Not rarely spontaneous fracture occurs.

The likeness of a new growth to tuberculous joint disease is sometimes so close that great care is required to avoid an error that may lead to disaster. This is the case when the growth is so soft and elastic that it seems to fluctuate; when it is seated in the immediate vicinity of, or has even extended to, the synovial membrane; and when, moreover, by interfering with the circulation, it has led to effusion into the cavity of the joint. Such tumours, which are usually of the periosteal variety, grow towards the joint in the form of either fleshy, or soft and elastic, ill-defined or flattened lobes, merging in other directions into the adjacent soft structures; or they may present firm, dense, and prominent lobes or nodules, closely abutting on the articular cavity. The joint diseases which they may closely resemble are (*a*) synovitis attended with some effusion, but mainly characterised by considerable pulpy thickening, and induration of the synovial membrane, and enlargement of the articular ends of the bones, such as is seen in some of the worst forms of tuberculosis and syphilitic disease (page 154); (*b*) certain forms of chronic rheumatism or osteo-arthritis with synovial effusion, and irregular nodular enlargement of the articular ends of the bones. The main points in differential analysis are the following:—A new growth is irregular in outline and, as a rule, extends in some directions obviously beyond the confines of the joint; the shaft of the bone, as well as its mere articular extremity, is distinctly enlarged; the swelling at the part most remote from the joint is often hard, nodular, lobed, or tuberose; one bone only is affected; movement of the joint within certain limits may be free. Enlargement is usually rapid and

continuous, so that in three months the disease has attained considerable size; the lymphatic glands may be enlarged. This, however, is rare. Pain, heat, effusion into the joint, and distension of the cutaneous veins are symptoms upon which, in respect to diagnosis, little dependence should be placed. In new growths pain may be either slight, moderate, or severe; local heat may be well marked, and the general temperature may rise to 102° or even 103°.* The cutaneous veins are often enlarged and conspicuous in advanced tuberculous disease. Some guidance may be derived from observing whether the patient presents any evidences of tuberculosis, or of the rheumatic diathesis, or is suffering from disease of any other joint; and the history of the case, and of the patient's family, should be inquired into. Should doubt remain, the disease should be closely watched, measurements should be taken, and the case in the meantime should be treated as if the affection were inflammatory, with rest and well-fitting splints, or with such remedies as the features of each particular case may suggest. It may even be advisable, care against septic infection being taken, to remove a portion of the disease for microscopic examination, so that diagnosis may be completed and the appropriate treatment entered upon without delay.

Treatment.—The treatment of tumours of the articular ends of the long bones involving the joints must lie between amputation of the limb and enucleation of the growth; or in the case of the upper end of the humerus, or the lower extremity of the ulna or radius, excision of the end of the bone.

Enucleation should be practised when the tumour is cartilaginous and limited in extent, and in some cases of myeloid sarcoma when the growth is still small and circumscribed, and when it has not yet destroyed, or

* St. Bartholomew's Hospital Reports, vol. xxviii. p. 14.

materially weakened the bone or involved the joint.* In instances of rapidly-growing sarcomata, in which the tumour is already large, amputation should be at once performed. In doubtful cases an exploratory incision should be made before amputation is carried out, or it may even be right, in the first place, to see if the tumour can be satisfactorily removed. Should the attempt fail, amputation must immediately be resorted to. Excision of the end of the bone may be attended in appropriate instances with an excellent result, in the case of the upper end of the humerus and the lower ends of the bones of the fore-arm. In the course of 1886 Sir W. Savory, at St. Bartholomew's Hospital, removed the upper third of the humerus for myeloid sarcoma growing within it in a girl aged 16. The wound healed without drawback, and there was every promise that the limb would be very serviceable when the patient was discharged six weeks after the operation. A case is recorded by Mr. Lucas† in which he removed the lower half of the ulna for a myeloid tumour occupying its substance. The patient retained a useful limb. In the same volume (page 138) Mr. Henry Morris has a valuable paper, in which he relates an instance where he removed the lower two-thirds of the radius and the lower three inches of the ulna for endosteal sarcoma of the lower part of the radius. After recovery the patient could use the limb for many purposes when it was supported in a leather case. In the same communication examples of a somewhat similar operation performed by other surgeons are referred to. Doubtless in the majority of these cases recurrence ultimately takes place, and in some it is not long delayed; yet the interval is in many of them amply sufficient to justify this method of

* On the subject of the removal of tumours from bone, the reader should consult a paper by Sir James Paget, Med. Chir. Trans., vol. liv. p. 253.

† Clin. Soc. Trans., vol. x. p. 135.

treatment, and the usefulness of the limb is certainly a striking feature in the result that is obtained.

Sarcoma commencing in the synovial membrane of a joint is probably very rare. I have seen only one example of it. This occurred in a boy, aged 17, who was admitted into St. Bartholomew's Hospital in 1893. The patient had a low-crowned firm swelling, about the size of a Tangerine orange, at the inner side of the right knee joint, and apparently attached to the internal condyle close to its articular border. When, however, the swelling was exposed it was found to be situated entirely in the synovial membrane. It was freely removed, together with a wide margin of healthy tissue. In this proceeding a large window was cut into the joint. The wound healed favourably. During 1895—that is, two years after the first operation—the growth returned in the form of a small nodule, and was again freely removed. On microscopic examination the tumour was found to be a sarcoma, presenting a structure composed of round and spindle cells.

Hydatid disease of the joints.—In a very valuable paper embodying the results of great research and containing all that is at present known upon the subject, Mr. Targett* has described the extension to the joints of hydatid disease involving the articular ends of the adjacent bones. This invasion establishes, Mr. Targett points out, a grave complication, inasmuch as the disease is always attended with suppuration. The development of the original cyst leads to wide destruction of the bones, the cancellous tissue is broken down, and extensive necrosis takes place. As the disease advances, the secondary cysts escape through the walls of the bone and occupy the surrounding structures and make their way into the cavity of the joint. These changes are well illustrated by a specimen of hydatid disease of the knee joint (No. 1700 B and C in the museum of the

* Guy's Hospital Reports, vol. l., 1893, p. 309.

College of Surgeons). The following is Mr. Targett's description of the case :—

The specimen consists of the ends of the bones and soft parts forming a right knee joint. The lower end of the femur (Fig. 45) has been divided in an antero-posterior plane, and the cut surface displays a large cavity occupying the interior of the bone immediately above its articular surface. This cavity measures nearly two inches vertically, and from before backwards, while laterally it extends into each femoral condyle, and has a width of three and a half inches. Above, it is bounded by the end of the diaphysis, which has been transversely fractured and driven into the cavity below for the distance of an inch. Anteriorly, the space is limited by the compact tissue of the bone; posteriorly, the corresponding layer is largely replaced by dense fibrous tissue, and what actually remains of the osseous material is reduced to a thin lamella. Similarly, the outer and inner walls of the condyles are little more than a translucent shell of bone. The articular surface of the femur which forms the inferior boundary of the

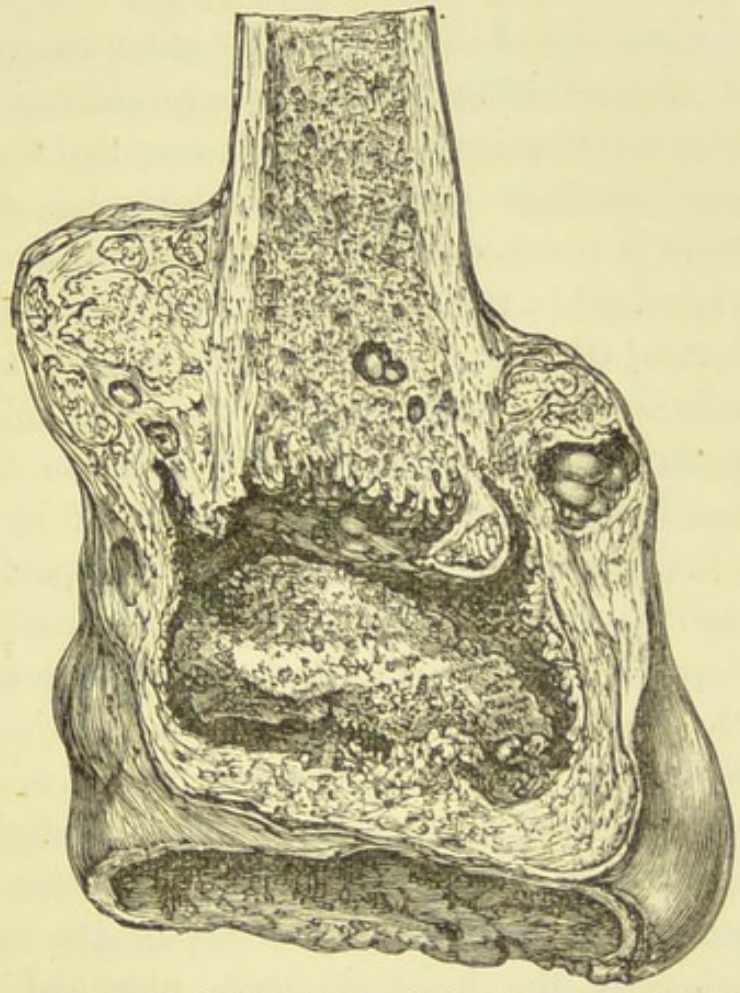

Fig. 45.—Hydatid Disease of the lower end of the Femur, involving the Knee Joint. (R. C. S. Mus., No 1,700 B.)

excavation is much destroyed. That part of the internal condyle which is in contact with the tibia has sunk into the cavity owing to the yielding of the bone, and forms a well-defined depression, the centre of which is perforated by a circular aperture one inch in diameter. By means of this aperture the cavity in the femur freely communicates with the interior of the joint. The outer condyle, though retaining its normal outline, presents several large perforations, around which the articular lamella is necrosed and partially detached. The cartilage upon the condyles has disappeared, and the bone is covered with inflammatory tissue, which is especially abundant in the crevices between the points of contact of the femur, tibia, and patella. The patella was united by fibrous adhesions to the front of the external condyle, and when separated, the corresponding area on the femur was found much eroded and in parts penetrated by the growth of cysts.

On viewing the exterior of this portion of the femur, it will be noted that the site of the fracture is marked by a deposit of new bone and callus, which projects chiefly on the posterior surface. It is also partly formed of a splinter from the lower fragment. There is close fibrous union between the fragments, allowing a slight amount of movement in front, while behind ossification has begun. Besides the perforations in the walls of the cavity in the femur, whereby the hydatids have obtained access to the knee joint and to the surrounding soft parts, it would seem that the fracture of the shaft has also liberated them, for cysts are seen on the outside of the bone at the line of fracture embedded in the thickened periosteum and cellular tissue. The interior of the excavation in the femur is lined with a succulent layer of granulation tissue, to which small spongy sequestra and numerous budding cysts are attached. Some of the latter are partially embedded in it. Where the broken end of the diaphysis projects into the cavity the cancellous tissue and medulla are infiltrated with small

hydatids, while the rest of the bone is covered with granulation tissue. As regards contents, in the recent state the cavity was filled with thick oily pus, loose hydatid cysts, sequestra and débris, but no hooklets were found. Many of the small sequestra have been removed, but a large one still occupies the cavity. It measures two and a quarter inches in length, is quite detached from the walls of the space, and appears to have been derived from the junction of the diaphysis with the articular extremity of the bone. It is composed entirely of cancellous tissue, and many of its superficial spaces are filled with minute cysts.

In the head of the tibia the changes, though rather less extensive, are precisely similar in character. The articular surface shows destruction of the cartilage covering the internal facet, and necrosis of the subjacent bone, a part of which being detached, a communication is established between the interior of the joint and an irregular cavity in the head of the tibia. The cartilage on the external facet is less destroyed, but through the yielding of the subjacent bone the surface is markedly depressed. At the back, near the head of the fibula, there is a small sequestrum and a passage leading into the above-mentioned cavity. There are numerous tracks of suppuration, and a few cysts among the ligaments of the joint. A vertical section of the head of the tibia displays a wide cavity beneath the articular surface, containing a large necrosed mass of cancellous tissue, which is not yet completely detached. In other respects it closely resembles the excavation in the femur. The soft tissues around the knee, particularly in the popliteal space, showed tracks of suppuration and various collections of pus, indicating gravitation from the joint and the cavities in the bones. Along many of the sinuses hydatids were to be seen, suggesting that the burrowing of pus might have carried the cysts into the soft parts, there to enlarge and multiply. The

directions taken by the pus were precisely those met with in an ordinary suppurating knee, bursal communications and the prolongation of the synovial membrane around the popliteus tendon being made use of to reach the exterior.

Clinical history.—The patient, a man aged 54, had received a severe injury to his knee joint from which he never completely recovered. He always had to use a stick afterwards, and it is probable that the femur was broken at the time of the injury. At first he noticed that the "knee bones" gradually enlarged, then a soft swelling extended upwards to the back of the thigh. When first seen by his doctor a year ago he had a large fluctuating swelling in and above the popliteal space, an apparent enlargement of the articular ends of the femur and tibia at the knee, and distinct grating in the joint on manipulation. The swelling was tapped, and a large quantity of turbid fluid drawn off containing small vesicles, the nature of which was not suspected. The swelling refilled and was laid open freely, and most of the contents were scraped out; a communication with the knee joint was then discovered. Suppuration ensued, and it was considered advisable to amputate the thigh a month later. The patient made a good recovery. For further information the reader should consult Mr. Targett's paper.

As to **exostoses** occurring in the close neighbourhood of the joints, it will be enough to say that not only are they sometimes placed so close to the articular border that their removal may, unless care is used, be attended with a wound of the synovial membrane, but that they are occasionally invested by a bursa, which communicates directly with the interior of the joint. Even in such cases, however, if the fact that the joint has been opened is discovered at the time and careful antiseptic treatment is adopted, no serious result will follow. On the other hand, if the necessary precautions are neglected acute arthritis will probably occur, and lead to destruction of the joint.

CHAPTER XXII.

ANCHYLOSIS.

It is important not to confound anchylosis—that is, the union of articular surfaces by either fibrous tissue or bone—with various other conditions by which the movements of a joint may be interfered with. The two cases are essentially different, and the failure to distinguish between them may lead to serious errors in practice. In the one, the formation of anchylosis involves the destruction of the joint, and the partial or entire obliteration of its cavity. In the other, although stiffness is complete, all the essential structures of the joint may be either intact or but slightly involved, the obstruction to movement being seated entirely in the surrounding parts. Mere stiffness, imitating anchylosis (and sometimes termed spurious anchylosis), may be due either to (*a*) muscular spasm, of which the best instance, perhaps, is the rigidity often present in incipient hip disease, and which may be so marked that the femur and pelvis move as one piece. It is also well illustrated at the shoulder. When disease of this joint is still in its early stage, the joint is often so stiff from muscular spasm that any movement of the humerus is at once conveyed to the scapula. Muscular spasm is seen again in hysterical contraction (page 285), and in some instances it follows sprains and other injuries. (*b*) Stiffness of a joint may depend on the presence of adhesions in the surrounding soft parts, due to inflammation produced by injury or rheumatism. Such adhesions are especially common amongst the muscles surrounding the shoulder joint.

If care be taken, the distinction between true anchylosis

and mere stiffness depending on conditions external to a joint, can seldom be difficult. The patient's history is different in the two cases. In instances of anchylosis there is generally an account of either acute or prolonged inflammation of the joint itself (but see page 143): while if stiffness depends on conditions external to the joint there is a history either of some accident, of a slight inflammatory attack, or of merely incipient disease of the joint. Examination often shows that, though at first sight the joint seemed to be absolutely fixed, this is not really the case, but that some movement remains between the articular surfaces. Thus, to take the case of stiffness of the shoulder due to some cause external to the joint: although when the humerus is widely moved the scapula moves with it, yet when the humerus is carried gently through a limited range backwards and forwards, or when it is rotated on its long axis through only two or three degrees, some natural movement, though it may be very limited, is detected at the joint. If the patient is examined under an anæsthetic, any stiffness that is due to muscular spasm will disappear, while, should rigidity depend on external adhesions, a very slight amount of force tentatively applied will often suffice to rupture some of them, and the nature of the case will become clear, not only from the fact that the adhesions, as they give way, are felt to be outside the joint, but from the immediate restoration of considerable movement. The treatment of muscular spasm must, of course, depend on the cause. If it results from incipient disease of the joint, treatment must be directed to this condition (page 267). If it is due to hysteria the remedies for this affection must be employed. The treatment of adhesions external to joints is given at page 227.

We may now turn to anchylosis itself. This may be fibrous or bony, or, as is often the case, these two forms may be met with in different parts of the same joint (Fig. 46).

Fibrous anchylosis varies widely in its extent. In some instances scarcely deserving the name, it is limited to a small patch of adhesions at some part of a joint that has otherwise returned, after inflammation, to a healthy state. In others, the whole cavity has become obliterated by the formation of dense short-fibred adhesions co-extensive with the original articular surfaces. It is often difficult to estimate the extent to which adhesions have formed. The best guides as to their amount are the severity and the duration of the antecedent disease. In cases of acute suppurative arthritis, and also in some of the more rare examples of rheumatic inflammation, or again in urethral arthritis, complete fibrous anchylosis has been found to occur in the course of three or four weeks. In other cases, fibrous anchylosis takes place from long-continued inflammation of a subacute type. This result is often met with in the typical form of urethral arthritis (page 24), and it is also well illustrated in cases of arthritis occurring in puerperal septicæmia (page 30). Other instances are those in which tuberculous disease is rapidly followed by the organisation of inflammatory products into dense fibrous tissue, so that nearly all movement is lost, even when the patient is under an anæsthetic (pages 143, *et seqq.*). It is, however, often impossible to form a correct *à priori*

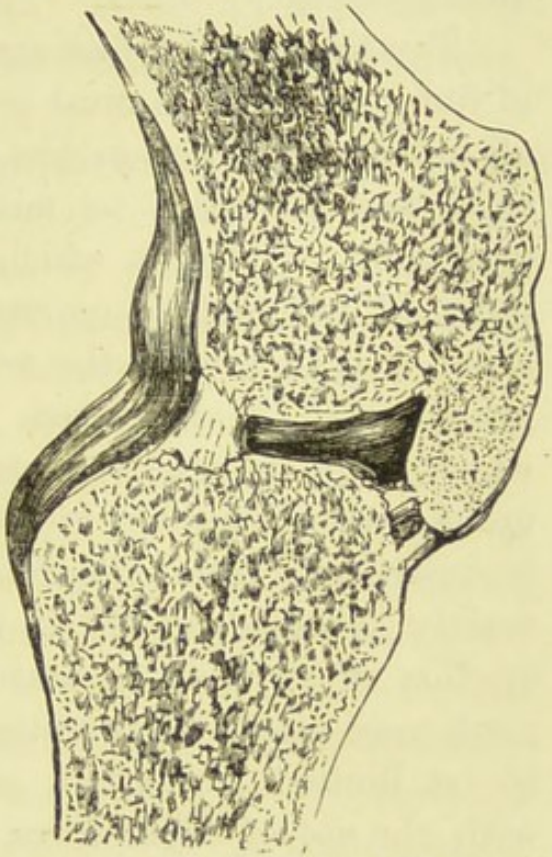

Fig. 46.—Anchylosis of the Knee Joint, partly fibrous and partly osseous. The tibia has undergone displacement backwards. (From specimen, No. 639, in the Museum of St. Bartholomew's Hospital.)

estimate as to the extent of adhesions present in a joint. Sometimes they are extensive when inflammation has been comparatively slight; in other cases they are limited, although inflammation has been either acute or prolonged. The only reliable course is to make a careful examination when the muscles have been relaxed by giving the patient an anæsthetic.

Treatment.—The first step in the management of a case of fibrous anchylosis must be to keep the joint at rest until all inflammatory action has ceased. Neglect of this principle has often led to mischievous results; for forcible movement of a joint which is still, or has recently been, inflamed, will induce renewed irritation, and further exudation of lymph, with the result that the stiffness already present will be increased. These are among the cases which have brought the manipulation of joints into very undeserved discredit. If rest is maintained till the joint is quite free from abnormal heat, and till swelling has mainly subsided, or till it is noticed that no further reduction of swelling is taking place, the condition of the joint may safely be investigated. If the adhesions prove to be limited in extent, so that movement is restored with the use of slight force, passive motion may be subsequently employed, provided the joint does not become, or at least does not remain, abnormally hot, and is not painful or swollen. In such cases very good results are often obtained. On the other hand, if moderate force does not restore movement, or if, when force is used, extensive intra-articular adhesions are found to be giving way, it is generally useless and inadvisable to proceed farther. To do so is to tear through the cicatrix by which the joint has been replaced, and the only result that can follow such a proceeding is either the re-formation and extension of the cicatrix, or a renewal, in perhaps an active form, of the original inflammatory process. In such instances, much as we

may regret the conclusion, the best course is to advise the patient to regard a stiff joint as inevitable. This is, I am convinced, the proper course to take in cases in which joints are left stiff after tuberculous disease. I do not remember ever to have seen manipulative interference restore movement in a joint that was the seat of fibrous anchylosis following tuberculosis. Tempting as it may be to use manipulation in these cases, it ought not, I believe, to be resorted to.

In instances in which a joint has become anchylosed by fibrous adhesions in a position of deformity, it is often advisable, when all disease has come to an end, to use forcible movement for the purpose of placing the limb in a more serviceable posture. Such a proceeding demands great care. It must be conducted with strict regard to the particular circumstances of each joint, and the surgeon will do well to remind himself of the natural extent of different movements by testing them on the corresponding sound joint. The operation can very seldom be called for in the shoulder, for this joint is unique in the fact that, even when the seat of severe or prolonged disease, it undergoes no deformity. If, however, force is to be used, the humerus should be rotated on its long axis in the glenoid cavity before any attempt is made to bring the arm away from the side; while the attempt to raise the elbow towards the level of the head must either be entirely avoided, or it must be most cautiously carried out, for otherwise the vessels, or the brachial plexus, may be seriously injured. In moving the elbow, the surgeon should always flex before he extends the fore-arm. Flexion should also always precede extension at the wrist. In the case of the hip, the femur should always be flexed upon the pelvis, abducted, adducted, and rotated on its long axis before any attempt is made to extend it. The danger of forcible extension of the hip has reference not so much to injury of the vessels as to

the probability that, if the head of the femur and the border of the acetabulum have been partially absorbed, the force used may have the effect of dislocating the femur upwards and backwards on the dorsum ilii. It must also be remembered that the femur constitutes a very powerful lever, and that if violence is used the neck or shaft of the bone may be fractured. Before attempting to flex the knee joint it must be ascertained that the patella has not become adherent to the condyles of the femur. If this investigation is neglected, the ligamentum patellæ may be torn across. Extension must be cautiously practised, not only because the popliteal vessels might otherwise be in danger, but because dislocation of the head of the tibia into the popliteal space is very likely to be produced. In the case of the knee, as in that of the hip, division of such of the tendons as are felt to be tense may be required. But in the instances of both these joints position is usually better corrected by gradual than by immediate force. The ankle may be forcibly flexed without danger, but division of the tendo Achillis may be required as an accessory measure. In cases of fibrous anchylosis, in which forcible movement has been employed to alter the position of a limb, there is usually a strong tendency for the deformity to return, and it is therefore necessary that adequate retentive apparatus, consisting either of plaster of Paris, well-padded splints, or weight-extension, should be employed.

Bony anchylosis.—This is generally the result of suppurative arthritis, which may have been either acute and of short duration, or less acute yet more prolonged. In acute arthritis it is occasionally produced very rapidly. In a case in which death had occurred from pyæmia following acute arthritis of the ankle joint, the result of infective osteomyelitis of the lower end of the tibia, I found on post-mortem examination, just a month after suppuration

had commenced in the joint, that the surfaces of the tibia and astragalus were already firmly united by new tissue, in which ossification was very nearly complete. Typical instances of bony anchylosis, after prolonged suppurative arthritis, are met with in hip disease, in the course of which the joint may become, as repair slowly advances, completely fixed (Fig. 47). Although, however, bony anchylosis is one of the undoubted results of suppurative arthritis, the opinion formerly entertained, that when suppuration has occurred in a joint, bony anchylosis is the only method by which repair can take place, is now known to be erroneous. Cases are not uncommon in which, notwithstanding that suppuration has been both copious and prolonged, recovery ensues with the preservation of very considerable movement. Indeed, I have met with several instances in which movement was quite perfect, and I have been led to the conclusion that instead of being the almost constant rule, it is the exception that suppurative hip disease is followed by bony anchylosis. A doubt has long prevailed whether bony anchylosis ever takes place in cases in which there has been no suppuration. That it does occur, however, is shown by the following case, for which I am indebted to Mr. Walter Roughton. A girl, of 18, had had disease, apparently tuberculous, of her elbow,

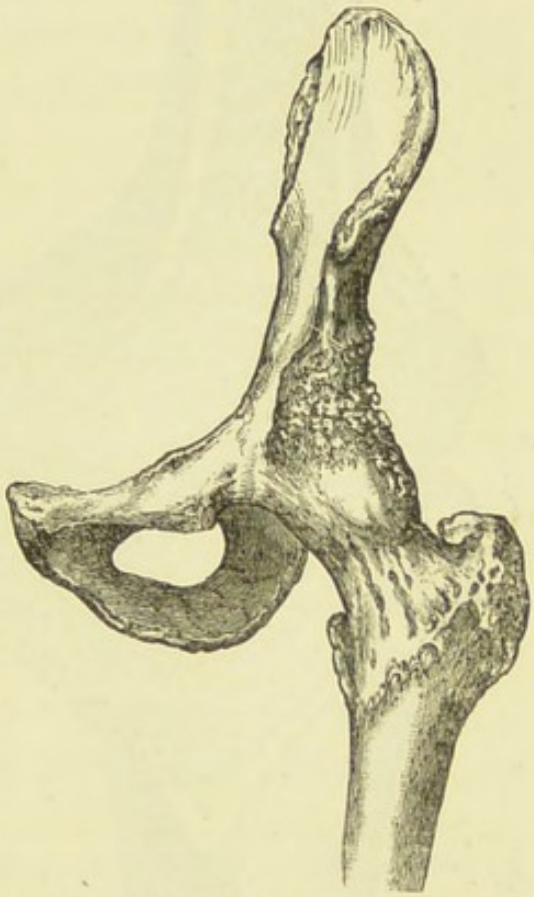

Fig. 47.—Bony Anchylosis at the Hip Joint. (From specimen, No. 649, in the Museum of St. Bartholomew's Hospital.)

of several months' duration. The joint had never been painful, or more than slightly swollen. No suppuration had occurred. The elbow was quite fixed at an angle of about 130°. On excising the joint to render the limb more useful, Mr. Roughton found that bony anchylosis had taken place. It is impossible to prove the existence of this condition till a longitudinal section of the bones has been made. But I have seen many non-suppurative cases after acute rheumatism, urethral arthritis, and tuberculous disease, in which the joint had become so fixed that not the slightest movement could be detected when the patient was fully under the influence of an anæsthetic, and in which I believe bony anchylosis had occurred.

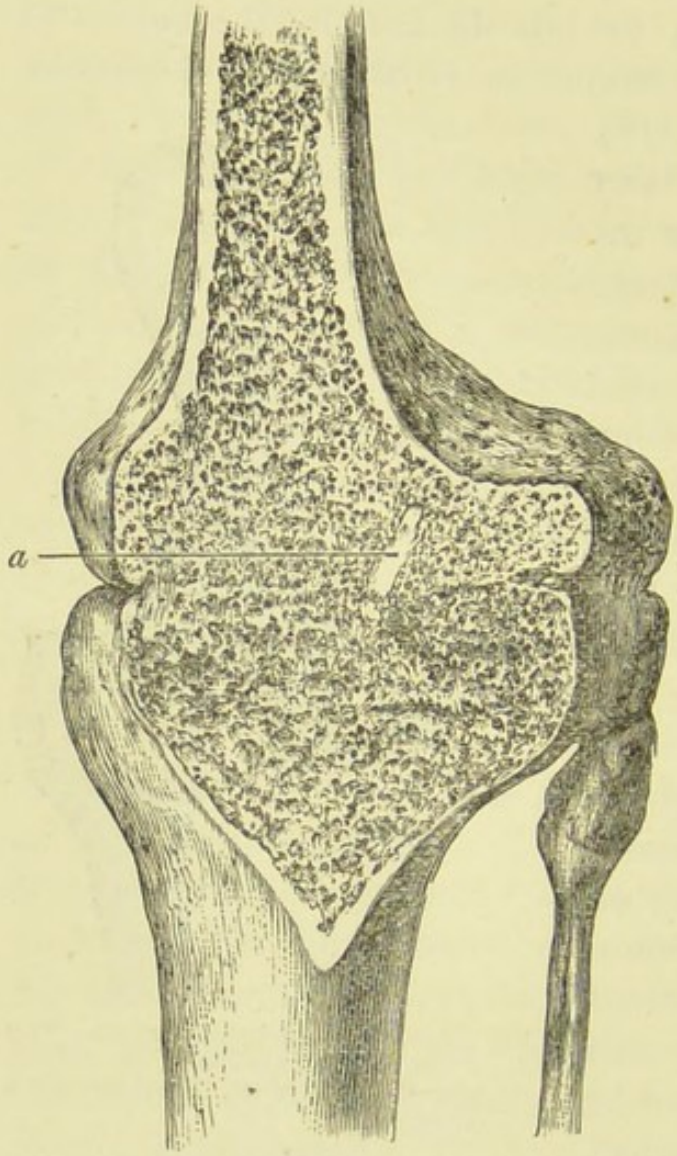

Fig. 47A.—A Vertical Section through the Bones of the Knee Joint, showing true bony anchylosis after excision. One of the bone pegs, *a*, used for fixing the bones is seen *in situ*. (From specimen, No. 657*a*, in the Museum of St. Bartholomew's Hospital.)

A good example of complete bony union after excision of the knee joint is shown in Fig. 47A.

It is of the highest importance, when a joint is seriously diseased, that mechanical treatment should be

adopted, by which deformity may be prevented. The difference as to usefulness between a limb in which bony anchylosis has taken place in a favourable position, and one in which deformity has been allowed to occur, is sufficiently obvious. In the one case, the patient has recovered with a limb that, in many instances, is scarcely less serviceable than a natural limb; in the other, the reparative process has been expended in vain, the patient is crippled, and the only means of helping him is to perform osteotomy or excision.

Treatment.—Bony anchylosis with deformity may be treated in various ways.

Our resources in this field have been largely increased by the introduction of osteotomy. It is now well known that when precautions against septic infection are taken, bones thus divided unite with both safety and facility. Indeed, we have in osteotomy a method, applied to the skeleton, very similar to that applied to the muscular system in the form of subcutaneous tenotomy. In other words, deformities of various parts of the skeleton are now treated by division of the bones that are at fault, just as deformities due to contracted muscles are corrected by tenotomy.

(*a*) When there is no displacement of the articular ends, and it is only necessary to alter the angle at which the joint has become fixed, it may be sufficient to introduce a chisel in the line of union, and divide the connection between the two bones. A few years ago a man was in St. Bartholomew's Hospital with bony anchylosis of his ankle joint, in a position of talipes equinus, following acute pyæmic arthritis. As he was unable to bring his heel to the ground, and as walking on his toes was very painful, I made a small incision through the skin in front of the ankle, just external to the tendon of the peroneus tertius, introduced a fine chisel in the line between the

tibia and astragalus, and divided the bony union. I was then able, after cutting the tendo Achillis, to bring the heel well down. The patient made a good recovery, and three months later could walk easily on the foot. I have seen Mr. Willett obtain excellent results by a similar operation.

(*b*) Sometimes this proceeding of simply chiselling through the line of union may afford good results in the case of the knee. Usually, however, it would be found impossible to extend the tibia upon the femur, owing either to displacement of the bones on each other, or to the presence of strong adhesions at the back of the joint. In these cases excision is the better operation.

(*c*) In the treatment of anchylosis of the hip, attended with deformity, osteotomy may be performed either through the neck of the femur, or through the shaft immediately below the trochanters. In the former proceeding, as the neck of the femur is likely to be altered both in shape and direction, I have made an incision at the back of the joint about three-quarters of an inch in length, just above the great trochanter, passed in my finger to ascertain the position of the neck, and have then with a chisel divided the bone in this situation. Complete extension, however, has not been immediately carried out, but the limb has been gradually brought down with the weight and pulley, as described at page 409. This course has been adopted as being free from violence, and as avoiding the result, which might follow forcible extension, of causing the end of the femur to slide upwards and backwards on the dorsum ilii. The objection that might be raised to division of the neck of the femur, namely, that the bone having been inflamed is unsuitable for operative treatment, has not been realised; in all the cases good repair has been obtained.

(*c*) In anchylosis of the hip joint, Mr. W. Adams's operation of subcutaneous division of the neck of the femur

by sawing through the bone will generally yield a favourable result in appropriate cases. The operation, however, is only suitable when the neck remains of nearly its usual length. This proceeding is one with which the surgeon should be careful thoroughly to familiarise himself, by practice in the dead-house, before attempting it on a living subject. Mr. Adams gives the following directions :—"The left thumb is placed firmly so as to compress the soft tissues against the bone, at a point situated at the centre of the top of the great trochanter, and the breadth of one finger above it. At this point the narrow-bladed knife * is pushed in till it reaches the neck of the femur, at a right angle across the front of which it is then carried. The knife is then gently moved to cut a space for the easy insertion of the saw, which, traversing the course of the knife, reaches the front of the neck of the femur, and gradually cuts it completely through. The surgeon cuts until he feels that the saw is free of the bone, and moving in the soft tissue only, behind the bone." From what I have seen of these two operations (*b*) and (*c*), I am inclined to think that the first described may be advantageously used in children, but that in the case of the larger and stronger bone in the adult, if the neck of the femur is still present, Mr. Adams's method is to be preferred.

(*d*) In cases in which disease of the hip joint has been extensive, so that the neck of the femur has been lost, and the upper end of the bone has undergone displacement upon the dorsum ilii, where it is embedded in an extensive deposit of lowly organised new bone and cicatricial tissue, it is best, especially if anchylosis is attended with considerable deformity, to divide the femur just below the trochanters. An incision three-quarters of an inch in length is made on the outer side of the limb through the soft parts down to

* The special instruments used by Mr. Adams are described in a pamphlet on the operation, published in 1871.

the shaft of the femur just below the trochanters. A chisel, or, as some prefer, a saw, is then introduced, and the bone is so far divided that it will easily give way when the limb is sharply adducted. Division of the bone should be mainly effected by the chisel or saw, so that the fracture may be transverse. The limb should be gradually brought down by weight-extension (page 409). I lately saw a boy of 17, on whom Mr. Willett had performed this operation at St. Bartholomew's Hospital for bony anchylosis, with great deformity of the hip joint, resulting from hip disease in early childhood. The limb after osteotomy was in a position of full extension on the trunk. Adduction, which had previously been very marked, had been entirely removed; firm bony union had occurred, and the boy could walk well on the limb. In several cases in which I have resorted to this operation, a favourable result has been secured. The operation is easily performed, and is, so far as I have seen, free from all material risk. Bony union is the usual result, and I should very strongly hold that this condition is far preferable to any form of ligamentous union, or a false joint. When anchylosis is present, no return of deformity can occur, while with a false joint deformity would be extremely apt to be developed when weight was thrown on the limb.

Bony anchylosis combined with deformity, in the case of the elbow, is best treated by excision, for by this operation a movable false joint will usually (if sufficient bone is removed—page 324) be secured; a result that cannot be obtained by osteotomy alone.

CHAPTER XXIII.

EXCISION FOR TUBERCULOUS DISEASE.

THE history of excision of the joints as an established operation of surgery practically extends over a period of less than fifty years. The knee was excised by Felkin, of Norwich, in 1762, and by Park in 1781 : the shoulder by Bent in 1771 ; the ankle by Moreau in 1782, and the hip by Anthony White, of the Westminster Hospital, in 1818. These proceedings, however, were isolated efforts which bore no immediate fruit. They were, indeed, so severely criticised by the surgeons of the day that the operation was discarded and apparently forgotten until it was revived many years afterwards by two great leaders of surgery, Syme and Fergusson. Syme, in 1826, performed excision of the shoulder and elbow; and Fergusson, "notwithstanding early prejudices, ventured in July, 1850, to perform excision of the knee joint on the living body." The case, however, ended in disaster ; "violent inflammatory fever set in before three days had elapsed, and death occurred on the ninth day," evidently from septicæmia, following osteomyelitis of the ends of the bones. Fergusson, though keenly distressed at this result, was not discouraged, but remained a warm advocate of the operation. It was repeated by his pupil, Jones, of Jersey, early in 1851, and subsequently by other surgeons so frequently, that upwards of a hundred cases occurred in the course of the next seven years.

In the period that has elapsed since 1850 ample experience of excision in its application to all the large joints has been obtained. In former days, when wounds became

septic almost as a matter of course, the results of the operation left much indeed to be desired. Cases were not rarely fatal, while in many others amputation had to be subsequently performed. Excision was, nevertheless, as Fergusson, with justifiable enthusiasm always regarded it, a great advance in the direction of conservative surgery. The immediate result of its adoption was to reduce very largely the number of amputations for joint disease, and it was a long step forward upon the road on which such great progress has lately been made.

With the introduction of aseptic surgery excision entered upon a new phase, and operators found that they were standing on new ground. It became possible to excise the large joints without suppuration, and to obtain primary union. This point reached, a strenuous effort was made between 1870 and 1885 to deal in some more satisfactory manner with tuberculous diseases of the joints. The object was not only to reduce the mortality of these affections, which in the case of the hip was shown by statistics to be between 30 and 40 per cent., but to limit the period over which these cases extended. For this purpose excision was employed on a large scale. It was, however, soon found that, when the operation was performed in cases in which septic inflammation had led to suppuration and extensive bone disease, the results of excision were very discouraging. In a large proportion of instances the disease was not arrested, but continued to advance very much as it had before the operation was performed. Thus it was seen that if the results of excision were to be satisfactory the operation must be undertaken at a much earlier stage, and before septic processes had become established. Moreover, Koch's discovery of the true nature of tuberculosis formed a new epoch in the history of excision. As the disease was now known to be parasitic in origin, and not only to have

a tendency to spread locally, but also to lead to systemic infection, resulting in the development of acute general tuberculosis, it appeared to many surgeons that the proper method of treatment was to eradicate the disease by the early and complete excision of all the structures that were involved. In accordance with this view excision was extensively employed in England as well as on the Continent and in America, as the routine treatment of tuberculosis of the joints when the stage of caseation was believed to have been reached. Some surgeons even performed the operation still earlier, and one case came under my notice in which a hip joint was excised within three months of the first appearance of the disease ! It was probably inevitable that, having on the one hand to deal with such an affection as tuberculosis of the joints, and on the other, having recently come into the possession of such enlarged powers as were conferred by the aseptic method, surgeons of a progressive temperament would give the operation an extensive trial ; in other words, that in the process of evolution, the surgery of the joints would pass through the excision age. This excision period extended, roughly speaking, over the ten years between 1875 and 1885. During this period the operation was performed in a very large number of cases, and ample materials were provided for a judgment of its merits. The immediate results of the operation itself showed a striking advance upon former experience, and left little or nothing to be desired. As a rule, primary union of the wound, in the case both of the hip and the knee, was secured, so that within a month the patients were able to be about with the limb protected in a suitable apparatus. This was a very material advantage, and could the operation have been judged by this standard alone, excision would undoubtedly have ranked as one of the greatest achievements of modern surgery. It was evident, however, that the mere healing of the wound was not enough. In order

to obtain a correct estimate of the operation, several important considerations had to be taken into account.

1. The principle of the operation is easily grasped. It is the cutting away of a part instead of the cure of the disease in which the part has become involved. It is like removing a tooth, an eyeball, or a testis, instead of curing the disease by which these organs have been attacked. However favourably or safely repair may be accomplished, the fact remains that the patient has suffered the loss of an important organ. Of course, this principle may be perfectly sound in some instances, and the treatment the best that can be adopted; but certainly it is not the principle that has guided recent progress in other fields of surgery, where every effort has been made to preserve the structures of the body, and to turn to the best account any which, although impaired, are yet not irreparably damaged.

2. Although in some cases tubercle, during its early stages, is mainly or entirely confined to the synovial membrane, yet it is frequently deposited in the cancellous tissue of the articular ends of the bones in the immediate neighbourhood of the epiphysial lines, so that any proceeding for the free removal of the disease must entail either the complete sacrifice or the serious injury of the epiphysial cartilage, and the consequent arrest, in the case of the knee and shoulder, of the further due growth of the limb. The full force of this objection is apparent when it is remembered that the majority of cases of tuberculous joint disease begin in children between the ages of three and ten.

3. In early life the ends of the bones are imperfectly ossified, so that in the case of the knee union does not occur by firm synostosis, and subsequent bending is very likely to occur.

4. As experience of the operation increased, it became clear that the ultimate condition of the limb was unsatisfactory. After excision of the hip, in the early stage, the

patients, in the majority of cases, were found to be very lame, and, in many, considerable deformity was developed. After excision of the knee the limb was short and weak, and often became flexed and to a great extent useless. And it must be remembered that by the results obtained in these two joints, excision as an operation for common use must stand or fall. No doubt the drawbacks mentioned above apply with less force to excision of the joints of the upper extremity. As to the elbow, the ends of the bones which form it are not the ends in which growth in length of their respective shafts mainly takes place; so that even a free removal of bone does not materially interfere with subsequent increase in the length of the limb; and secondly, the upper extremity, although after excision it is shorter than its fellow, may still be efficient and useful. The exact symmetry of the two upper limbs is comparatively unimportant. Even after excision of the shoulder, although the limb is materially shortened, it may yet be very serviceable. Excision of the shoulder for tuberculous disease is, however, very rare. As to the wrist, a planned excision of this joint is so rare that it need be no further alluded to than to say of it that, although the result is occasionally satisfactory, yet in the generality of cases the functions of the hand are very materially interfered with.

5. During the period mentioned, 1875-1885, the life history of the bacillus tuberculosis was carefully and widely studied, with the result that this micro-organism was pronounced both by pathologists and clinical observers to be of low vitality, and largely dependent for its development and growth on fitness of soil. Moreover, it transpired that much of this fitness of soil consists in conditions and influences which are either in their nature transitory, or such as can be counteracted or removed: and that when these conditions are no longer present, the bacillus perishes and the tuberculous process comes to an end. That fitness of soil is

transitory appears from the fact that in a large majority of instances, tuberculosis of the bones and joints begins between the ages of three and nine, and that frequently children in whom, during this period, tuberculosis has assumed a severe form, afterwards completely recover and remain free from any further development of the disease. As to conditions which can be counteracted or removed, these are found in such defects of the general health as are induced by unfavourable surroundings, or which follow the exanthemata, especially measles. That, in the absence of favourable conditions, the bacillus often perishes has been established by numerous observations. The evidence adduced on this subject by Dr. Ransome, in his lectures on the "Etiology and Prevention of Phthisis," is typical of much that has lately been recorded. Having quoted the view of Sir Thomas Watson, that "tuberculous disease, when established, is beyond our power," he continues, "these views . . . . of the incurability of phthisis are now altered; for not only does clinical evidence show a considerable percentage of cure or improvement under judicious treatment, but the evidence of *post-mortem* examination of adults who have died of diseases other than phthisis, shows that a very large percentage of persons have suffered, and recovered from, tuberculous disease of the lungs." And he quotes the late Dr. Moxon's view that "the life of the bacillus parasite is difficult and easily discouraged by unfavourable circumstances, like an aphis by an easterly wind."

Another point on which pathological research and clinical observation were found to be completely in accord was that, when by unfavourable conditions the life of the bacillus has been brought to a close, its products become a mere *corpus mortuum*, to be either gradually removed by disintegration and absorption or to give rise to an abscess, with the evacuation of which they are clean swept away. When this clearance has been effected, the structures

concerned, relieved of the parasite element, are left to undergo sound repair.

When the evidence under these various headings was examined, it became apparent that neither the necessity nor the advisability of early excision as a means of eradicating the tuberculous process had been established. Nor could the proceeding be recommended when it was observed that the future usefulness of the limb was seriously impaired. Thus, this important question had been submitted to an exhaustive examination, in which the ablest surgeons of the day had taken a part, and a clear answer had been obtained. As a matter of fact, the great majority of those who originally employed the operation on a large scale, in early cases, have virtually given it up. That tuberculous joint disease can be successfully treated without excision, is shown by the fact that, among the well-to-do, who can secure early treatment, the operation is practically unknown. Were excision the best treatment, many of the rich, among whose children tuberculous disease is frequently met with, would certainly avail themselves of it. In the fact that those who could most readily secure all the advantages which it has to offer are scarcely ever advised to accept it, we meet with the strongest proof that excision, when the patient's circumstances are favourable, can and had better be avoided.

It seems probable that, in the future, excision of the knee will be employed chiefly in two groups of cases. (1) In those in which, as the result of old-standing disease, so much deformity has occurred, that it is only by excision that the limb can be placed in a useful position. (2) In advanced disease in patients above the age of twelve or fifteen, in whom the bones have attained the whole or the major part of their growth. In such patients the shortening of the limb entailed by the operation is so limited that it can easily be made good by artificial

means; the bones are firm in structure, and their cross-section presents a large surface for co-aptation, so that complete and firm synostosis is obtained. While experience shows that when asepsis is secured the operation is well borne, primary union takes place, and the bones are well united in a month or five weeks. It seems probable that while excision of the knee in young subjects will fall into disuse except for the removal of deformity; in patients between fifteen and forty it will become, in appropriate cases, one of the most satisfactory of the larger operations of surgery.

For the present, however, excision is the only resource in cases among the children of the poor, in whom, in the absence of early treatment, the articular ends of the bones, as well as the synovial membrane, have become so widely involved by the tuberculous process that, in the judgment of the surgeon in charge, the disease can be arrested only by operative interference. The ultimate condition of the limb may be defective, but this, in the circumstances, cannot be avoided. When the synovial membrane only is involved arthrectomy (page 334) is better than excision.

Excision of the hip, in the future, will in all probability occupy a limited field. For early cases it will be discarded: in the first place, because such cases, when they are adequately treated, do well in the great majority of cases without operative interference; and, secondly, because when excision is withheld the limb is a much better one than when the operation has been performed. The operation will, it seems safe to anticipate, be reserved for (*a*) cases in which suppuration is combined with considerable deformity. Here the operation will secure the double advantage of removing septic bone and of effecting an improvement in the position of the limb. (*b*) In cases of extensive bone disease, whether of the upper end of the femur or the acetabulum, attended with septic suppuration. Here excision is often

followed by rapid healing, and the arrest of the disease; while, in many instances, a serviceable limb is obtained. Fortunately, however, both these groups are steadily diminishing in number, and as the proportion is increased of instances in which treatment by rest is adopted early, the necessity for excision at a later period will become less and less frequent.

In former years it was observed that the operation of excision was not rarely followed by the speedy development of acute general tuberculosis. This result is easily explained. In the undisturbed condition of the parts the tuberculous products are walled in by inflammatory exudation, which affords a barrier against systemic infection. When, however, in the operation of excision the cancellous spaces were laid open, and, as was then the practice, the wound was left charged with tuberculous material, absorption through these open spaces frequently took place. Now, owing to the careful manner in which the operation of excision is performed, this disaster very rarely occurs. The wound is thoroughly freed from tuberculous products by flushing, and is further protected by the use of antiseptics.

The shoulder.—Excision of the shoulder joint is but rarely performed in tuberculous disease, for owing to the readiness with which the movements of this joint are vicariously performed either between the scapula and thorax, or at the elbow, this articulation when diseased can be placed at rest; and the inflammatory process is usually neither acute nor destructive. There is, moreover, no tendency to deformity. I do not remember ever to have seen this joint excised for tuberculous disease in childhood. A serious objection to the proceeding in early life is that, as the upper is the growing end of the humerus, and as the epiphysial line is situated immediately below the head, the result of the operation must be to arrest the further growth of the arm. Even in the adult the operation is rare. Were

the operation necessary it should be performed by making an incision from the outer side of the tip of the coracoid process downwards for about three inches in the line of the long tendon of the biceps and extending to the bone. In this incision the deltoid is uninjured. The margins of the wound are then retracted, and the long tendon of the biceps is hooked aside and carefully protected. The supra- and infra-spinatus and teres minor muscles are divided at their insertion into the greater tuberosity of the humerus, the bone being for this purpose rotated inwards; the subscapularis is then divided, the humerus being, at the moment, strongly rotated outwards, and the point of the knife being kept as close to the bone as possible. The head of the humerus, when any remaining parts of the capsule have been severed, will now be exposed. It is protruded from the wound, and the neck is cut through just below it. The glenoid cavity is very rarely diseased, and may generally be left without interference. A drainage tube should be inserted, through a posterior counter-opening at the lower end of the incision. No splint is required, the arm being bandaged to the side, and the fore-arm and hand placed across the chest. Thus, excision of the shoulder joint really consists in removing the head of the humerus. In the few cases of excision of this articulation for other conditions which I have seen, the result has varied. In some the arm has been wonderfully useful, and the new "joint" has been firm, and has admitted of considerable movement. In others, however, movement has been very limited, and the arm has been so weak as to be virtually useless, though the movements of the fore-arm have been preserved.

The elbow.—At the present time cases are often met with in which tuberculous disease of this joint has been left without adequate treatment till the articulation has become

disorganised and sinuses have formed. In many instances disease has begun in the bones, and has subsequently involved the joint, so that with the joint affection there is combined extensive caries of either the lower end of the humerus or the olecranon process of the ulna. Although many of these cases would at length recover with long-continued rest, the best course, under the conditions in which the children of the poor are placed, often is to perform excision. The objections that apply to the operation of excision in the case of the hip and the knee are not in force here. That is, the proceeding is much more limited than it is in these large joints, and ligamentous union, easily obtained, is all that is required for the future usefulness of the limb. The shortening of the limb due to excision of the elbow is of very much less importance than is that which follows excision of the hip or the knee.

Excision of the elbow must be carefully performed, with the smallest possible injury or disturbance of the surrounding soft structures. Usually a single longitudinal incision is all that is required, and it is better to prolong this than to convert it into a T-incision by making a transverse cut running outwards from its centre. This longitudinal incision begins about two inches above the joint, in the middle line, and is carried downwards just internally to the tip of the olecranon, and continued for about two inches along the posterior ridge of the ulna. It extends to the bone. All the soft structures *en masse* are then very carefully turned off the internal condyle. The ulnar nerve embedded in them ought not to be seen. There is less danger in cutting this nerve as it passes behind the condyle (for every one is cautious here) than there is of dividing it below the joint; for on leaving the back of the condyle and entering the fore-arm the nerve turns a little outwards, and tends to approach the posterior ridge of the ulna; so that if the operator,

after clearing the condyle, uses his knife freely an inch or thereabouts lower down, the nerve will be in imminent danger. When I was Demonstrator of Surgery I found that it was at this point that beginners usually cut the nerve. The accident may be avoided by keeping the knife close to the bone and never thrusting its point out of sight deeply into the muscles. Another important point is that the anconeus muscle should be preserved. In the operation by a T-incision not only is the connection between the triceps and the ulna divided (this cannot, of course, be avoided, since the olecranon is removed), but the anconeus, when the transverse incision is made, is cut across. The result is that the patient is left without any extensor of the fore-arm, and thus in many instances, though other movements are regained, and the fore-arm is strong, the power of extension is very defective. If, however, the anconeus is saved and turned off the ulna to a point just below the olecranon, but no farther, and is then retracted, it will subsequently, by undergoing development, constitute an extensor of considerable power. Some years ago the late Mr. Maunder showed a patient at one of the societies on whom he had thus operated, who could strike a heavy blow with the fore-arm. When the soft parts have been so far detached that the olecranon is exposed, this should be removed with a saw or cutting forceps; and then the lower end of the humerus should be removed. As soon as the wound has healed, and the soft parts are free from considerable swelling, the patient may be allowed to be up, to leave off the splint, and to use the limb (at first very gently). Free movement will often be regained. But, in order to secure this, there should be an interval of about half an inch between the ends of the bones when the limb is placed on the splint. This interval may usually be provided by drawing the fore-arm a little way from the arm; but if during the operation, when the

bones are brought into position, it is found that they are in contact, it is better to remove a further portion.

The wrist.—Excision of the wrist for tuberculous disease is seldom required. So far as I have seen, this joint is very amenable to treatment by well-fitted leather splints (Fig. 50) constantly worn. If splints are applied in the early stage, it seems to me to be no exaggeration to say that recovery may be very confidently reckoned upon. Perfect movement is usually preserved. At least, I have seen this result over and over again. In neglected cases, which have gone on to suppuration and caries, prolonged rest will still, without doubt, in the great majority lead to sound repair. But when sinuses have formed, and are lined with tuberculous granulation-tissue, and when the soft parts have become widely septic, prolonged rest may fail, and some operative interference then becomes necessary. In such cases I have seen much better results obtained by following up fistulous passages, scraping away granulation-tissue, extracting the individual carpal bones that are found either necrosed or extensively carious, and cutting away pulpy synovial membrane, than by performing a systematic excision. I have, it is true, seen a few excellent results after complete excision of the wrist; but these have been far outnumbered by instances in which though sound healing has been secured, the hand has been almost useless. Thus, I would strongly urge that excision of the wrist should only be resorted to in instances in which every other means short of amputation has been fully tried and has failed. In many cases that looked hopeless when first seen, the splint treatment has been quickly followed by improvement, and improvement by ultimate recovery.

Excision of the hip.—I have already alluded to the general question of excision of the hip joint, and have adopted an adverse view respecting the operation. The subject, however, is one upon which much divergence of

opinion still exists. Some surgeons scarcely ever resort to the operation. Some have maintained that it should be performed as soon as caseation is detected. I have endeavoured to look at the question without prejudice, and from every point of view. Many considerations must be taken into account. In the first place, the results to be generally obtained by continued rest in cases that are still in an early stage, are such as to render a large operation totally uncalled for. I am convinced that in such instances the mortality is not more than, at the most, five per cent., and that, in a large proportion of the cases (seventy per cent., I should say) recovery with but slight lameness, and slight loss of movement, takes place. I have met with many cases in which, three or four years after the disease had been brought to an end by rest, the result was so good that it would be impossible, unless he was individually known, to pick out the former patient from a group of healthy children with whom he had been placed. When suppuration has occurred, if pus is at once evacuated by the method described on page 420, the abscess cavity will speedily close, often by primary union between its walls. Deformity may be removed by weight-extension, and recovery will be secured with very little shortening (less than an inch), often with movement that is but slightly impaired, and with very slight lameness. The mortality of this group is, at the most, six to eight per cent. I believe it is not so high. In cases which have been some years in progress, in which suppuration, septic in character, has long been profuse, in which the bones are extensively carious, and in which the health is seriously impaired, or lardaceous degeneration has become established, the mortality rises at once to some twenty, thirty, or even forty per cent., under whatever treatment is adopted.

Much difference of opinion exists as to the frequency with which hard sequestra of any material size are present

in the later stages of hip disease. By some it is held that they often exist, and that their presence determines the necessity for operative interference. Many, and I must rank myself among the number, dissent from this view. It is well known, of course, that, generally as the result of acute inflammation, but sometimes in chronic disease, the head of the femur undergoes necrosis in mass, and becomes separated at the epiphysial line so as to form a loose sequestrum, which will keep up suppuration until it is removed. These cases, however, are rare. Again, it often happens that in the progress of far advanced hip disease both the upper end of the femur and the floor of the acetabulum become extensively carious, and are found during the operation of excision to break down very easily, and to come away in fragments, which some term sequestra. They are formed, however, of porous friable bone, readily crushed between the fingers. Their structure is such that, should the operation not be performed, they will crumble away and disappear, and will not prevent repair. This seems to be proved by the fact that in numerous cases in which suppuration has been going on for a considerable period, so that there can be no reasonable doubt that bone disease has been present, all the sinuses will close, although no bone has either worked out or been extracted. In these instances we must conclude either that no sequestra were present—and in that case it would appear that sequestra are not so common as some believe—or that they often crumble away and are discharged, so that operative interference is by no means essential for their removal.

The operation of excision of the hip has been performed by several different methods. Originally the joint was reached by a posterior incision through the glutei. The muscles were detached from the great trochanter, the upper end of the femur was protruded from the wound,

and the bone was divided either through the neck, or at a lower level—sometimes below the trochanters—according to the extent of the disease. This proceeding, which inflicted needless injury on the parts concerned, has been almost completely discarded, and the joint is now approached from the front. Apparently Professor Simon, of Heidelberg, was the first to employ an anterior incision. In a case of suppuration of the hip joint following a punctured wound, he enlarged the wound in a direction parallel with the femoral vessels. The case was published in 1866. Lücke's incision passed between the rectus and the psoas; while the incision employed by Hueter, and, at about the same time, by R. W. Parker, lies just internal to the tensor fasciæ femoris, and passes between this muscle and the sartorius and rectus. By this incision, which is admirably adapted for its purpose, neither any muscle nor other structure of importance is divided, and the joint is well displayed. The different steps of the operation are clearly described by Mr. A. E. Barker, and the results have undoubtedly been greatly superior to any previously obtained. By Mr. Barker's method primary union can generally be secured—a very striking advance upon the best results that were obtained only a few years ago.

After the operation, a double Thomas's splint should be employed. In the course of three weeks, or a month, when usually the wound will be soundly healed, the patient should be fitted with a single Thomas's splint, and be allowed to be upon crutches with a high boot on the opposite foot (Fig. 61).

Excision of the knee.—In the middle and upper classes, in whom joint disease is detected early, and adequately treated by rest, excision of the knee is scarcely ever performed. At present, however, there are many among the poor who can neither be properly treated at

home nor retained in a hospital for the necessary time, in whom tuberculosis, though it may never assume an acute form and may never lead to suppuration, is allowed to go on for months, or even for years together. In such cases the synovial membrane has passed into a condition of advanced pulpy degeneration, the ligaments have been softened and in great part destroyed, and the cavity of the joint has become obliterated by the formation of adhesions between the ends of the bones, but the tibia also has undergone irremediable displacement towards the popliteal space. In these instances—which I will term group (*a*)—no treatment short of an operation can restore the limb to use. Here excision will yield the best attainable result, and when it is performed under safeguards against septic changes in the wound, it involves but a small amount of danger to life, and very little chance of the failure of sound repair. In this group of cases excision is an appropriate and serviceable operation.

(*b*) Sometimes, added to the features just noticed, there is disease of the ends of the bones, attended with chronic suppuration. In these cases excision will often be followed by firm union, though the process of repair will be tedious, owing to the fact that during the operation it is necessary to gouge away part of the bone, so that a cavity is left which is only slowly filled up.

(*c*) In acute and rapidly advancing cases, in which tuberculous disease has originated in the articular end of one of the bones and has thence extended to the joint itself, it is advisable to perform excision as a means of averting amputation. The question, however, in such cases is whether, without trenching on the epiphysial line, the infected structures can be completely removed. Unless this end can be secured, although the wound heals by primary union, disease may be renewed in the form of a tuberculous osteitis, attended with extension to the surrounding soft structures.

But, even should this occur, if the patient's surroundings are favourable and rest is maintained, recovery may be, as I have seen on several occasions, ultimately secured.

The frequency with which surgeons resort to excision of the knee will depend on the object which they propose to secure. For my own part, and I am here subscribing to the opinion of the great majority of English authorities on the subject, the cases in which the operation is mainly required are those where irremediable displacement has occurred. In other words, it is not so much the amount of disease, as the presence of deformity, which renders the excision advisable. In many cases, indeed, in which the disease has either already become cured, or is so slight that it would readily yield to treatment, the operation is still required in order that the limb may be placed in a position in which the patient can walk upon it. The age of the patient is a very important point in respect to excision of this joint. In children under six the operation is highly unadvisable, for in all but the worst cases disease may be cured by rest, and with the growth of the limb deformity, even though it is considerable, will gradually disappear. At this early age the ends of the bones are still formed partly of cartilage, and as firm union cannot be obtained, subsequent deformity is very likely to occur, and the growth of the limb, moreover, is likely to be arrested. The best age for excision lies between twelve to twenty-five, when the limb has obtained the whole or the major part of its growth, and when the processes of repair are still active. In more advanced life the dangers attending the operation steadily increase. In the opinion of the majority of surgeons, it should but rarely be undertaken after about the age of forty. Mr. Gant, however, has recorded a successful case in a woman of fifty-three.*

* Med.-Chir. Trans., vol. lvi. p. 213.

The operation.—Of all the excisions, that of the knee is the most important as a surgical operation. The wound is more extensive, and the bony surfaces exposed are larger than in any other case. Besides, this is the only instance in which it is a necessity that bony union should be secured.

The success of the operation is largely dependent on the form of splint employed. The main difficulty, especially when the bones of the leg are considerably displaced backwards, is to prevent the riding of the femur in front of the tibia. The plan of firmly bandaging the lower end of the femur to the back splint leads to swelling about the wound. It is apt also to induce persistent venous oozing after the operation. To avoid these drawbacks I have found Mr. Gant's splint very satisfactory. It consists of two portions; a simple back splint (a little trough-shaped, and wider above than below, to correspond with the outline of the limb), extending from just below the tuberosity of the ischium nearly to the ankle. This is padded in its whole length; but extra padding is placed upon its lower half, where it corresponds with the tibia. By this means, instead of binding the femur down to the level of the tibia, the operator lands the tibia up to the level of the femur, so that no tight bandaging of the thigh is employed. The amount and disposition of the extra padding must, of course, vary with the case. When the limb has been accurately adjusted and secured on the back splint with wide pieces of strapping, not too tightly drawn, and a bandage, the second part of the apparatus is applied. This is formed of an outside splint extending from the great trochanter to the foot. It is furnished with a footpiece, and is interrupted at the knee so that the wound can be easily dressed. This outside splint has the effect of steadying the limb, and, acting with the back splint, it maintains the bones accurately in position.

A proceeding which greatly assists in keeping the bones in apposition is that of pegging them together, by the method introduced by Mr. Baker at St. Bartholomew's Hospital. Mr. Baker employs two stout steel pins. These are passed through the soft parts into the tibia, and on for about an inch and a half into the femur. They are removed (an easy matter, as their ends are left projecting) on the tenth to the twelfth day. I have used them—sterilised by boiling immediately before introduction—in several cases, in adults, with very satisfactory results. In children I have employed sterilised bone pegs, about the size of large knitting-needles; cutting them short off and leaving them embedded. These pegs, of whichever kind, fix the bones and keep them steady. They seem to produce no material pain.

A modification of the usual operation by which the patella is removed, is that practised by Mr. Golding Bird.* In this method the patella is sawn across at its middle and its two portions are turned, the one up and the other down When the operation is completed, they are replaced and united by two stout carbolised silk sutures, which are passed through the substance of the bone after it has been drilled. The ends of the sutures are cut short. The case shown by Mr. Golding Bird to illustrate this proceeding was an excellent one. The patella was freely movable. In a case in which I adopted this plan, but in which a stout silver-wire suture was used in place of silk, a strong limb was obtained, upon which within six months of the operation the patient, a boy of fifteen, was able to walk from London to Great Yarmouth, a distance of about 120 miles, in seven days, thus travelling seventeen miles a day. On examining the limb a month after this journey, I found it quite firm and free from any bend. This method may very well be adopted in cases in

* Clin. Soc. Trans., vol. xvi. p. 82, 1883.

which the patella is free from disease, and in patients above the age of eight or ten. But when the patella is involved in disease, or when it is still in part cartilaginous, it will probably be best to remove it.

Excision of the ankle.—This, as a systematic operation, is very seldom required, either for tuberculosis or any other disease. In the early stages of tuberculosis of this joint, treatment by local rest will very generally succeed. If advanced synovial disease is present, or if suppuration has occurred, the best course will be to perform arthrectomy (page 335), the astragalus being, if necessary, removed. When as much as this is done, some may maintain that the operation practically amounts to excision. But, although such a proceeding is somewhat more than arthrectomy, it is yet somewhat less than excision, for the articular ends of the tibia and fibula are preserved, and the internal lateral ligament is in great part left undivided. The few excisions of this joint which I have seen, when compared with such excellent cases of arthrectomy as those which Mr. Clutton has recorded,* have clearly shown the superiority of the latter proceeding. I shall not enter upon the details of excision of this joint, for I can add nothing to the directions for its performance which are to be found in the text books.

* Med. Chir. Trans., vol. lxxvi. p. 85, 1894.

CHAPTER XXIV.

ARTHRECTOMY OR ERASION OF JOINTS.

THOSE who have watched the development of the operative treatment of tuberculosis of the joints during the last twenty years, and seen the conservative principle constantly assert itself, have felt assured that such a proceeding as excision—that is, the total sacrifice of one of the large joints—would not long be accepted as the routine treatment of tuberculous disease in young subjects. It was certain that strenuous efforts would be made to replace it by some less radical method: in other words, that as excision was introduced as a substitute for amputation, so it, in its turn, would give place to some procedure of a still more conservative nature. A step in this direction was taken when, in 1881, Mr. Cross, of Bristol, proposed the method which has since been termed by Wright, of Manchester, erasion, and by Volkmann, arthrectomy. This operation consists in principle of the systematic removal of all the synovial membrane and the ligaments, if, or so far as, they are involved in the disease—the bones, except when they are found to be superficially eroded, being left intact. Mr. Wright, so well known for his numerous and excellent contributions to the Surgery of Childhood, has taken a leading part in the development and practice of this operation. Originally applied to the knee, arthrectomy has in the last few years been adopted also for the elbow and ankle.

In arthrectomy of the *knee* the joint is widely opened, as in excision; the patella is turned down, and the lateral ligaments are divided. The whole of the synovial membrane is then systematically removed. This is best done

by dissecting it away, as far as possible, as a continuous layer, with a scalpel and forceps. But scissors may also be freely used. If practicable, the crucial ligaments are saved, but in many cases it is impossible to remove the synovial membrane at the back of the joint until they have been cut. If the ends of the bones are found to be superficially eroded, they are freely scraped. Mr. Clutton remarks: "Whether a thin layer of cartilage is removed from the articular surfaces and the bones made to anchylose by pinning or wiring them together, depends on the conditions found at the operation and the views of the operator. As a rule, on account of the knee being in the centre of a limb where the chief function is that of supporting the weight of the body, it is better to aim at immediate anchylosis than to have the knee slowly undergo a subsequent contraction. If the cartilages are left, such rapid fusion of the two bones cannot be obtained." Most surgeons would pronounce this view to be correct in theory. The practical difficulty, however, is that often no firm synostosis, but only fibrous anchylosis, can be obtained.

In the *ankle*, the method which Mr. Clutton recommends, and which I have found convenient, is the following:—Four incisions are made, one in front of, and one behind, each malleolus. These avoid ligaments and tendons, but freely open the joint. Through these incisions, when their edges are well retracted, a sharp spoon can be introduced and the synovial membrane can be freely cleared away; while by passing in the finger through the different openings the condition of the bones can be ascertained. Any disease thus detected is then scraped out. Some surgeons, having opened the joint from the outer side, proceed as a matter of routine to remove the astragalus, in order to secure a better exposure. No doubt this method may leave a useful foot, but the operation is something more than arthrectomy, and approaches an excision. It

seems unnecessary except in cases of extensive disease. Arthrectomy, when applied to the *elbow*, is similar in principle, and need not be particularly described. In the case of the *hip*, only a modified or partial arthrectomy is practicable, for in order to reach all the synovial membrane, the head of the femur must be removed, a proceeding which would amount to excision.

The cases in which arthrectomy is appropriate require very careful selection. The disease must be mainly limited to the soft structures of the joint. When the cancellous tissue of bones is materially involved arthrectomy is out of place. The more limited the degree in which the synovial membrane is involved the more favourable the case, so far as the immediate result of the operation is concerned, and those who do the operation in early disease will be able to show the best results. In early cases, however, the operation is not required if rest can be secured. A wide extent of synovial disease is not a bar to successful arthrectomy in such joints as the elbow and ankle, for although it necessitates free division of ligaments, and leaves movement much restricted, the parts are braced up by the development of new fibrous tissue, and the joint remains firm and serviceable. In the case of the knee, inasmuch as the lateral and crucial ligaments may have to be divided in order to follow up and remove all the diseased synovial membrane, the joint is so much weakened that, just as after excision, there is an obstinate and prolonged tendency for the leg to become flexed upon the thigh.

When suppuration has occurred in a joint the chances of a favourable result after arthrectomy are much diminished. They are still further reduced when the structures have become septic and sinuses have formed. By far the best results of arthrectomy that I am acquainted with were related by Mr. Clutton.* The series included nine cases of

* Trans. Med. Chir. Soc., vol. lxxvii. p. 85.

the elbow and six of the ankle. In the elbow, in two cases, anchylosis had occurred. Six had more or less movement. The ninth was subsequently excised. Three cases of the ankle were excellent; in two of them the patients were walking without lameness and with some movement in the ankle and tarsal joints, and in one the patient was able to be on the limb thirteen hours a day as a hosier's assistant; in the fourth case the wounds were healed and the foot was free from disease; in the fifth no disease remained and the patient was walking on the limb, but there was some displacement; the remaining case was lost sight of. This is a record of success which, when the elbow and ankle are in question, shows that in selected cases the operation is a valuable addition to our resources of treatment.

It is at present too soon to offer any exact estimate of the value of arthrectomy. It can only be said, as matters now stand, that while in selected cases, in the elbow and ankle, it yields good results, in the hip and the knee its value is doubtful. In the hip, as already said, in order to remove the synovial membrane from the inner surface of the capsule, and clear away the fatty tissue from the depression in the floor of the acetabulum, the head of the femur must be either removed or displaced. Besides, and this is the crucial point, tuberculous disease of the hip begins, as a very general rule, in the bones. On this ground alone arthrectomy for the hip would seem to be out of court. In regard to the knee, in the majority of cases great difficulty in obtaining good results has been encountered. The source of difficulty is clear when the structure of the joint is considered. While the hip, the ankle, and the elbow owe their security to the modelling of their articular ends, in the knee this security is entirely dependent on the presence of powerful ligaments. These ligaments, while they connect the bones firmly together, yet allow flexion and

extension, sliding and rotation, as well as these movements in constantly varying forms of combination. By arthrectomy not only is the largest of the synovial membranes completely removed, but the ligaments are divided. In fact, all the essential components of the joint, except the articular ends themselves, are sacrificed, and the bones are henceforth connected merely by cicatricial tissue. One is almost tempted to remark that if, after this, a useful joint remains, the original structures would appear to have been a needless elaboration. Probably, indeed, in the future, the attempt to preserve movement in the knee after arthrectomy will be discarded, and the object aimed at will be to procure a stiff limb.

These remarks are not intended as an adverse criticism of arthrectomy as matters at present stand. When, either from the ignorance of parents or from deficient hospital accommodation, a case has been allowed so to drift that the synovial membrane of a joint has become the seat of extensive and chronic tuberculous disease, recovery without surgical interference is no more likely to occur than it is when lymphatic glands are occupied by old-standing tuberculous products. In both cases alike the best available course is to remove the structures, the repair of which has become hopeless. My object is, so far as this can yet be done, to arrive at the comparative value of arthrectomy as a resource in the treatment of tuberculous joints. And the conclusion, it appears to me, must be the same as that which is reached after a study of the principle, and a consideration of the results, of excision. No matter what the operation is termed, or whether the whole joint, including the articular ends, is removed, as in excision; or whether, while the other constituents are sacrificed the articular ends are left, as in arthrectomy, the proceeding falls far below the level of conservative surgery, as it is practised in all other departments, except in the case of malignant disease. In malignant

disease our only resource at present is entirely to remove the affected part. In other instances the object always is, while eradicating the disease, to preserve the organ which it has involved. We must be satisfied with nothing less than this in the case of tuberculous joints. A child who has had his hip or his knee excised or erased—no matter how safely or rapidly the wound may have healed—has lost one of the chief of his organs of locomotion. Such expedients, sound as they may be as successive stages in the evolution of surgery, are certain, having had their day, to give way, as amputation has, to measures of a still more conservative kind. Such measures, of which a large experience has already been obtained, consist in the recognition of the disease while it is still in its incipient stage, and the immediate adoption and the persistent use of complete local rest, together with the provision of conditions favouring the general health.

CHAPTER XXV

DISEASES OF THE TEMPORO-MAXILLARY JOINT.

MANY diseases commonly met with in other joints are rare or unknown in the temporo-maxillary articulation; yet there are several affections of which it is liable to be the seat. The chief of these are (*a*) osteo-arthritis; (*b*) pyæmic inflammation; (*c*) tuberculous disease, which may extend to the joint either from the ear or from the ramus of the jaw; (*d*) internal derangement or subluxation (displacement of the interarticular fibro-cartilage). (*e*) It seems advisable also to allude to a group of cases in which movement in this joint is prevented by spasm of the surrounding muscles, for I have met with several instances where the condition on which this closure of the jaw was dependent had escaped notice.

(*a*) **Osteo-arthritis.**—The temporo-maxillary joint is so frequently the seat of osteo-arthritis that, together with the carpo-metacarpal joint of the thumb, which is also often attacked, it should always be carefully examined if any indistinct symptoms in any of the other joints from which the patient is suffering are suspected to be due to this affection. If the case is one of osteo-arthritis evidence to that effect may often be detected in this articulation. The disease presents here very similar features to those which are observed in the other joints. It may occur in persons (chiefly females) over fifty, who are usually already suffering with the disease in other joints, or in young subjects, especially young women who are suffering from anæmia and feeble general health associated with uterine derangements. One or both

sides may be attacked. The symptoms are pain and cracking or creaking on movement, stiffness, and some general fulness, or even, in rare cases, marked deformity. Robert Adams, in Plate I. of his Atlas, gives an illustrative case, in which considerable deformity and want of symmetry are observed between the two lateral portions of the jaw. "The right condyle is greatly enlarged, the surface of the articular part is rough and scabrous, the interarticular cartilage, as well as the cartilage of incrustation, has been removed. The height of the right ramus and its condyle inclusively exceeds by one inch the height of the same portion on the left side of the lower jaw. The right glenoid cavity is much increased beyond its usual size and capacity; . . . . the maxillary eminence has not only been removed, but the temporal bone where it normally forms this eminence, and the root of the zygomatic process, have been excavated to receive the enlarged condyle." Drawings from the cast of the face and from the macerated skull in this case show the "distorted appearance of the visage and protrusion of the chin to the left side, circumstances anatomically accounted for by the lengthened ramus and condyle of the jaw on the right side." In the later stages of the disease movement becomes more and more interfered with, so that the patient is able to open the mouth to only a very limited extent, and is unable to masticate food. In a well-marked case that came under my observation the disease had been produced by injury. The patient, a lady aged 54, fell and struck her chin upon the edge of a stair. This accident was followed by a persistent form of osteo-arthritis involving the joint on both sides, and also the condyle and neck of the jaw, and leading to the same kind of absorption of bone that is met with in the head and neck of the femur after falls on the trochanter (page 65). Both the joints became stiff, so that the patient, at the end of two months, could not

separate the teeth for more than a quarter of an inch; the teeth of the lower jaw receded considerably behind those of the upper, so that, as the patient said, she could no longer bite a piece of cotton, and the angles of the jaw became less prominent than before the injury.

Treatment is attended with very imperfect results. Patients often seek advice only when the disease has been slowly advancing for several months, and when serious structural changes have already taken place; but even at its commencement the affection generally proves to be very obstinate. The remedies most likely to be useful are repeated small blisters, which here, as in the case of other joints, tend to relieve both the pain and stiffness of osteo-arthritis; hot sponging; warm covering so that the joint is protected from the sudden changes of temperature to which all the parts of the face are generally exposed; and passive movement, effected by the use of a screw-gag, whose blades, which should be covered with a thin plate of cork or indiarubber, are slowly separated when they have been introduced between the teeth. Very little force, however, must be used. The practice of giving an anæsthetic and forcibly opening the mouth with a powerful gag has never, within my observation, been attended with any marked improvement. Usually it not only causes the patient considerable pain, but is followed, each time it is repeated, by an increase of stiffness.

(*b*) Occasionally the temporo-maxillary joint is the seat of acute inflammation occurring during some form of **blood poisoning.** I have seen it in pyæmia, and also twice as a sequel of scarlet-fever in childhood. The *treatment* is the same as that which is required in other joints which are the seat of this form of arthritis (page 27). Matter should be evacuated at the earliest moment at which it can be detected. If it is allowed to collect in any quantity, it will not only burrow widely among the im-

portant structures in the neighbourhood, and perhaps lead to thrombosis of the adjacent veins, but it may also give rise to meningitis by inducing necrosis of the thin plate of bone which forms the floor of the glenoid cavity at the base of the skull. Another direction in which pus may extend and produce serious mischief is towards the middle and internal ear by making its way through the fissura Glaseri.

(*c*) In cases of **tuberculous otitis** attended with suppuration, matter sometimes finds its way from the cavity of the tympanum through the Glaserian fissure into this joint, and in cases in which necrosis of the petrous portion of the temporal bone occurs, the articulation is sometimes entirely disorganised, and movement of the jaw on that side is to a great extent lost. The possibility of the occurrence of this result may well be added to the other urgent reasons that exist for the adequate treatment in its early stage of suppurative otitis. In two instances I have seen matter, formed in connection with tuberculous periostitis of the external aspect of the ascending ramus of the jaw, make its way into the temporo-maxillary joint. In one of these a large collection of pus had formed, extending from the angle of the jaw to the zygoma. When this was opened the surface of the jaw was found to be bare, and a probe passed readily into the interior of the joint. The patient, a boy of 10, ultimately recovered, but the movement of the jaw on that side was much impaired.

(*d*) **Subluxation.**—This condition is briefly described by Sir Astley Cooper.* It is met with most commonly in young adults, especially in young women, in consequence of relaxation of the ligaments, resulting from feeble health. It may, however, as I have seen, occur in middle-aged or elderly patients as the result of a lax condition of the ligamentous structures such as is not rare in rheumatic

* "Dislocations and Fractures," p. 266. 10th edit., 1839.

subjects, and which so frequently leads to subluxation of the knee. I have related an instance of the affection at page 212. The symptoms are sudden inability on the part of the patient entirely to close his mouth; some deviation of the jaw, so that the symphysis is carried a little over towards the opposite side, and the teeth do not correspond; and there is also pain, which is sometimes severe. When the condition is of any duration a snap when the slip occurs is felt, and may often be heard even to some distance. In one case the condition followed a fall on the chin, which had apparently either separated the cartilage from its attachments or torn it across, so that the condyle slipped in front of it and thrust it back towards the posterior part of the articulation. Reduction often immediately follows the slip, or can be at once effected by some movement of the jaw which the patient has learnt will replace the cartilage. In a case in which there was any difficulty, so that a surgeon was consulted, reduction would be best effected by the methods that are employed in the reduction of dislocation of the jaw; but the manipulation required would be slight. It is very difficult to prevent the tendency to the recurrence of this accident, for none of the mechanical appliances, which are so efficacious in the case of the knee, can be used. A main point is that the patient should habitually guard himself against wide movements of the jaw. Small blisters may be applied over the joint. Sir Astley Cooper advises the shower-bath, but the hot douche would be preferable in young and anæmic subjects. Tonics, especially easily digested preparations of iron, should be prescribed if the general health is defective. In many of these cases treatment, though it may be to some extent beneficial, does not entirely cure the affection. The patient, however, finds that the slip becomes less painful, and he also learns how at once to "put his jaw in," so that the condition is not usually a source of any

very material trouble. In any case in which the functions of the jaw were very seriously interfered with, and in which all other treatment had failed, the cartilage might be fixed by suture or dissected out. The same favourable results might be anticipated here as have followed in the case of the semilunar cartilages of the knee joint.

(*e*) Closure of the jaw from spasm of the masseter and other muscles may depend on reflex irritation, arising either from difficult cutting of a wisdom tooth, or from disease of one of the other molars. Sometimes it is due to cold. It is most often met with in young adults in connection with delayed eruption of a wisdom tooth. Diagnosis is usually easy, for the evidences of dental irritation are readily detected. In these cases the jaws should be separated by means of a gag when the patient is under an anæsthetic, and the carious tooth should be removed, or a free incision should be made in the gum over the retained molar, so that it may be enabled to make its way through. In some instances, in which the jaw is already filled with closely-set teeth, it is best to remove the wisdom tooth with an elevator. Sometimes the contracted state of the muscles and consequent closure of the jaw persists, even for several weeks, after the original irritation has subsided. In such instances movement may be restored by opening the jaw once or twice with a screw-gag.

CHAPTER XXVI.

DISEASES OF THE SHOULDER.

Synovitis.—Simple synovitis, such as is sometimes met with in the elbow and knee, from overwork, cold, etc., is very rare in this joint. Synovitis may, however, arise from either rheumatism or blood poisoning, it may occur after typhoid or scarlet fever, or it may result from mechanical injury. The symptoms, which will vary to some extent with the nature and grade, as to acuteness, of the inflammatory process, are (*a*) stiffness of the joint, so that the humerus and scapula move together; that is, when the elbow is carried forwards and backwards, or is drawn away from the side, the inferior angle of the scapula travels with it; (*b*) swelling, taking the form of general fulness about the joint, and giving it a globular outline. Swelling is usually limited in tuberculous synovitis; but it may be very considerable, and attended with obvious fluctuation both in acute rheumatism and in the various forms of blood poisoning; often the joint looks more enlarged than it really is, owing to wasting of the muscles of the scapula and upper arm. (*c*) Abnormal heat of the surface may be detected in the more acute forms of inflammation, but in many cases, owing to the thickness of the soft parts over the articulation, this symptom is not present.

Treatment must be general and local. The arm must be kept at rest by the side of the trunk by means of a bandage (not too tightly applied) surrounding the arm and thorax, from the axillary fold to the elbow. The fore-arm should also be bandaged to the chest, or be constantly kept in a sling. In addition, a shield-splint

which encloses the shoulder and upper half of the arm is sometimes useful. General treatment should be directed to the condition out of which the joint affection has arisen, whatever this may be, and for a description of which, works on general medicine and surgery may be consulted. In *acute rheumatic* synovitis the joint should be wrapped in cotton wool, and kept at rest at the side. Warm lead and opium lotion, or belladonna liniment soaked in lint and covered with oil-silk, may be applied beneath the cotton wool. Sometimes relief is speedily obtained by painting the skin, over an area of two square inches, with blistering fluid. Aspiration of the joint, to relieve tension, is seldom advisable, though it has been practised in some instances. Generally, when inflammation has subsided, movement is either spontaneously regained, or may be restored by manipulative treatment (*but see* page 232). Synovitis following *scarlet fever* or *pyæmia* is usually attended with the rapid formation of a large collection of pus in the joint. Owing to distension of the capsule, displacement of the head of the humerus is not unlikely to occur. The arm should be kept at the side, the elbow supported, and the joint opened and drained antiseptically. Synovitis following *typhoid fever* is rarely met with in this articulation. The affection is either plastic, so that it leaves the joint fixed ; or it leads to serous effusion, which is apt to induce spontaneous dislocation. This accident must be carefully guarded against. It can scarcely occur if the arm is kept to the side.

Tuberculous disease.—Tuberculous disease of the shoulder is common in children and young adults. It is usually very insidious and chronic, and sometimes makes considerable progress before it is detected. It may begin either as a synovitis (the most usual form) or as an inflammation of the shaft of the humerus just beneath the epiphysis, soon extending into the joint itself. In the latter form the

head of the bone is sometimes reduced to little more than a shell. In two cases that I have seen, the head, reduced to a carious fragment, was found to have become separated, as a sequestrum.

Symptoms.—Pain here, as in so many other instances of tuberculous joint disease, is often completely absent, or so slight as to be mistaken for "growing pains." When present it may be felt either in the joint itself, or at the middle of the arm near the insertion of the deltoid. The most prominent symptoms are wasting of the deltoid and the scapular muscles, and stiffness of the joint, the inferior angle of the scapula being found to travel with the humerus whenever an attempt is made to rotate the latter in the glenoid cavity, or when the elbow is moved forwards or backwards or is brought away from the side. In the synovial form of disease suppuration is rare; but when the humerus is involved an abscess may be developed, and may either give rise to a large fluctuating swelling beneath the deltoid, or it may point at the anterior or the posterior edge of this muscle, or in the axilla.

The shoulder is so easily kept at rest, its movements being so readily performed either between the scapula and the thorax, or at the elbow, that, though disease is tedious, the destructive changes and suppuration often seen in other joints are seldom met with here, and recovery usually takes place. The joint, however, will probably be stiff.

Treatment consists in maintaining rest by keeping the arm bandaged to the side, and protecting the joint by moulding a leather shield-splint to the shoulder and upper part of the arm. These means should, even although disease is only incipient, be continued for from three to six months. In the rare event of the joint being painful, notwithstanding that it has been placed at rest, two or three small blisters, one healing before the next is put on, may be used; or, better still, the benzoline cautery may be lightly applied

when the patient is under an anæsthetic. Should suppuration occur, matter must be at once evacuated. In disease of the upper end of the humerus, the inflammatory process may lead to advanced rarefying osteitis, and the interior of the bone may be extensively broken down. Generally, owing to the soft and cancellous nature of the tissue, no firm sequestra requiring removal are produced. Any fragments that are separated are readily disintegrated and got rid of in the discharge. No operation for dead bone, therefore, is usually called for; and the parts had better be left for repair under the influence of rest. Should a sinus, however, remain unhealed in spite of rest of the joint continued for two or three months, it should be explored. If a sequestrum is found, it should be gently extracted, and the granulation tissue should be removed.

I have several times seen attempts made to restore movement in this joint in cases in which it had become impaired as the result of tuberculous disease. These attempts have been attended with failure, and in some of them a renewal of disease has been provoked.

In the course of pyæmia, the shoulder may be the seat of acute synovitis attended with the rapid formation of a large collection of pus; which distends and soon ruptures the capsule, and then burrows widely in the axilla and in the surrounding intermuscular spaces. In young subjects the head of the humerus may be quickly destroyed, and the joint, if the patient survives, will be left in a flail-like condition. In some cases the inflammation is plastic in character, and is attended with only slight effusion. It will then probably lead to close fibrous anchylosis.

Acute arthritis of infants (page 129) is prone to attack this joint in the first few months of life. In the early stage the patient is observed to keep the arm still, and to cry when the limb is disturbed. In the course of two or three days the cavity of the articulation becomes

distended with a collection of pus, forming a large globular swelling beneath the deltoid. The skin is generally free from inflammation, but assumes a congested and dusky appearance. As large subcutaneous veins become visible, the condition may, as I have more than once seen, be mistaken for malignant disease. If an early incision is made, and drainage established, recovery will generally occur, though the joint may be stiff. I have, however, seen perfect movement regained.

Osteo-arthritis.—Among the large joints the shoulder is, next to the knee, the articulation most often involved. The affection generally commences after the age of forty-five or fifty, but it may occur in patients under thirty. In such instances it is usually only part of a general outbreak of the disease in a severe form. The ordinary chronic variety begins with pains of a rheumatic character about the joint or with a persistent, dull, aching or wearing sensation about the outer aspect of the arm near the insertion of the deltoid. This is accompanied by a feeling of weakness, and by stiffness, especially after rest. All these symptoms increase, often very slowly, and are soon accompanied by muscular wasting, which may become very marked, and by creaking, cracking, or grating of the joint. By degrees the movements of the arm become more and more restricted, and any attempt at motion is painful. Pain of a neuralgic character is often present at night, so that the patient is unable to sleep, or to lie on the affected side. At length, as the original glenoid cavity undergoes absorption, and as new bone is being deposited around its margin, a large articular hollow is developed, extending to, and often in part formed by, the eroded coracoid process (Fig. 48). At the same time the head of the humerus becomes enlarged, partially worn away, misshapen, and displaced upwards and forwards so that the appearances presented are those of an old traumatic

subcoracoid dislocation. A remarkable anatomical feature is sometimes observed in connection with osteo-arthritis of this joint. It consists of the separation of the end of the acromion, so that this process has the appearance of having undergone a fracture which has been repaired by fibrous union. The line of separation varies in different cases. In some instances merely the extremity, in others a considerable amount, is detached. In a specimen in the museum of St. Bartholomew's Hospital the acromion is divided in two places, the resulting fragments being maintained in position by partially ossified bands of fibrous tissue. Another result is that the long tendon of the biceps becomes displaced from its groove, and is often completely worn through. In these cases the lower end of the tendon is found adherent to the upper end of the groove or to one of the tuberosities.

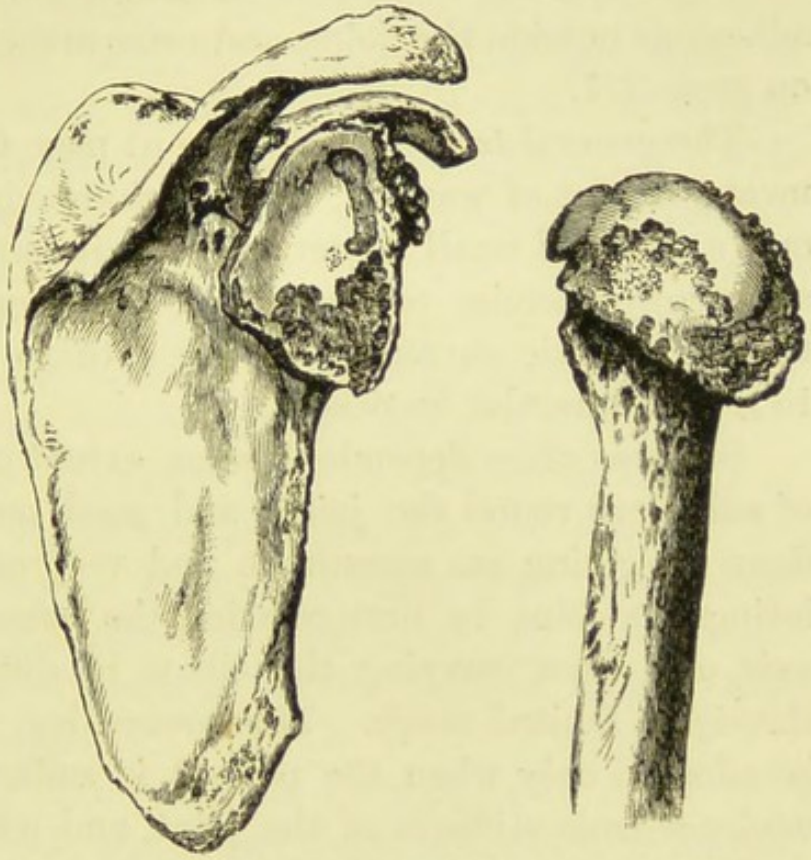

Fig. 48.—Osteo-arthritis of the Shoulder Joint. (From preparation, No. 669, in St. Bartholomew's Hospital Museum.)

Diagnosis.—This is usually easily made. The age of the patient, the presence of similar disease either in the opposite side, or in some of the other joints, and the manner in which the affection has developed itself, together with the

local symptoms mentioned above, will serve clearly to indicate the nature of the case. In some instances in the shoulder, as in the hip (page 65), osteo-arthritis follows an injury, and may then be met with apart from any manifestation of the disease elsewhere. This form is inveterate, and of the same active type as that which is met with in the hip. The importance of an accurate diagnosis between adhesions outside the joint and osteo-arthritis is alluded to on page 227.

The general *treatment* is given at page 69 *et seqq.* Local means consist of warmth, hot douching vigorously carried out, a series of small blisters when pain is marked, massage and gentle exercise of the joint. In some cases the continuous electric current is of use both to relieve pain and to retard muscular wasting.

Stiffness often depends to some extent on the formation of adhesions round the joint, and good may sometimes be done by giving an anæsthetic and very carefully manipulating the joint by first rotating the humerus on its long axis, and then carrying the elbow in different directions through a limited range. This proceeding, however, should be adopted only when the patient is suffering great inconvenience from stiffness of the joint, and when the articular surfaces appear to have undergone no very extensive alterations in shape. In advanced cases, manipulation will not only be useless, but it will in all probability considerably aggravate the disease.

Charcot's disease.—This is less common in the shoulder than in the knee, hip, or elbow, yet well-marked examples are sometimes met with. In its early period the affection is indistinguishable from osteo-arthritis, and it is often only when evidence of disease of the nervous system is detected that the true nature of the malady is disclosed. In its later stages the changes in the joint still resemble, though they tend to exceed, those that are met with in the

ordinary form of osteo-arthritis. The articular surfaces are extensively altered. The glenoid cavity is replaced by a large articular hollow, bounded above and in front by the acromion and the coracoid process, and below by a mass of new bone springing from the axillary border of the scapula, and produced apparently by ossification of the long head of the triceps. The head of the humerus disappears, and the upper end of the bone is converted into a large club-shaped mass, which is drawn upwards and forwards as in subcoracoid dislocation. The joint capsule, together with the neighbouring bursæ, is sometimes distended with fluid. The joint is loose and flail-like, and grating is felt on movement. Sometimes the upper end of the humerus drops away from the scapula towards the axilla, but admits of being easily replaced. Movement, however, causes little or no pain, and it is surprising to see the extent to which the arm can still be used. The shoulder is attacked usually only after other articulations have become involved; and no local treatment likely to be of material service, beyond support and rest, can be recommended.

For a notice of syringo-myelia *see* page 94.

Synovial cysts presenting the characters of enlarged bursæ are not rare in connection with the shoulder joint. It is important to remember that these cysts may be in direct connection with the articulation (page 176), and that if it is proposed to deal with them by active surgical interference the strictest antiseptic precautions must be employed. Enlargement of the bursa beneath the deltoid muscle is noticed at page 169.

Syphilitic disease of the shoulder joint is, I think, extremely rare. I have never recognised an example of it. For the diagnosis and treatment of **adhesions** about this joint, resulting from injury or other causes, *see* page 230.

CHAPTER XXVII.

DISEASES OF THE ELBOW.

The elbow.—This joint is very subject to disease. It may not only be attacked with tuberculosis, osteo-arthritis, Charcot's disease, or syphilis, but is often the seat of traumatic inflammation more or less acute. **Acute arthritis** is often met with in pyæmia and in septicæmia, and occasionally after scarlet fever and typhoid. I have seen acute arthritis, rapidly passing on to suppuration and destruction of the joint, follow violent exertion in a hard boat-race.

The symptoms of inflammation of the elbow joint (to offer a general description of them) are : (*a*) swelling, seen chiefly on the outer side, in the neighbourhood of the head of the radius, and about the tip of the olecranon, so that the joint viewed from behind presents an appearance of increased width. There is also a longitudinal depression corresponding to the position of the triceps, with a puffy or fluctuating fulness on either side of the insertion of this muscle. When enlargement is considerable, the joint is maintained at an angle of about 140° (the position of greatest ease), and has a fusiform or globular outline. (*b*) Movement is in some instances much restricted or entirely lost, but in many it is only slightly impaired ; so slightly, indeed, that disease may easily be overlooked. Defect of movement is most apparent in the fact that the joint cannot be completely extended. In many cases of subacute inflammation, pronation and supination are scarcely at all interfered with. (*c*) Pain is very variable ; when disease is acute it may be severe, but in subacute cases pain may be deceptively trivial. (*d*) Heat is readily detected

(so large a part of the joint being subcutaneous) when inflammation is acute, but in mild cases it may be scarcely appreciable. (*e*) Muscular wasting quickly takes place, and, often in obscure cases, constitutes a valuable evidence of disease. It may almost invariably be detected when inflammation has existed for a fortnight or three weeks and upwards. I have found it distinct in the upper arm in acute disease within ten days. The total absence of muscular wasting in a case of suspected disease of the elbow joint may be taken as strongly suggesting that the joint is not itself affected. The *treatment* must be adapted to each case. In acute inflammation the joint should be at once placed on an angular splint. The joint may be covered with an evaporating lotion, or irrigated with iced water allowed to fall drop by drop on lint from a vessel suspended an inch or so above the part. When acute traumatic inflammation is incipient, if the patient is an adult eight or ten leeches may be applied with great advantage. In cases of punctured wound, or pyæmic infection followed by acute arthritis, should suppuration occur—an event that will be indicated by a continuance of severe pain and high temperature, combined with an increase of swelling, or the development of redness and œdema of the integument so that the surface pits on pressure—a free incision should be made on the outer aspect of the joint, the synovial cavity should be freely irrigated, a small and short drainage tube introduced, and the wound dressed antiseptically. In favourable cases, especially in the young, recovery will take place without loss of movement; but as the joint may become stiff, it should, during repair, be placed at an angle of about 100°. When simple synovitis has been acute and has extended only over a few days, should the elbow remain stiff at the end of two months after all inflammation has subsided, a cautious attempt may be made to restore motion when the patient is under an anæsthetic; but when

disease has been prolonged this practice will generally be either useless or mischievous.

Tuberculous disease.—This is very common, and most frequently sets in between the ages of three and nine. But it may occur at any period of childhood or adult life. More rarely it is met with in the old. (*See* Senile tuberculosis, page 120.)

Symptoms.—The joint, maintained at an angle of about 140°, becomes more or less stiff. Sometimes stiffness is very slight, and the joint will admit of all its movements except full extension—pronation, supination, and flexion remaining free. Usually, however, stiffness is much more marked. There is swelling in the form of fulness or puffy thickening, most apparent posteriorly on either side of the triceps, so that the joint looked at from behind presents an aspect, as compared with its fellow, of increased width. In advanced cases the whole joint is enlarged and fusiform, and all the bony landmarks are obscured. Pain is often entirely absent, and is not provoked even by gentle movement. This absence of pain often induces parents, and perhaps even surgeons, to believe that no disease is present. Abnormal heat of the surface may be noticed, but its absence must not be taken as a sign that the joint is not affected. Muscular wasting can almost invariably be detected, especially in the upper arm. Indeed, muscular wasting, swelling, and stiffness are the three symptoms that are most constantly developed, and that may be most safely depended upon as indicating that tuberculous disease is present.

Treatment.—At the earliest moment at which disease is detected the joint should be enclosed in a pair of well-fitting rectangular leather splints (Fig. 49),* and supported in a sling. These splints should be worn by night as well as

* These and several other splints illustrated in this work are copied from splints manufactured by Spratt and Brooks, New Bond Street, London.

by day. They should be removed only every second or third day, while the skin is gently sponged, dried, and dusted with fine boracic powder, and then be at once replaced. I believe it is best not to use any local applications to the joint beneath the splints, for they lead to an undesirable amount of disturbance of the articulation, without doing any material good. If the complete rest secured by the splints is continued for from three to nine months, recovery will in a very large proportion of cases be obtained. Usually at least six months will be required. I have seen a considerable number of instances in which, after six months' rest, perfect movement has been regained, and no return of disease has subsequently been observed. When, as so frequently is the case, disease has been allowed to advance for from three to six months or longer, a proportionately extended period of rest will be required. This may amount to a year or even eighteen months; but if this term can be secured a good result will ensue. Sometimes the joint will be stiff (*see* page 488); but in many instances, although the splints have been uninterruptedly worn for as long as a year for the treatment of disease of long standing, free movement has been preserved. The splints should be worn for at least three months after all pain, heat, and swelling have disappeared; and movement should be only very gradually resumed. Should suppuration occur, matter must be at once aseptically evacuated. If the disease has reached an advanced stage, and if sinuses have already formed, when the case is originally seen the joint should be

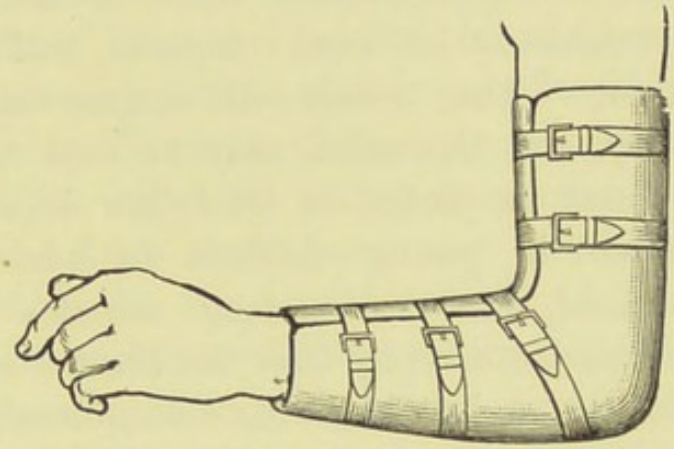

Fig. 49.—Leather Splints for the Elbow Joint.

placed at rest in leather splints, with openings through which matter may escape. Cases thus treated are often seen to undergo rapid improvement, so that in a few months the sinuses have soundly healed. Others are much more tedious, but in many repair will at length take place. There are some instances, however, in which the synovial membrane has become the seat of chronic suppuration, and in which the soft parts are traversed by old sinuses, filled with tuberculous granulation tissue. Here arthrectomy should be performed, while if the ends of the bones are extensively involved excision will be the proper operation. The result of arthrectomy is often satisfactory, and the same may be said of excision, for an arm almost as useful as its fellow is secured. But in some cases in young children in whom disease is very advanced, the surrounding muscles have undergone such extensive atrophy that the limb is very weak and the joint is loose and flail-like for a considerable time.

Osteo-arthritis and **Charcot's disease** are both met with in the elbow. Neither, however, calls for detailed description, for the characters they present are very similar to those observed in such joints as the knee and shoulder (pages 55 *et seq.*).

I have met with four instances of **hæmophilia** involving the elbow. In all, at a time when hæmorrhage was taking place elsewhere, the joint was observed to become suddenly swollen and painful. Enlargement continued for about a fortnight and then gradually subsided. In two of the cases the joint was left much stiffened, and to some extent distorted, in consequence of changes apparently closely resembling those observed in osteo-arthritis.

Syphilitic disease.—Cases of syphilitic disease of this joint, in the form either of synovitis with effusion, or of gummatous infiltration of the sub-synovial tissue,

are by no means rare. Two are related at pages 150, 151. In two children, a boy of nine and a girl of eleven, both elbow joints were the seat of effusion, and of considerable thickening of the synovial membrane. Both had interstitial keratitis. Under the use of grey powder and strapping with unguentum hydrargyri, the thickening and effusion slowly disappeared and the joints returned to a normal condition. The treatment, however, extended in the one case over three months and in the other over five.

Cases in which, without presenting symptoms of still existing disease, the elbow joint is found to be stiff, are not uncommon. Stiffness may depend either on adhesions outside the joint, following fracture, dislocation, or other injury, or result from slight synovitis, either traumatic or due to rheumatism of the joint itself; or it may originate in childhood from fracture in the neighbourhood of the joint, or partial detachment of some of the epiphysial processes. In such instances the history of the case should be carefully ascertained, and if the injury or disease, of which an account is forthcoming, has been trivial, and if tuberculous inflammation can be excluded, an anæsthetic should be given, and a cautious attempt made to restore movement. This, which if properly carried out can do no harm, will sometimes prove completely successful. These are some of the cases in which an opening is too often left for the successful employment of so-called bone-setting by irregular practitioners (pages 220 *et seqq.*).

CHAPTER XXVIII.

DISEASES OF THE WRIST.

In children and young adults tuberculous disease is often met with in this joint. Here, as elsewhere, the affection is apt to be so insidious that, in the majority of cases, it has made considerable advance before its presence is even suspected. Probably for one case in which the affection is detected and adequately treated in the first month of its existence, there are twenty in which it is allowed to drift on for three or four months, or even longer, before it is recognised. While this is allowed, tuberculous disease of the wrist, as of the other joints, will maintain its reputation as an intractable condition, often leading to serious impairment of the limb. On the other hand, when an early diagnosis is made, and efficient treatment is brought to bear, these cases, as a very general rule, will end, in periods varying from three to nine months, in absolute recovery. In many instances tuberculous disease of the wrist (as well as of other joints) ensues quickly after injury. But, as injury is the original condition, and as tuberculous inflammation is developed very insidiously, the transition from the mere traumatic to the tuberculous type of inflammation is so gradual that it is apt to be overlooked; and I have seen several instances in which, though tuberculous disease was obviously present, those who had been watching the case from day to day as one of traumatic inflammation, had not been struck with the change that had supervened.

Symptoms.—The wrist is often a little dropped, so that the hand forms an angle of about 120° to 140° with the fore-arm. Swelling is invariably present, so that, as

compared with the opposite wrist, the various depressions between the tendons are obscured or lost, and not only is the wrist increased in size on measurement, but it exhibits a fulness and smoothness of outline, both on the palmar and dorsal aspects, which, even when it is slight, is very characteristic. This, together with muscular wasting of the fore-arm, has always seemed to me to afford the earliest and most suggestive evidence of disease. Indeed, it is often obvious before any other symptom has become well marked. Pain cannot be relied on. It is often very slight or entirely absent, not only at first, but for all the earlier period of disease. Movement, when tested by the surgeon, is frequently scarcely interfered with; though if the point is looked to, it will be found that there is distinct, though slight, restriction of full extension and also of full supination and pronation. Limitation of movement is often earliest disclosed by the manner in which the patient uses the limb. He may be observed to have, as his parents think, a trick of putting his hand in some peculiar position in feeding himself, or in other common movements, the true explanation of which is that he cannot bend his wrist freely. Muscular wasting, as already indicated, is a symptom to which considerable weight must be attached. It should be looked for in the muscles of the fore-arm, where it is shown either by loss of girth of the limb, or by flabbiness and softness. Increased surface temperature may be present over the dorsal aspect of the carpus, but this is frequently absent in the early period of the affection.

Treatment.—The fore-arm and hand should be without delay enclosed in leather splints (Fig. 50) and the arm kept in a sling. The patient should not be allowed to use even his fingers. Under this plan, and when means are taken to improve the general health, disease of the wrist will steadily recede. Any active symptoms that may have been present, such as pain, heat, and puffy swelling, will

subside, and in six or eight weeks it will be obvious that the case is making satisfactory progress. The time during which treatment must be continued will, of course, vary. It should, however, I believe, in no case be less than six months. The best rule is to persevere with the use of the splints for at least three months after all symptoms, including swelling, have completely disappeared; and to be ready rather to extend than to curtail the period of rest. I have often been struck with the effect of complete rest in the case of the wrist. Perhaps rest is here so

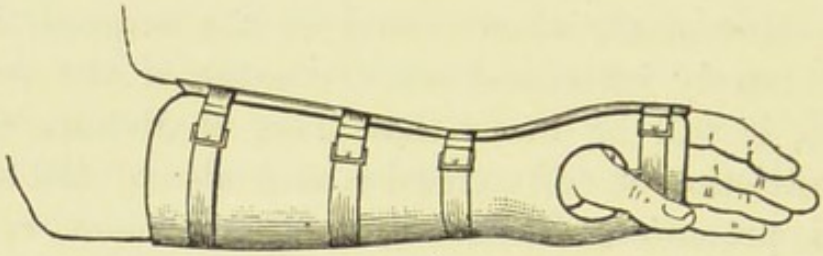

Fig. 50.—Leather Splints for the Treatment of Disease of the Wrist Joint.

efficacious because the splints are able to render it so complete. I have seen several instances in young adults in whom, although the patient was the subject of advancing phthisis, the joint affection has undergone complete repair. Should matter form (but this is very rare, unless the disease is already far advanced before the splints are put on), it should be at once evacuated aseptically, the splints being cut away so that dressings can be applied. In neglected cases, in which extensive pulpy degeneration has been followed by caries of the carpal bones, suppuration, and the formation of sinuses, improvement will at once succeed the institution of rest; discharge and swelling will diminish, sinuses will close, and a useful joint will at length be obtained. Many of these instances, however, extend over from nine to twelve months. The question of arthrectomy, and of excision is discussed at page 325. I will only say here that even the best results that I have seen have made me

believe that every possible means should be taken to escape the necessity of resorting to an operation involving more than the scraping away of granulation-tissue and the removal of any of the carpal bones that have become loose sequestra. I have myself performed excision on only two occasions, and though an average good result was obtained, both cases convinced me that much better ultimate results are to be secured by prolonged rest.

Osteo-arthritis is prone to affect the wrist ; but this, usually, in combination with like disease in many other articulations. The joint becomes stiff and notably weak. The patient is unable to lift an object of any weight. The wrist is also painful, especially on movement in certain directions, particularly if this is sudden : and the patient often finds that he is thus in danger of dropping whatever he has in his hand. Pronation and supination become limited sooner than flexion and extension, and cracking or creaking can frequently be felt. Swelling is often present in the form of puffy enlargement, especially noticeable on the dorsal aspect of the joint. In some cases the synovial membrane becomes distended into pouches and ganglionic enlargements, prominent on the dorsal aspect, and extending for some distance up the fore-arm, so that the disease thus far resembles ganglionic swelling of the sheaths of the tendons. The fact that these collections are often in direct communication with the carpal joints must not be overlooked, when the question of evacuating their contents is being considered (page 181). Usually it is best to abstain from all active interference with them. But swellings, about which it can be ascertained that they do not communicate with the articulation, if they are so large as to cause inconvenience, may be evacuated aseptically, and a Martin's indiarubber bandage may be applied to secure uniform pressure. Osteo-arthritis of the wrist is generally intractable. The best *treatment* consists in

moderate exercise, warmth, hot douching, and blistering if pain is present.

Urethral arthritis is occasionally met with. I have notes of one case in a man of 24, in whom, after an attack of acute inflammation following gonorrhœa, the wrist was left perfectly stiff, and flexed at an angle of about 130°. The muscles of the fore-arm were much wasted. Ether having been given, the joint was manipulated, so that it could be placed in a position of extension on a splint. It was subsequently treated by massage, and passive movements were sedulously practised. Posture was improved, and some motion was regained, so that the patient could write, but this was all that I could succeed in doing.

Rheumatic arthritis.—In cases of subacute but persistent rheumatic inflammation of the wrist, the ligaments sometimes become softened and relaxed so that, as the result of this condition, and of effusion, the joint tends to undergo formidable displacement, the carpus and hand together sliding towards the palmar aspect and the radial border of the limb. In such instances no time should be lost in applying leather splints (Fig. 50). These will not only prevent or arrest a distortion which, if allowed to advance, will go far to cripple the limb; but they will tend to check the disease and promote a satisfactory recovery. Besides, they will be of great service in the relief of pain (page 47).

Acute inflammation, depending upon blood poisoning, is occasionally met with. It must be treated by rest, evacuation of matter, and drainage (page 27). **Charcot's disease** and **syphilitic disease,** especially the latter, are rare. They are, however, occasionally met with. (*See* pages 81 and 148.)

CHAPTER XXIX.

DISEASE OF THE SACRO-ILIAC JOINT.

The sacro-iliac joint.—Tuberculous disease of this joint deserves careful study. In the first place, because it is often attended with very obscure symptoms, and may thus be confounded with disease of the spine, the hip, or other neighbouring part ; secondly, because it is very important that a correct diagnosis should be made early in the case, and that the necessary treatment should be applied without delay. Unless this is done, the prospect before the patient is that he will be confined to bed for months, or even for years, with an affection which is attended with severe suffering and which shows but very little tendency to repair : or his disease may assume an active form, and lead to a fatal result by suppuration and exhaustion. Fortunately, the disease is rare. It is very seldom met with in childhood. I have had but very few examples of it under treatment at the Hospital for Sick Children, while among upwards of a thousand cases which have applied at the Alexandra Hospital, and which have included many different affections (supposed by parents to be hip disease), there have been but very few examples of it. The large majority of cases diagnosed as disease of this joint are, in adults as well as in children, instances of Pott's disease of the lower lumbar vertebræ. It is most often seen in patients between the ages of fifteen and thirty-five, though it may occur either before or after this period. Inflammation of this joint is for the most part tuberculous, but it is probably sometimes the result of injury in otherwise healthy subjects. It has also been met with in

the course of pyæmia, and I have seen one instance in which it followed typhoid fever. No doubt it is occasionally produced by extension of disease from adjacent parts of the pelvis, or by the burrowing into the joint of pus from an iliac or psoas abscess. In its usual form the disease is chronic, and the process of inflammation is inactive,

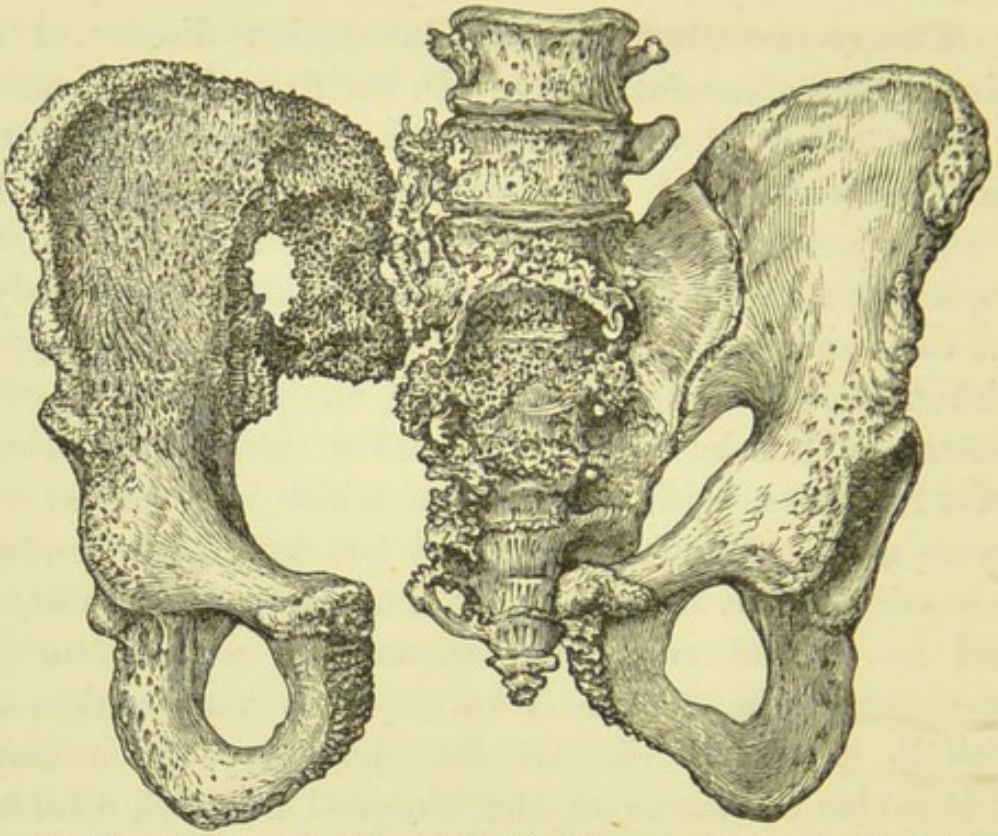

Fig. 51.—Tuberculous Disease of the Sacro-iliac Joint, leading to extensive destruction of the Sacrum and Innominate Bone. (From a preparation, No. 1090A, in the Museum of St. Bartholomew's Hospital.)

tedious, and slow; but sometimes it is from the first acute, and soon passes on to suppuration accompanied with fever, to the destruction of the joint, and to the death of the patient by exhaustion. In some cases it becomes complicated with acute tuberculous phthisis. In acute or far-advanced cases the bones are carious, the cartilage has disappeared, the ligaments have been destroyed by ulceration, and the joint admits of abnormally free movement. In instances in which recovery takes place, repair is

effected by the development of fibrous or sometimes of bony anchylosis.

The *symptoms* of this disease are very variable, and so many of them are also the symptoms of disease in neighbouring parts, that a correct diagnosis can be arrived at, not by regarding any particular symptoms as characteristic and always trustworthy as conclusive evidence, but by carefully weighing all the signs of disease that are present, and by seeing whether disease of adjacent parts, especially of the lumbar spine and the hip joint, can be excluded. This is always a main point in the study of these cases. It is well also to bear in mind that mischief is much more frequent in the spine and in the hip than it is in this joint, so that, *primâ facie*, the probability is against the presence of sacro-iliac disease. The symptoms, from the observation of which a correct diagnosis may be formed, are the following:

(*a*) *Lameness.*—The patient limps, and often complains of a sense of insecurity about his hip and of a want of power, especially when he is going upstairs, or when he attempts to run or to carry a weight.

(*b*) *Pain* is usually well marked, and is often severe. In some cases, however, it takes the form merely of a sense of uneasiness and wearing discomfort about the limb. It is felt over the joint itself, where there may be also marked tenderness on pressure; vaguely about the hip; in the course of the sciatic nerve at the back of the limb; or, more rarely, in the course of the anterior crural in front. In some cases pain is complained of only, or chiefly, at the knee, when it is apt, with other symptoms, to suggest the idea that the mischief is in the hip joint. In acute cases pain is increased by coughing or sneezing, and particularly by a sudden jar of the limb, as by a false step.

(*c*) *Swelling.*—This is sometimes, especially if the patient is stout, quite inappreciable, but often some fulness

and alteration of outline can be detected posteriorly on the suspected as compared with the opposite side. In the later stages of the disease, when suppuration has occurred, both swelling and fluctuation, or at least a sense of deep-seated elasticity, may be detected. More rarely suppuration occurs in the iliac fossa, and matter burrows towards Poupart's ligament.

(*d*) *Alteration in the position of the limb.*—The thigh usually remains fully extended on the trunk. Often there is no change in the apparent length of the limb, the two malleoli remaining exactly level with each other. Neither is there any eversion. In other cases, however, there is half an inch, or even more, of apparent lengthening, and there is distinct eversion.

(*e*) There is always *muscular wasting* of the gluteal region and of the rest of the limb ; indeed, when the disease is established, the limb is usually to a marked extent wasted and powerless.

In investigating a case of suspected sacro-iliac disease, it must be remembered that (*a*) lameness is of no diagnostic value. It is a symptom here, as in a case in which hip disease is suspected, which shows that something is wrong, but it is entirely wanting in any specific character. (*b*) Pain is in itself useless for diagnosis until we come to observe by what disturbance it is produced. It becomes strongly suggestive of sacro-iliac disease when it is provoked by pressing the crests of the two iliac bones either apart from each other, or towards each other, so as to put the ligaments of the articulation on the stretch, or so as to press its surfaces into firm mutual contact ; especially is this the case if movement of the hip is painless and free, and if no evidence of disease of the lumbar spine can be detected. The presence of tenderness on pressure over the sacro-iliac joint is a symptom of importance. (*c*) Swelling, if taken alone, is deceptive. It may, as already

said, be entirely absent; while any that is present may be due to an abscess burrowing beneath the glutei from disease of the spine. (*d*) The posture of the limb cannot be in the least depended upon. It is sometimes, as already mentioned, quite unchanged; in other cases there is some apparent lengthening; or when abscess is forming in the iliac fossa, there may be flexion and eversion combined with abduction, so that the position of the limb suggests hip disease.

Having observed all these points, the surgeon should carefully investigate the condition of the lumbar spine and the hip joint. The diagnosis of hip disease is given at pages 387 *et seqq.* Disease of the lumbar spine may be excluded if the column is found free from all suspicion of deformity; if no fulness or increased resistance can be detected in the vertebral grooves on either side of the spinous processes; and if the lumbar spine is observed to be freely movable.

Treatment.—This must consist of the maintenance of long-continued rest in the horizontal position. In other words, it is the same as that which is demanded in disease of the lumbar spine. If diagnosis is made early, and rest is at once secured, the disease will undoubtedly in a considerable proportion of the cases subside, and recovery will ensue. Rest must, however, be persevered in for from six months to a year or more. Accessory means are repeated blistering, or the use of the actual cautery over the joint. I have seen the latter remedy very beneficial in relieving pain and arresting the course of the disease. After the blistering or the use of the cautery, the pelvis may with advantage be enclosed in a well-fitted and well-padded leather or felt case fastening with straps and buckles. Pain is often at once relieved by this appliance. In a patient, aged 34, in St. Bartholomew's Hospital, with advanced sacro-iliac disease and

suppuration, attended with some pain, weight-extension gave very decided relief, probably by steadying the pelvis and keeping the parts at rest. Should matter be detected, it ought at once to be evacuated, great care being taken to secure an aseptic condition of the wound. There can be little doubt that the tendency of this disease to lead to profuse suppuration and the wide burrowing of pus both under the glutei and within the pelvis has been owing to the fact that, instead of being at once removed by incision and adequate drainage, pus has been allowed to remain confined under tension beneath dense fibrous structures, where it has acted as a constantly increasing source of irritation. When caries of the bones has taken place, the disease has entered on a very intractable stage. With rest and free drainage recovery may still ensue; but the probability is against this. Nor can any operative treatment be depended upon to do material good. Generally, although the surgeon is induced to operate repeatedly, and although on each occasion he removes carious fragments, he fails to secure repair. In cases, however, in which disease is confined to the structures of the joint itself, the removal of the affected tissues, by scraping them away with a Volkmann's spoon, together with the free laying open of all the sinuses that are within reach, may be followed by sound healing. A case of this kind was sent by Dr. Horace Jeafferson, of Wandsworth, to St. Bartholomew's Hospital. The patient was a woman aged 32, in whom several fistulous passages opening on the surface and leading into the sacro-iliac joint were laid open. I found that the investing cartilage was in a condition of pulpy thickening, and was bathed in curdy pus. I freely scraped all the granulation-tissue away, so far as it could be reached, and sponged out the joint with a solution of chloride of zinc, forty grains to the ounce. Complete repair occurred, and in the course of four months the patient was discharged

with all the wounds closed. She still remains well and is able to work as a domestic servant.

Mr. Golding Bird has described three cases in which he operated in the early stage of sacro-iliac disease, in patients aged respectively fourteen, thirty, and thirty-nine. The wound healed in each instance by primary union. When the paper was read,* one patient was still under observation, but was doing well; the other two were up and walking about without pain, and were to all appearances cured. In all the cases the symptoms, which had lasted many months, were lameness, pain, and well-marked tenderness on deep pressure over the posterior aspect of the joint.

Description of the operation.—A semicircular flap of skin and subcutaneous tissue over the area of the joint, having its convex margin corresponding to the posterior edge of the ilium, is dissected up and thrown forwards, and the underlying glutei are similarly detached. The bone being thus freely exposed, a large trephine is applied at the root of the posterior inferior iliac spine, and in a line drawn from the top of the spine to the junction of the anterior with the middle third of the iliac crest. This line lies in the axis of the auricular surface of the joint.

At the root of the posterior inferior spinous process the bone is very thick, but the disc of bone removed should extend down to the joint. This opening enables an inspection of the joint to be made, if this is all that is desired; but to remove disease it must be further enlarged by whatever means the surgeon thinks best. It is essential that the amount of bone removed should be practically that forming the iliac surface of the joint.

When all visible disease has been removed, and especially if the trephine openings do not quite cover the area of the joint, the ilium should be prised off the sacrum with an

* *Lancet*, 1895, vol. i. p. 1117.

elevator. Sufficient separation of the two bones is thus easily effected to allow of the introduction of a Volkmann's spoon, for the more effectual removal of disease or *débris*. A further gain from this manœuvre is that it may be the means of revealing pus lying just outside the limits of the joint, and not before known to exist. The pus wells up into the joint as the ilium is lifted up, and further opening may be necessary to get at and cleanse the cavity in which it lies. If the case is complicated with sinuses, these must be treated on general surgical rules ; but Mr. Golding Bird expresses the opinion that the following up of a sinus as an indication of the route by which to reach the joint, with a view to excision, is useless. The excision must be deliberately carried out in the way described, and then the sinuses be dealt with.

CHAPTER XXX.

DISEASES OF THE HIP.

The hip.—Among the diseases of the hip joint are some of the gravest maladies that ever present themselves for surgical treatment. The joint is a large one, and is deeply placed beneath the great muscles of the thigh and gluteal region, while it is separated by merely a thin plate of bone, a muscle, and a layer of fascia from the cavity of the pelvis and the important organs therein contained. It is enclosed in dense and unyielding fibrous structures which give rise to a degree of tension that, in acute inflammation, greatly aggravates the processes of disease. It is subject to the influence of some of the most powerful muscles in the body, which, when they are the seat of contraction resulting from reflex nerve-irritation, induce an amount of inter-osseous pressure that leads to highly mischievous results. It is so formed that any material destruction of either of its component bones is liable to be followed by shifting of the articular surfaces upon each other, and a loss of the ball-and-socket mechanism on which it is constructed. Until within the last few years several forms of disease of this joint were attended with prolonged suffering, and not rarely ended fatally, while, in cases in which patients survived, the limb was, in the majority, left in a deformed and crippled state. At the present time, owing to the labours of numerous workers, prominent amongst whom have been several distinguished American surgeons, and the establishment of the three great principles of early diagnosis, complete rest, and the aseptic evacuation of matter as soon as it is detected, affections of this joint

have been brought to a large degree under control; the mortality attending them has been greatly reduced, the suffering they formerly involved can now to a large extent be relieved, deformity can be prevented or corrected, and, in many cases, recovery takes place with complete restoration, or with very slight impairment of the functions of the limb. It must, however, be confessed that, although experience shows these results are, in favourable circumstances, to be obtained, a large number of cases still end in disaster; for the three principles to which I have alluded are often not brought to bear, and cases that would, in their earlier stages, at once respond to treatment, are allowed to drift from bad to worse. This is largely due to the fact that parents, starting with preconceived notions, are unwilling to agree to the necessary means. It is also to some extent dependent on the circumstance that some surgeons are imperfectly convinced of the soundness of the methods to which allusion has been made. This subject is further noticed on page 449.

Acute arthritis of the hip joint is occasionally met with after an injury.

A boy, aged 13, while running through long grass, caught his foot, and was thrown down so that his hip was violently wrenched. He was unable to walk, and the same evening he was attacked with severe pain in the joint, and in two days his temperature rose to 103°. A long splint was applied to the sound side, and a weight of six pounds to the injured limb; but for several days pain continued to be very severe, and was aggravated by the slightest movement. The temperature ranged between 102° and 104°, and he rapidly lost flesh. Spasmodic contraction of the muscles, producing painful startings of the limb, were at first almost constant. These were relieved when the weight was increased to nine pounds, and by the hypodermic injection of a sixth of a grain of morphia. The soft parts around the

joint were the seat of effusion and brawny induration, and the glands in the groin were enlarged. On the tenth to the twelfth day suppuration seemed about to occur; but no matter could be detected. With continuous rest and weight-extension the acute symptoms gradually subsided, and at the end of three months the boy was free from pain; and his temperature had been normal for upwards of a fortnight. He ultimately recovered; but the joint was almost absolutely stiff.

Acute arthritis occurring in *pyæmia* and other forms of blood poisoning is fortunately rare. It is in the highest degree formidable. Suppuration usually takes place rapidly, and in a few days the joint may be completely disorganised. The symptoms are generally well marked and unequivocal. The patient, in whom generally other evidences of blood poisoning are already developed, complains of sudden and severe pains in the joint, and is unable to bear the slightest movement. The temperature ranges between 100° and 104°, and rigors may occur. On examination the limb is found to be maintained in one position; generally it is flexed, abducted, everted, and the joint is stiff. Pressure on the front of the capsule or behind the trochanter causes pain; and within a few hours there is distinct swelling, most apparent over the front of the capsule. Often, in the course of two or three days, fluctuation is detected. In other cases, however, mischief is much more insidious. The patient complains of little or no pain in the joint, and effusion and spontaneous dislocation may take place without attracting any attention, until the altered length or position of the limb is noticed, when the acute stage of the original disease has passed off.

In some instances a psoas abscess, connected with Pott's disease of the spine, bursts into the cavity of the hip joint, by passing through the large bursa which lies over the front of the capsule, and which generally communicates by a wide

opening with the joint. An acute suppurative arthritis is the immediate result. Hitherto such cases have generally been rapidly fatal. The best course would be to drain the psoas abscess through a free incision in the loin, as recommended by Treves (page 500), and to open the joint from the front and freely irrigate and drain its cavity. This treatment would afford a good prospect of success.

Treatment.—In acute arthritis of the hip joint the limb must be placed in a position of extension, and be kept at rest by the application of a weight, or of Thomas's splint. When pain is severe, these two methods may be advantageously combined. Should matter form, it should be evacuated by free incision and drainage. In young subjects, should the joint have become disorganised, and if exhausting suppuration persists, excision or amputation may be sometimes performed, with some prospect of averting a fatal result. Generally, however, the best chance of recovery will be in prolonged rest, combined with free drainage. In adults amputation is very seldom admissible.

In the course of *typhoid fever* the hip, more commonly, I think, than any other joint, is liable to be attacked with subacute arthritis. The affection sets in usually after the active period of the fever is over, and I have met with it when the patient had reached the sixth week after the commencement of the fever, and was far advanced in convalescence. The disease seldom goes on to suppuration, and is seldom very acute. It is characterised by pain, a fixed condition of the joint, and tenderness on pressure over the capsule. In some instances there has been considerable serous effusion, and dislocation has taken place. There is danger that this accident may be discovered only when the patient has become convalescent, and when it is too late to effect reduction. In any case in which a patient complains of pain in the joint, or in the knee, or in which the limb is observed to be fixed in one position (this is usually

flexion and abduction), an examination should at once be made, and if symptoms involving the hip are detected weight-extension should be applied, and a cradle should be placed over the foot to prevent pressure by the bed-clothes upon the limb. In the rare event of suppuration taking place (but I have never seen it), the treatment will be the same as that recommended in pyæmic arthritis (page 376).

Urethral arthritis.—Under this term gonorrhœal arthritis is included. (*See* page 23.) This condition involves the hip more often than any other large joint, except the knee. The affection, which may be developed at any time between four or five days, and many weeks after infection, and when merely a chronic gleet remains, presents itself usually as a subacute, but very persistent, form of arthritis, attended with the same symptoms that occur in rheumatic inflammation of moderate severity. It often, after lasting for many weeks, leaves the joint completely fixed by adhesions, some of which are situated within, and some external to, the articular cavity. In some instances, however, the attack is very sudden and acute, and the temperature rises to 102° or even 104°. Suppuration, though it has been met with, is extremely rare. (*See* page 24.) Care must be taken that the real nature of the joint affection is not overlooked; and in any case in which the symptoms of inflammation of a rheumatic type are developed in a male patient who has never before had ordinary rheumatism, it should be ascertained whether any urethral discharge (which, it should be noticed, is not necessarily gonorrhœal) is present. The management of the urethral condition is alluded to at page 26.

The local *treatment* consists in placing the joint at complete rest; and when the attack is acute in a strong adult, in the employment of eight or ten leeches, followed by hot fomentations frequently renewed. When the active stage of inflammation is passed, a succession of blisters about

two inches square should be applied. As to the benefit derived from free blistering, there can be no doubt. But in cases in which the inflammatory process becomes obstinate, the benzoline cautery has a still better effect. When inflammation has entirely subsided, and no pain has been felt in the joint for a fortnight or three weeks, should stiffness remain, the patient should be put fully under chloroform, and an attempt be made to restore movement by manipulation, by first flexing the limb, then adducting it, then abducting it, and lastly extending it. In a strong subject in the prime of life considerable force may be used; but this must always be applied cautiously, and not too suddenly. I have seen the end in view defeated by the use of violence, which had the effect of producing extensive laceration of the muscles, and a further exudation of lymph about the joint, which became organised, and added to the stiffness already present. In many cases manipulation fails to restore motion, for, though the joint moves freely at the time, stiffness quickly returns. In such instances daily massage and passive movements must be practised, and be continued for several weeks. In some instances complete bony anchylosis is developed. Should the limb have become firmly fixed in a distorted position, which manipulation fails to correct, the case must be treated as one of anchylosis, and either the neck of the femur must be divided by Adams's method or osteotomy below the trochanters must be performed.

Acute arthritis of infants (page 129).—This affection, which is not rare in children under the age of two years, is often obscure at its onset. The patient (usually an infant of only a few months old) is observed to keep the limb in a fixed position of more or less flexion, and to cry when lifted, or when the thigh is moved. In a few hours the joint is observed to be painful and swollen. The swelling rapidly increases, so that often

within forty-eight hours it has become considerable, and fluctuation can be detected.

Treatment.—If matter is evacuated early by aseptic incision, complete recovery may take place, or at most the joint may be left slightly limited in its range of movement. If, on the other hand, the nature of the case is misunderstood (I have known this condition mistaken for rapidly-growing sarcoma of the muscles of the thigh), or if there is any hesitation in opening the abscess that has formed, matter will continue to accumulate, and, rupturing the capsule, will become extravasated among the soft structure of the thigh, the joint will undergo complete disorganisation, the head and neck of the femur and the borders of the acetabulum will be destroyed, and the upper end of the thigh bone will be found to move freely about on the side of the pelvis. Probably death will ensue from exhaustion; but, should the patient survive, the joint will be loose and flail-like, in the condition observed in the worst examples of congenital dislocation (page 130). It will thus be seen that it is of paramount importance to let matter out with the smallest possible delay.

Osteo-arthritis.—This affection is not only common in the hip joint, but it often assumes a severe form, and leads to characteristic and grave results. Though met with in rare instances in patients under forty, or even under twenty, it usually sets in after forty-five or fifty. It may attack the hip joint alone, when it constitutes the old morbus coxæ senilis, or monarticular rheumatism; or it may occur in association with similar disease in other articulations.

The affection usually begins slowly and insidiously, with occasional wandering pains in the groin, at the back of the joint, or down the limb in the course of the sciatic nerve, attended with stiffness of the joint after rest, and a feeling of weakness and fatigue. Many cases that are termed "sciatica" are really instances of osteo-arthritis, a fact that

should make us careful, whenever a patient is reported to have sciatica, to investigate the condition of the hip joint. Lameness is soon developed, creaking and cracking on movement may sometimes be noticed, and the muscles of the hip and thigh undergo wasting. These various symptoms, though with frequent exacerbations, and partial intermissions, gradually increase. Especially is this the case with pain and stiffness. The former is particularly marked at night, the patient being unable to lie on the affected side, or to place himself in a comfortable position on account of a dull wearing and aching sensation about the hip and down the thigh. As the disease advances, and changes occur in the shape of the bones, the joint becomes more and more stiff, the limb becomes shortened and everted, and the trochanter is found to be travelling upwards towards the dorsum ilii; the patient is unable to stoop or to put on his boot, and the muscles of the limb undergo steadily-advancing atrophy. At last the hip becomes completely fixed, owing to the manner in which the articular surfaces, now greatly altered in shape, and surrounded by osteophytic outgrowths, are locked together. Bony anchylosis, as stated at page 61, does not occur. The limb is shortened sometimes to the extent of two inches or more, lameness becomes excessive, in part from shortening and stiffness, and in part from the inability of the patient to bear his weight on the limb; usually the thigh remains extended on the trunk, and the patient limps on his toe. The bones in the neighbourhood of the joint can be felt to be enlarged and distorted, and the trochanter lies considerably above Nélaton's line. Cases of osteo-arthritis following a fall upon the trochanter are referred to at page 65.

A remarkable deformity, leading to what Mr. Lucas has described* under the head of "cross-legged progression,"

* Clin. Soc. Trans., vol. xiv. p. 20.

occasionally results from osteo-arthritis. (*See* Fig. 52.) The gait of the patient is due to the fact that both limbs have become fixed in a position of extension combined with adduction.

Treatment.—The general treatment of osteo-arthritis is described at page 69. In the hip, as in the other joints, gentle exercise is advisable. When the joint is painful, counter-irritation in the form of mustard leaves or small blisters gives marked relief in many instances. In some cases, however, it completely fails. Blisters act best when they are used in a series of four or five, one being allowed to heal before the next is applied. Relief may also be obtained by covering the joint, after it has been thoroughly douched with hot water, with a liniment of belladonna or opium. In some instances pain is relieved by the continuous electric current of six or eight cells applied daily. In the later stages the disease obstinately resists treatment, and often steadily advances. Little can be done but to employ the means that have been enumerated for the relief of pain, and to advise the patient to walk with a firm stick, so as to avoid throwing much weight on the joint, and to wear a high boot, constructed as lightly as possible, which will compensate for shortening of the limb. The question of endeavouring to restore movement, when the

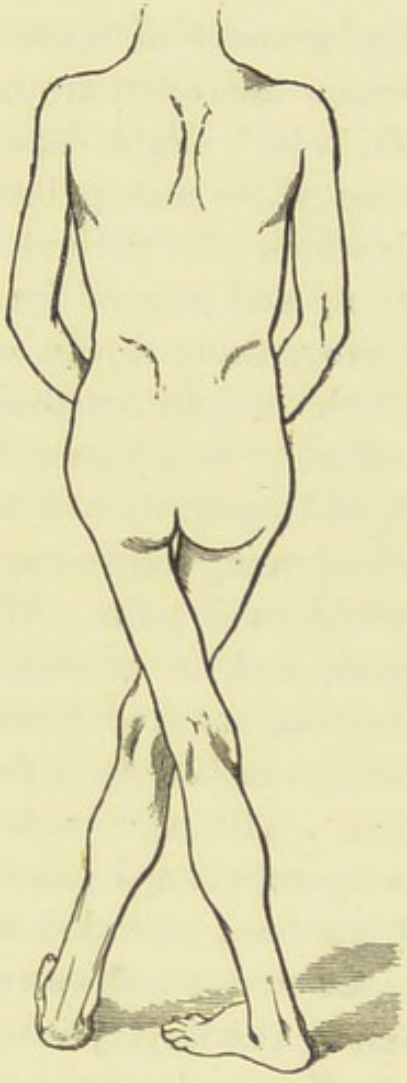

Fig. 52.—Attitude in Cross-Legged Progression.

joint has become stiff, is one of great importance. As a very general rule, no advantage will be obtained by such an attempt; while there is considerable danger that the force employed may be followed by aggravation of the patient's suffering. In a few instances, however, the range of movement may be increased by the detachment and displacement of some of the adventitious bone which has become deposited around the margin of the articulation, and which by a slight degree of force can be pushed aside. The cases where manipulation may fairly be tried are those (1) in which the patient is not beyond middle age, and is strong and in good general health, (2) in which the disease is progressing slowly and only the hip is affected, and (3) in which the joint, without being the seat of much pain, is so stiff as to be a source of great inconvenience. The attempt should certainly not be made in old and feeble patients in whom many joints are affected or in those who are suffering considerable pain. When the disease is making active progress, and is attended with pain which is increased by exercise, marked benefit will be obtained by keeping the patient in bed for a few weeks and applying weight-extension. Although such treatment is not generally regarded as appropriate, I have met with several instances in which it has been attended with very satisfactory results.

Charcot's disease.—Next to the knee, the hip is, among the large joints, most liable to be attacked with this affection. In some instances the local features of the malady are indistinguishable from those of osteo-arthritis of the ordinary type, and it is only the presence of tabetic symptoms (page 82) that discloses the more formidable nature of the attack. In other cases, however, the changes in the joint are not only associated with evidences of disease in the spinal cord, but they exceed, both in the rapidity with which they are developed and in their extent, anything with which we are familiar in

the course of what is usually understood as osteo-arthritis. These cases also differ notably from osteo-arthritis in the absence of pain and, generally, of stiffness, in the fact that the patient is able to make considerable use of the limb, and in the presence, in some of them, of a large collection of turbid serum forming a fluctuating tumour of large size occupying Scarpa's triangle, and presenting also at the outer and back part of the joint.

A typical instance of the acute form of the disease is recorded by Mr. Keetley.* The patient was a man, aged 34. He was in good health till October, 1880, except that he suffered with muscular pains which he attributed to rheumatism, and with occasional diarrhœa; and also, from time to time, with suppuration under a corn beneath the great toe. These symptoms had existed for twelve years. In October, 1880, the great toe was attacked with swelling, and a week afterwards the right hip and thigh swelled enormously. The swelling of the hip subsided to a great extent in about two months. The joint remained loose and grated on movement. It was painless, the limb was shortened, and the inguinal glands were enlarged. The left hip was similarly attacked in September, 1881. It passed through the same stages as the right, and in six weeks was also shortened and loose, and gave a crunching sound on manipulation. The swelling almost entirely subsided within six weeks of the onset of the attack. On examination, Mr. Keetley found that the trochanter on each side had ascended an inch or more, and when either limb was rotated, moved through so small a circle that there could scarcely be a doubt but that the heads of both femora had been absorbed, at least partially. The ordinary signs of locomotor ataxia to be discovered were inability to stand with the eyes shut and the heels together, loss of patellar reflex, and of contraction of the pupil under the

* Clin. Soc. Trans., vol. xv. p. 13.

stimulus of light. Sensation was blunted on the outer side of both feet, and also in front of the lower half of the left thigh, and perverted in the left foot (he thought his heel was being touched when it was really his toe). There had been no gastric crises, but there had been what might perhaps be termed "intestinal crises," namely, often for a considerable period unaccountable attacks of diarrhœa coming on once a fortnight.

As to *treatment*, there is generally but little to be done. In those instances in which there is a distinct history of syphilis, especially if this is recent, either mercury or iodide of potassium should be given. But I know of no other drug that can be prescribed with any prospect of advantage. If large collections of fluid are present around the joint, they may, if the amount is increasing, be aspirated, though it is doubtful whether anything material will be gained by the proceeding, for the fluid will probably soon re-form. Cases have been recorded to show that rest has a marked influence in checking the progress of the disease in acute cases, so far as the wearing down and destruction of bone are concerned.

CHAPTER XXXI

MORBUS COXÆ (MORBUS COXARIUS).

HIP DISEASE, in the natural sense of the word, is as vague a term as "eye disease" or "lung disease" would be. The phrase, however, which has come down to us from former times, is now by common usage limited to tuberculosis of the joint. Nor, when thus employed, is it superfluous; for the malady in question presents so many special features in respect alike to its symptoms and diagnosis, the course it takes, and the treatment it requires, that it is convenient to describe it under a separate name.

Hip disease usually originates in the bones; either in the upper end of the femur, or in the floor of the acetabulum, but it may also begin, though this is comparatively rare, in the synovial membrane. The old view, that it commenced in the ligamentum teres, or in the articular cartilage, has now been discarded.

In the femur tubercle is deposited (*a*) in the growing tissue of the neck, immediately beneath the epiphysial plate (Fig. 53); (*b*) in the substance of the head, in the vicinity of the ossifying nucleus; or (*c*) in some part of the neck within the capsule. In the acetabulum it usually affects the lines of junction between the three segments of bone which meet here, and are connected, during growth, by the Y-shaped cartilage. The frequency with which the hip joint becomes involved in tuberculosis seems to depend on the fact that both the upper end of the femur and the floor of the acetabulum are formed of vascular cancellous tissue which is undergoing rapid growth. It is in such a tissue that the tubercle bacillus finds a highly congenial soil.

The disease at its commencement is a lesion of the osseous system. The joint becomes involved as a direct result of the anatomical relation of the parts. For, as the area of the bone mischief is enclosed within the capsule, the synovial membrane becomes infected by direct extension. This extension of inflammation from the bone to the synovial membrane is generally a gradual and insidious process. In some instances, however, inflammatory products, originally contained within the bone, suddenly escape from its interior into the cavity of the joint, with the result that an acute synovitis, soon converted into an acute suppurative arthritis, attended with severe pain, high temperature, and other urgent symptoms, is produced. In other instances, tuberculosis of the upper end of the femur leads to chronic osteitis of a low grade of intensity, accompanied with considerable and irregular enlargement of the bone, with the result that, while the symptoms of joint-disease are but slight, so much heaping up of new bone occurs about the upper end of the femur as even to suggest the presence of sarcoma.

In the synovial variety the inflammatory process may be acute, and attended with early suppuration; but much more commonly it is chronic, and leads either to slow caseation and suppuration, or, when the effused lymph is plastic in its character, to firm fibrous, or, more rarely, bony anchylosis.

Whatever its starting-point, the disease, if allowed to advance, soon involves all the structures of the joint. Owing to the cancellous structure of the bones, the inflammatory process commonly ends in caries, rather than necrosis; and though sequestra are sometimes found, they are seldom much larger than a nut, and consist of soft fragments easily broken down and absorbed. Cases, however, are not very rare in which, as the result of acute inflammation at the junction of the epiphysis with the neck, the whole head of the

femur, or what remains of it, becomes detached from the neck (Fig. 53), and is found lying in the interior of an abscess, or in the cavity of the joint. In extensive disease of the acetabulum, sequestra may be found, but they are usually small and friable. Ultimately, the head and neck of the femur, as well as the rim of the acetabulum, having been absorbed, the upper end of the femur is displaced upwards and backwards on the dorsum ilii, and accompanying this displacement there is usually an increase of deformity in the direction of flexion and adduction of the limb. In the worst cases the bones become extensively involved. Chronic osteo-myelitis spreads down to a considerable distance along the medullary tissue of the femur, and leads to widespread necrosis. In other instances, the rim of the acetabulum becomes so extensively absorbed that the cavity is entirely destroyed.

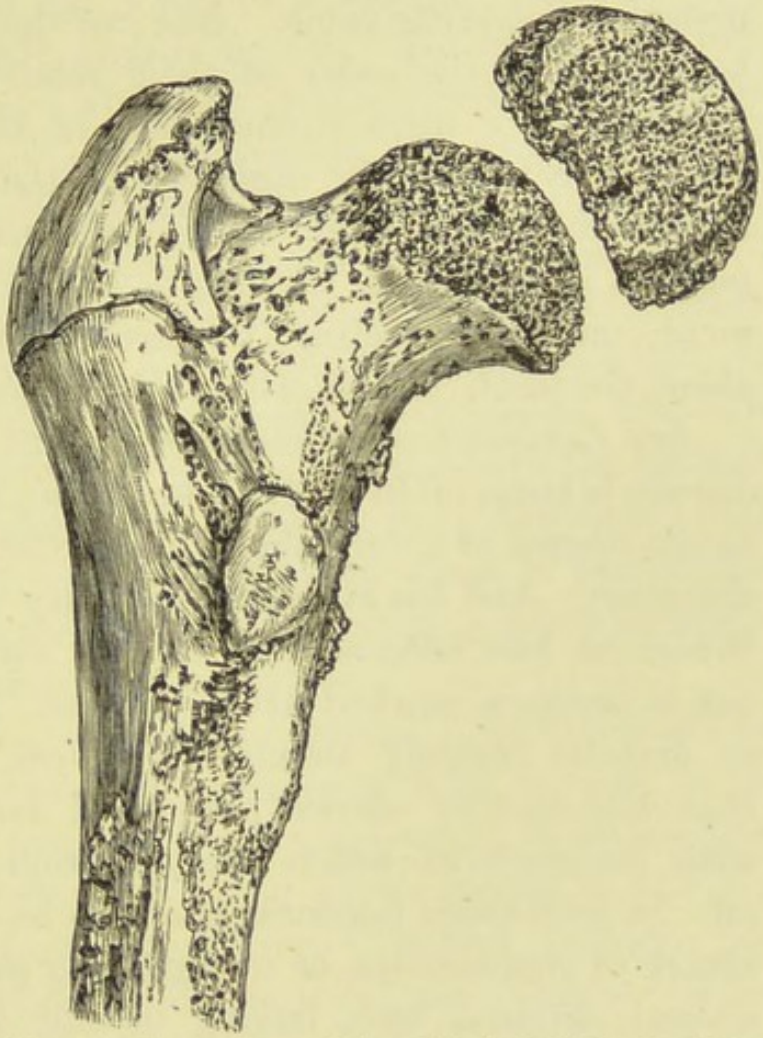

Fig. 53.—Separation of the Epiphysial Head of the Femur. (From a preparation, No. 621, in the Museum of St. Bartholomew's Hospital.)

Diagnosis.—Although in advanced cases hip disease is often obvious almost at a glance; yet in its incipient stage,

in which its recognition is so highly important, an accurate diagnosis is often attended with considerable difficulty. In such instances it can be arrived at, not by an appeal to two or three symptoms that are always well marked, but by taking into account and fitting together various symptoms, no one of which, if isolated from the rest, would be of any material diagnostic value. Nor can the different symptoms be placed in the order of their relative value; and the following is a mere enumeration of them as they would be most conveniently observed in the investigation of a suspected case. They are:—Lameness, pain, abnormal posture, alteration in the length of the limb, loss of movement, muscular wasting, tenderness on pressure, swelling about the joint. Each claims a brief notice.

(*a*) *Lameness.*—Generally a patient with incipient hip disease is lame, often very markedly so; but sometimes only to the degree of a very slight limp which may easily escape detection. And his lameness may vary with circumstances. When he has been at rest it may completely disappear, but it becomes marked after exercise. Sometimes it may at first be entirely absent for a week or even longer, so that the history shows periods of lameness alternating with intervals in which the symptom completely passed off. In such cases lameness is apt to be ascribed to a slight attack of rheumatism, or to "growing pains." I remember several children who, having become lame, were at once put to bed and kept there for three or four days before being brought for examination, and in whom the lameness had subsided, though other symptoms clearly indicated that early hip disease was in progress. This will be further dealt with later. Again, it must always be remembered that there is no form of lameness that is in the least characteristic of or special to hip disease.

Lameness may be due to four different causes—impaired movement of the joint; altered position (flexion, abduction,

or adduction) of the limb; tenderness of the structures involved; and the weakened condition of the surrounding muscles. And its form will vary with each of these: or, rather, will depend on the manner in which they happen to be combined. Obviously, for example, lameness depending on marked flexion will not be the same as that due to tenderness of the joint, in a case in which the limb is abducted and only slightly flexed. Nor must it be forgotten that lameness which at first suggests hip disease may be produced by some altogether different cause; for instance by spinal disease and psoas abscess, or even, as I once saw it, by a contracted burn-scar on the groin.

Thus it will be seen that, although lameness is clear evidence of the presence of some abnormal condition, it is of no direct value as a means of diagnosis between hip disease and some other affection from which the patient may be suffering. In other words, it is an indication that there is something wrong; but, taken alone, it carries the investigator no farther; what the wrong is must be determined by an appeal to other evidence.

(*b*) *Pain* varies greatly in its amount. It may even be entirely absent. In some cases, from first to last, it is so slight as to be misleading. In others it is severe and persistent. The following is the nerve supply to the hip joint: branches from the anterior crural usually, but not constantly, pierce the front of the capsule; some from the sciatic and other offsets of the sacral plexus enter behind; and a twig from the obturator reaches the interior through the cotyloid notch. From these different nerves peripheral branches are supplied to various parts of the limb below. Branches from the anterior crural enter the knee through the front, and from the obturator through the back of the capsule; other twigs from the obturator end on the inner side of the thigh, while the sciatic supplies the ham, and the long saphenous the inner side of the leg.

This nerve-distribution is alluded to in order to explain how it is that pain may be felt either in the hip joint itself, or in and about the knee, on the inner side of the thigh, or the inner aspect of the leg. Its occurrence in parts of the limb below the hip is an example of the reference of pain to the peripheral ends of the sensory nerves.

It is well known that when the hip is affected pain may be so entirely confined to the knee as to lead to an oversight as to the real situation of the disease. A case was lately brought from India for treatment in England, in which both knees had been assiduously blistered for pain which in reality depended upon double hip disease. Pain referred to the inner side of the thigh or the leg is not very commonly met with, yet distinct examples of it are now and then to be seen. It must be remembered that pain is occasionally referred to the knee and other parts of the limb in several affections besides disease of the hip:—in Pott's disease of the lumbar spine, inflammation of the sacro-iliac joint, and in abscess in the pelvis or in Scarpa's triangle; so that this symptom is in itself in no way conclusive as to the presence of disease of the hip. It becomes valuable only when it is found combined with other signs. The severe pain which recurs whenever the patient drops off to sleep, and which leads to night screams, is produced by the sudden pressing together of the articular surfaces during contraction of the muscles round the joint, resulting from reflex irritation.

(*c*) *Altered position.*—In the early stage of the disease the limb is flexed, abducted, and rotated outwards. The explanation of this attitude, formerly so much discussed, is simply that it is the position of greatest ease. It is habitually assumed when we sit at rest with the lower limbs flexed, the knees apart, and the heels nearly touching. Flexion relaxes the strong ilio-femoral ligament in front of the joint; abduction the ligamentum teres and

the upper (ilio-trochanteric) band of the ilio-femoral ligament; and rotation outwards the inner band of the ilio-femoral ligament and the back of the capsule.

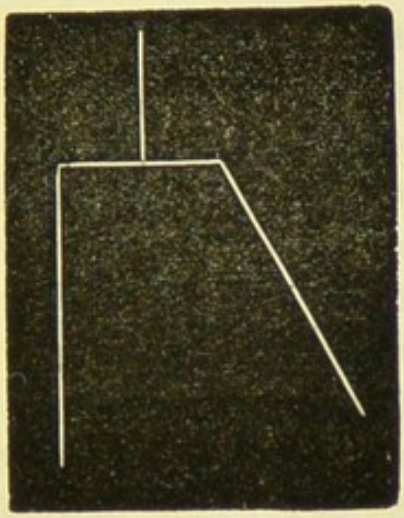

Fig. 54.—Diagram representing Abduction.

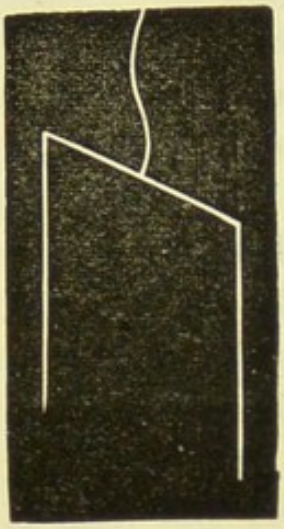

Fig. 55.—Diagram illustrating Apparent Lengthening.

Compensatory postures.—As the patient cannot use the limb for progression when it is either flexed and abducted,

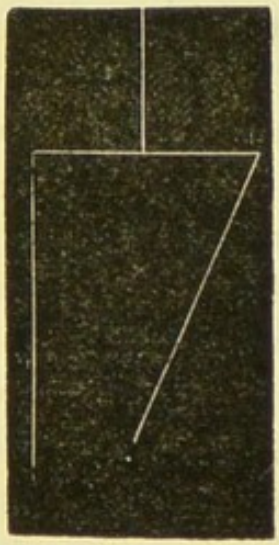

Fig. 56.—Diagram showing Adduction.

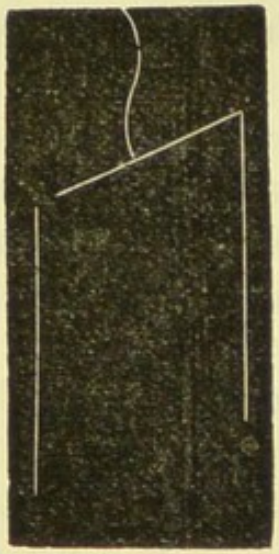

Fig. 57.—Diagram illustrating Apparent Shortening.

or flexed and adducted, he adopts certain compensatory postures which enable him to move about. Having lost the power, through stiffness of the hip, of moving the femur on the pelvis,

he now moves the femur and pelvis together on the spine. By increasing the curvature of the lumbar spine (lordosis) he turns the pelvis on its transverse horizontal axis, so that the knee points downwards instead of forwards: to compensate for abduction (Fig. 54), he draws up the sound side of the pelvis (Fig. 55), and thus depresses the affected side, with the result of bringing the femur inwards towards the middle line. This movement, attended with curvature of the lumbar spine towards the diseased side, has, by lowering that side of the pelvis, the incidental effect of producing apparent lengthening of the affected limb (Fig. 55). If the limb is adducted (Fig. 56) the reverse occurs; the patient draws up the pelvis on the affected side, and so wheels the limb outwards (Fig. 57). This movement is attended with curvature of the lumbar spine with its concavity towards the diseased side, and, incidentally, with apparent shortening (Fig. 57). Thus it will be observed that apparent lengthening of the limb is invariably secondary to and indicative of abduction; and apparent shortening is, in the same way, secondary to and indicative of adduction.

A real alteration of length of the limb occurs only in the direction of shortening. True lengthening, if not absolutely non-existent, is rare in the highest degree, and its seeming existence on measurement depends on an error in the way in which the measurement has been taken. Real shortening results either from bone absorption, or from arrested growth of the limb, or from pathological dislocation—*i.e.* the sudden slipping of the femur upwards upon the dorsum ilii, after the head of the bone and the upper rim of the acetabulum have been absorbed.

Real shortening from absorption of the head of the femur and the upper part of the acetabulum is present only when the disease has considerably advanced. Its amount may be tested either by a careful comparison of the position

of the trochanter on the suspected side with that on the sound side, by placing the thumbs on the anterior iliac spines and the fingers on the tops of the trochanters; or by drawing Nélaton's line (from the anterior iliac spine to the most prominent part of the tuber ischii), and observing whether the trochanter touches, though it remains below this line, as is normally the case; or whether, and to what extent, it passes above it.

(*d*) *Impaired movement.*—This is in all but exceptional cases the most important of the symptoms of early hip disease. There are possible fallacies, however, in connection with it that require to be recognised and guarded against. In applying this test all the movements natural to the joint must be severally and critically investigated. It is a useful preliminary to move the sound limb slowly through all its natural ranges, so that the patient may see that manipulation is to be gentle, and understand (if he is old enough) what is intended in regard to the suspected limb. The thigh on the side in question—being held just above the knee, and the leg being flexed—should be a little drawn upon, so that the head of the femur is not pressed home into the acetabulum, and the limb should be slowly, and with a light touch, flexed upon the trunk; but it is very important that it should be at the same time adducted, so that the knee is carried upwards and across the middle line. The point here is that the limb (if disease is present) is probably already fixed in a position of abduction, and will therefore admit of considerable flexion and abduction combined; whereas flexion combined with an attempt at adduction at once discloses that movement is restricted. This flexion, with adduction, must be carried to its full normal range, for in some early cases the limb will move with unimpaired freedom through all the middle range, and it is only when the limit of normal flexion is approached that restricted movement can be detected.

During this movement of the limb, the surgeon's disengaged hand should be placed under the lumbar spine, so as to make sure that movement is not being produced there instead of at the hip joint. It should then be ascertained—the spine being watched as before—whether the limb can be completely extended; and then whether, when flexed at a right angle with the trunk, it can be completely abducted and completely adducted without disturbing the pelvis, or whether when a certain point is reached the pelvis follows the femur.

These tests are often all that are employed as to movement, but thus used they may be completely deceptive and may be productive of grave mistakes. What they serve to show is, whether or not the thigh moves with its natural freedom upon the trunk; but it is highly necessary to bear in mind that they show no more than this. They afford no trustworthy evidence whatever upon the crucial question whether the stiffness is produced within the joint itself, the case being one of hip disease; or by the condition of the surrounding parts, the joint itself being perfectly healthy. Fortunately another test-movement remains which may be trusted, except in very rare cases, to settle this point. This is the movement of rotation. To apply it, the thigh is placed at an angle of about 120° with the trunk; the knee is lightly grasped, and an attempt is then made to rotate the femur on its long axis in the cup of the acetabulum. If rotation is perfectly free, it goes far to negative the presence of disease. If, however, rotation is more or less interfered with, this shows that disease is really present. But where is it situated? It is at this point that rotation becomes so valuable for differential diagnosis. If the joint itself is affected, rotation is lost or much impeded, even through a narrow arc; while, on the other hand, if the joint itself is healthy and is merely hampered in its movements by the condition of the surrounding parts, although rotation

is much impeded or entirely lost in the wider ranges, it is, within certain limits, absolutely free, and the head of the bone can be felt moving with its normal smoothness and facility in the acetabulum.

There are, it is needless to say, several conditions of the parts surrounding the joint which interfere with either flexion or extension, or with both, and which may thus be mistaken for hip disease unless the rotation test is critically applied. There may be (*a*) Pott's disease of the spine attended with an iliac or psoas abscess. Here there may be flexion (or lordosis), abduction (or apparent lengthening), and eversion; there may be pain in the knee and marked muscular wasting, and, when an attempt is made to extend the limb, it may be found that lordosis is being produced or increased: in other words, that extension cannot be effected. The test of rotation, however, when the limb is flexed at an angle of about 100° with the trunk, discloses the fact that movement of the joint itself is perfectly free, a fact that should at once direct attention to the condition of the parts outside the joint, with the result that the abscess will be detected, and the true state of the case made out. There may be (*b*) Pott's disease with sub-gluteal abscess. Here as soon as an attempt is made to flex and adduct the limb the pelvis will be carried up with the thigh just as it is in hip disease. The rotation test will, however, at once show that the hip joint itself is not affected.

Although the subject now under discussion is the diagnosis of early hip disease, I may, in passing, refer to the great value of the rotation test in a set of cases in which disease is of long standing. There may be considerable brawny thickening and swelling about the hip joint with matting of the soft parts, together with several sinuses occupying the usual positions of sinuses depending on hip disease—on the outer side beneath the tensor fasciæ femoris; behind the trochanter; or just above Poupart's

ligament; and it may be found that, tested as to flexion, extension, abduction, and adduction, the movements of the joint are lost. Here an error is likely to be committed unless the rotation test is applied. When this test is appealed to, it may be found that within certain limits the smooth head moves normally in what the trained sense of touch easily appreciates as a normal acetabulum; and now on examining the spine the evidences of caries will be detected. Even mere adhesions following a wrench may imitate disease of the hip.

(*e*) *Muscular wasting* is a very constant and important symptom. It is most marked as flattening of the glutei and obliteration of the gluteal fold; but it can also be detected with less annoyance to female patients past early childhood by comparing the circumference of the middle of the thigh with that at the same level (arrived at by careful measurement) of the opposite limb. But it is obvious that although muscular wasting is a constant symptom of established hip disease, its existence may be due to so many other causes—for instance, to infantile paralysis, congenital dislocation of the hip, disease of the lumbar spine (I have several times met with wasting of one of the lower limbs from this cause), sacro-iliac disease, or disease of the sacrum involving the branches of the sacral plexus as they leave the sacral foramina or the sacro-sciatic notch—that it must be said of muscular wasting, as it has been said above of lameness, that it is not in itself in any way pathognomonic of hip disease. In combination with other symptoms it is of first-rate value: but apart from them its meaning is completely negative. Muscular wasting is frequently ascribed to disuse of the limb. It is, however, though in part due to this cause, produced mainly by reflex atrophy, and has its counterpart in the muscular wasting which accompanies disease of all the other principal joints.

(*f*) *Swelling.*—Although swelling is a very early and

valuable symptom of tuberculous disease of the superficial joints—elbow, wrist, knee, ankle—it is not usually to be detected in early hip disease, for it is masked by the thick coverings of the joint. It may, however, sometimes be made out as a fulness over the front of the capsule in Scarpa's triangle; or it may be due to enlarged glands in the line of Poupart's ligament. Swelling may also be discovered by grasping the joint between the finger, placed in front of the capsule, and the thumb placed behind the trochanter. Sometimes important evidence may thus be obtained that the upper end of the femur is involved in the inflammatory process. General swelling around the joint, in the early stage, is occasionally seen, and must be regarded as a formidable symptom, indicating widespread and rapidly advancing tuberculous infection of the tissues, which will probably be followed by extensive suppuration. Should a high temperature also be present the severity of the case would be all the more clearly indicated. The absence of swelling, it must be understood, does not in the smallest degree indicate that hip disease is not present.

Here I may particularly allude to the extent to which the symptoms of incipient hip disease may disappear when the joint has been kept at rest for a few days. This is shown by the following cases, and the fact is one of great clinical importance. A highly distinguished surgeon expressed the opinion that a boy of 9 had early hip disease, and advised that he should be at once confined to the horizontal position. After the boy had been kept in bed a fortnight his parents decided to see someone else, and consulted a surgeon scarcely less distinguished than the first. This surgeon said that no disease was present. Feeling all at sea, the patients requested me to examine the child, but without stating what had already taken place. I found the patient in bed. The movements of the joint were

absolutely free in every direction, except that abduction seemed to be very slightly restricted: there was apparent lengthening, so slight, however, that it was scarcely appreciable; and the glutei were in a very slight degree wasted and flabby. The child, when asked to get out of bed, did so very readily, and walked without a trace of lameness: and he had no pain whatever. As there were three symptoms obviously present, though they were almost imperceptible, I reported that a suspicion of hip disease must be entertained. I was then told the previous part of the case, and, on inquiring of the first surgeon consulted, was informed that when he saw the child (a fortnight before) the patient was distinctly lame, and was complaining of pain in the hip and in the knee; whilst flexion, abduction, and rotation were restrained to a degree that was quite unmistakable. The view that hip disease was present was confirmed by the subsequent history of the case.

A child, aged 6, was brought to the out-patient room for advice as to pain in the knee and lameness—for which she had, however, been kept in bed for a week—during which time the pain had disappeared. I carefully examined the case. The glutei muscles were a little flabby on the suspected side, and there was very slight apparent lengthening: but I could not detect the slightest restriction of movement; the child did not complain of pain, and she walked without appreciable lameness. Feeling suspicious, but yet uncertain, I desired the mother to let the child be on her feet for three or four days and then to bring her again. Three days later she returned. The child was now distinctly lame, pain had returned, and on examination I found the hip so fixed that one of the dressers, when asked what was the nature of the case, said there was evidently, on whatever it might depend, firm anchylosis of the hip.

During *examination* the patient should be undressed, and lie, not on a soft bed, but on some firm surface—a well-stuffed couch, a table covered with a folded blanket, or the like. It must then be observed whether he can lie flat on his back in the normal position, with the lumbar spine free from forward curvature (lordosis) and the ham touching the couch; whether the malleoli correspond, and whether the anterior iliac spines are level. If, while the knee is down on the couch, the lumbar spine is felt to be arched forwards when the fingers are passed under the loins, it shows that the thigh is flexed on the pelvis; the extent of this flexion is ascertained by raising the knee till the lumbar spine is straight. If the anterior iliac spine of the suspected side is too low (Fig. 55), it means that the limb is abducted; the amount of this abduction is ascertained by moving the limb outwards until the iliac spines are again level (Fig. 54). If the anterior iliac spine, on the contrary, is too high (Fig. 57), it indicates adduction, the degree of which may be defined by moving the limb inwards across its fellow, till the pelvis is again square (Fig. 56). Thus the real position of the limb on the trunk will be disclosed. Movement should now be tested by carrying the thigh, with the knee a little bent, slowly and gently in the direction, first of flexion (the knee being carried upwards and inwards across the middle line [page 393]) to the full natural range; secondly, it should be extended, also to the full amount, the hand being placed under the loins to see that no lordosis is being produced; thirdly, the knee, still flexed, should be gently grasped, and while the fingers are placed on the anterior iliac spine the thigh should be carefully rotated, so as to ascertain whether the femur turns freely in the acetabulum. This test, as already said, is of the highest value, and must be very carefully applied by light and gentle manipulation of the limb, so that neither

is the child frightened, nor are the muscles roused to a protective contraction. The movements in all directions must be carried to their full range, for in slight cases it is only as their extremes are approached that they are limited, and so they afford evidence of disease.

Muscular wasting should now be looked for, either by comparing the two hips, as to flattening and flabbiness of the muscles and the loss of the gluteal fold, or the same information may be gained by taking the circumference of the two thighs at the same level, the corresponding points being obtained by measuring upwards from the superior edges of the two patellæ. Any swelling that exists may be detected, either by comparing the two sides, or by careful handling. It should especially be noticed whether any thickening is felt when the joint is grasped between the finger and thumb in a direction from before backwards (page 397). Tenderness on pressure, either over the front of the capsule or behind the trochanter, is sometimes a marked symptom, and much depended on by some surgeons. It should be carefully used, for children often complain from the mere fear of being hurt. Jarring the heel or the knee is also a test little to be trusted in any case of doubt. It makes a timid child flinch when the joint is sound, and certainly it often gives no discomfort when the joint is undoubtedly affected.

When all these symptoms have been investigated, the evidence must be carefully weighed. Generally a conclusion is readily formed, but in some cases this is a matter of no small difficulty, and a diagnosis must be arrived at by piecing together various small shreds of evidence, and in spite of the absence of symptoms which are usually well marked. Thus in one case the only symptoms may be slight and occasional pain, either in the knee or the hip, slight flattening of the glutei, or a flabby condition of the muscles of the thigh, slight impairment of rotation of the femur

in the acetabulum, and slight thickening over the front of the capsule. In another, while there is scarcely a trace of pain, slight lordosis, slight apparent lengthening, and slight limitation of extension and rotation can be detected. In another, the only prominent symptom may be muscular wasting, so marked as to suggest infantile paralysis, though a careful examination shows impaired movement, and perhaps tenderness on pressure over the front or the back of the joint. An important point of diagnosis is the exclusion of disease elsewhere, especially in the spine and the sacro-iliac joint. Errors are most likely to be made in the direction either of overlooking incipient disease; or of a confusion between hip disease and disease of the spine, attended with psoas or iliac abscess; congenital dislocation of the hip joint—a much more common condition than some believe; infantile paralysis; and the lordosis of rickets, accompanied, as is sometimes the case, with a painful condition of the muscles of the limbs. In one case infantile scurvy, attended with hæmorrhage under the periosteum of the upper end of the shaft of the femur, and pain on movement, was at first mistaken for acute hip disease.

If the disease be allowed to progress unchecked, various complications are soon developed.

(*a*) *Deformity.*—This arises chiefly from muscular action, the result of reflex irritation. The limb at first becomes gradually more flexed and abducted—forms of distortion showing themselves as the patient lies in bed, as lordosis; and obliquity of the pelvis, with apparent lengthening of the limb (page 392). Later, there is flexion combined with adduction, as the result of which the pelvis on the diseased side is more and more drawn up, so that there is an increase of apparent shortening. By degrees, also, as the bones are absorbed, the trochanter travels upwards and backwards on the ilium, and considerable real shortening is produced.

(*b*) *Abscess.*—When hip disease is seen early (in the first three or four months), and is adequately treated, suppuration does not occur in more than, at the most, fifteen per cent. of the total number of cases. At this stage treatment leads to the subsidence of inflammation and the absorption of exudation; and the bacillus, thus deprived of a favourable pabulum, is placed at a fatal disadvantage. The tuberculous process gradually ceases, its products are disintegrated and removed, and the tissues undergo sound repair. But if the disease is left to advance, caseation and suppuration will probably follow. Yet even in advanced disease suppuration does not always take place. Every surgeon has met with cases of long-standing hip disease in which, although extensive bone absorption has occurred—indicated by displacement of the trochanter—much bony thickening has taken place about the upper end of the femur, and the movements of the joint are lost, yet no abscess has formed.

In such cases the tuberculous process, though persistent, is of low intensity, so that the resulting inflammation, instead of being active and destructive, is attended with the organisation of new material, leading to sclerosis of bone; and to a cicatricial condition of the soft parts, very similar to that which is present in fibroid phthisis.

In a small proportion of cases the tuberculous process is active from its beginning, and suppuration occurs notwithstanding careful treatment. If in these instances of early suppuration, septic elements gain an entrance, either when the abscess is opened or at any later period, death by exhaustion will very probably ensue, perhaps after suppuration has continued for several months. Many abscesses are developed insidiously, but others are preceded by long periods of high temperature, night screaming, and pain on movement. Many form within the joint, and travel outwards, either through the cotyloid notch, to present in Scarpa's triangle; or through the thin part of the capsule at

the back of the neck of the femur, to lie beneath the glutei: or they pass into the bursa under the tendon of the psoas, so as to be situated in front of the joint, close beneath Poupart's ligament. Others are from the first outside the capsule, and arise from suppuration about the inflammatory products with which the soft parts have become infiltrated. These may be present at any aspect of the joint, and often track their way for some distance beneath the tensor fasciæ femoris muscle, or towards the apex of Scarpa's triangle. When the acetabulum is affected, matter may form within the joint, and after producing absorption of the bone, may cause a collection on the inner aspect of the pelvis beneath the obturator fascia, or it may form here when, although involved, the acetabulum is not yet perforated.

Such abscesses, even when small, may sometimes be detected by a finger passed into the rectum, a method of examination which often affords useful information. As they increase, these collections within the pelvis, rising in the direction of Poupart's ligament, can at length be felt when the fingers are pressed downwards above the ligament towards the deeper part of the pelvic cavity.

Several cases have come under observation, in which intra-pelvic abscesses have formed a connection with the rectum and bladder, so that fæces and urine made their way through the hip joint and were discharged by sinuses opening on the surface. In a case recently met with suppuration within the pelvis was followed by extensive necrosis of the sacrum.

The detection of an abscess is usually easy. When two or three fingers are placed flat on the surface, and are made to pass over the different aspects of the joint, a circumscribed swelling is found, in which fluctuation can be discovered. When matter is but small in quantity, and is deeply placed, it may be difficult to find it: there may be no fluctuation, and, as the abscess is chronic, neither œdema

of the surface, nor the "tender spot" (often such important symptoms in deep-seated acute abscess) is present. In such a case the discovery of deep-placed resistance, of fulness, or of elasticity, will raise a suspicion of the presence of matter: and the abscess, as it increases, will soon distinctly declare itself by the development of fluctuation.

(*c*) *Lardaceous disease.*—Formerly, when cases were often left without efficient treatment, when sepsis occurred and when profuse suppuration was a common result, many patients became affected with lardaceous disease of the internal organs, disclosed by enlargement of the liver, or of the spleen, or of both these organs, or by the presence of albumin in the urine. These patients usually developed anasarca and died of exhaustion, often accelerated, when the intestinal mucous membrane became lardaceous, by obstinate diarrhœa.

This complication must be suspected when discharge is copious and continues for several months, and when the patient is losing colour and flesh. Its occurrence, however, is uncertain; in many cases that I watched in former years to a fatal termination by suppuration and exhaustion, no lardaceous degeneration occurred. While in other instances, though suppuration had been in progress for only three or four months, and was not very profuse, lardaceous disease was developed, and led to the patient's death. The urine should therefore be often tested for albumin, and the liver and spleen examined for enlargement, in every instance where suppuration is persistent and at all free. In the advanced stage of lardaceous disease the patient becomes feeble and wasted, the skin assumes a waxy pallor; there is general anasarca, first apparent in the eyelids and scrotum; often there is diarrhœa, which it may be difficult or impossible to arrest; and sometimes obstinate sickness. The specific gravity of the urine is at first not below normal, but as the affection advances, and the

excretion of urea is more and more interfered with, the specific gravity falls to 1012, or even to a lower point.

The subject of intercurrent *tuberculous meningitis* is dealt with on page 114.

The treatment of the early stages of hip disease must provide for absolute rest, and for the removal of any abnormal position of the limb. These conditions may be secured either by a Thomas's splint (Fig. 61), or by weight-extension.

Thomas's splint.—In the case of young children, and when the position of the limb is but little changed, Thomas's splint is both convenient and efficient. If carefully fitted, and kept in place by a lightly applied bandage for the limb and a wide chest-band, it provides rest and affords a ready means by which the patient can be lifted without disturbance of the joint. When the disease is acute, or the patient restless, a double Thomas's splint may be advisable, for a time at least. If the limb is flexed, Thomas's splint may be used to bring it down, in the following way:—The splint is bent to fully the same degree as the limb, so that when it is applied, the limb rests in it without constraint; then it and the limb are well supported with pillows. Under the influence of rest, muscular spasm gradually passes off; and, as the limb yields, the splint is straightened to a corresponding degree. The rate at which the splint may be straightened is ascertained by removing it about every ten days, and noting the extent to which the limb can be brought down without producing lordosis. No attempt must be made to straighten the limb actively by bringing it down to the splint, which is bent up to a less extent than the limb itself. To do so would be to employ leverage, and so produce pressure of the head of the femur against the floor of the acetabulum (page 269). An advantage that may fairly be claimed for Thomas's splint is that (when once the position of the limb has

been rectified), it is more easily managed by parents and relatives than weight-extension is. It remains to add, that during treatment with a Thomas's splint the patient must be placed on a soft mattress, which by yielding to the splint will prevent injurious pressure.

Weight-extension.—In patients over ten, and also in children under this age, if deformity is marked, I prefer weight-extension; for the weight, as an active force constantly at work, exercises a much more definite influence in removing muscular spasm; and it has always seemed to me much more effective and satisfactory for the removal of any considerable degree of deformity. During the use of weight-extension, the patient must be placed on a firm mattress, with a board beneath it to maintain its level surface. The head-pillow should be somewhat wedge-shaped, and large enough only to support the head in a comfortable position. If it is of the usual size, the patient will mount his shoulders upon it, so that his trunk is no longer horizontal. In the case of children the mattress should be protected by a piece of waterproof and a draw-sheet. It is absolutely necessary that, for a time, the patient should be confined to the horizontal position. To ensure this a good plan is to apply an ordinary long splint, such as is used in the treatment of fracture of the femur, and reaching as high as the axilla, to the *opposite* or *sound* limb. A chest band should also be used. This (Fig. 59) consists of a piece of webbing, passing across the front of the chest immediately below the clavicles, and ending in two loops, through which the two arms are passed, and through which also is threaded another piece of stout webbing, which runs transversely across the surface of the bed under the child's shoulders, and is fastened at its two ends to the sides of the bedstead. When this is in action the patient's shoulders are kept flat on the bed, so that he can neither sit up nor turn on his side. This chest band

does not cause the slightest discomfort. It is not, of course, fixed tightly, and when the child finds that he cannot sit up, he makes no further attempt to do so; and as he lies flat, the band is loose.

The weight is applied by means of a "stirrup," made of stout strapping, of which Leslie's is the best kind I have seen. The stirrup is thus prepared:—A piece of strapping is cut, from two to three inches wide, and long enough to

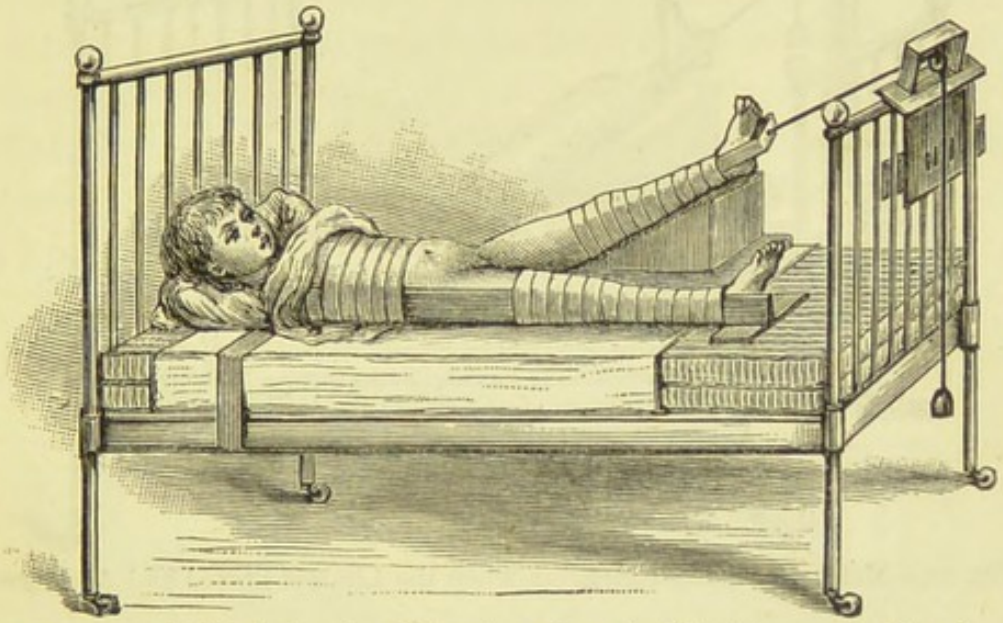

Fig. 58.—Method of using Extension when the Limb is merely Flexed on the Trunk.

extend as an elongated loop from two or three inches below the foot to the middle of the thigh. This is doubled upon itself at its middle, and a piece of wood, shaped like a visiting card, is placed in the concavity of the loop, and fixed by a transverse fold of strapping, and a drawing pin at each corner. The loop below the foot is thus "set out," so that the sides of the stirrup stand off from, and do not rub the malleoli. Through the centre of this piece of wood a strong cord is run over a pulley. The stirrup is fixed by pieces of strapping surrounding the limb, and a bandage. The stirrup should reach well above the knee, so that the ligaments of the knee joint are not subjected to injurious

traction. I have seen several instances in which, when this precaution has been neglected, the knee has become so "loose" that the leg admitted of considerable hyper-extension on the thigh. The strapping should only be

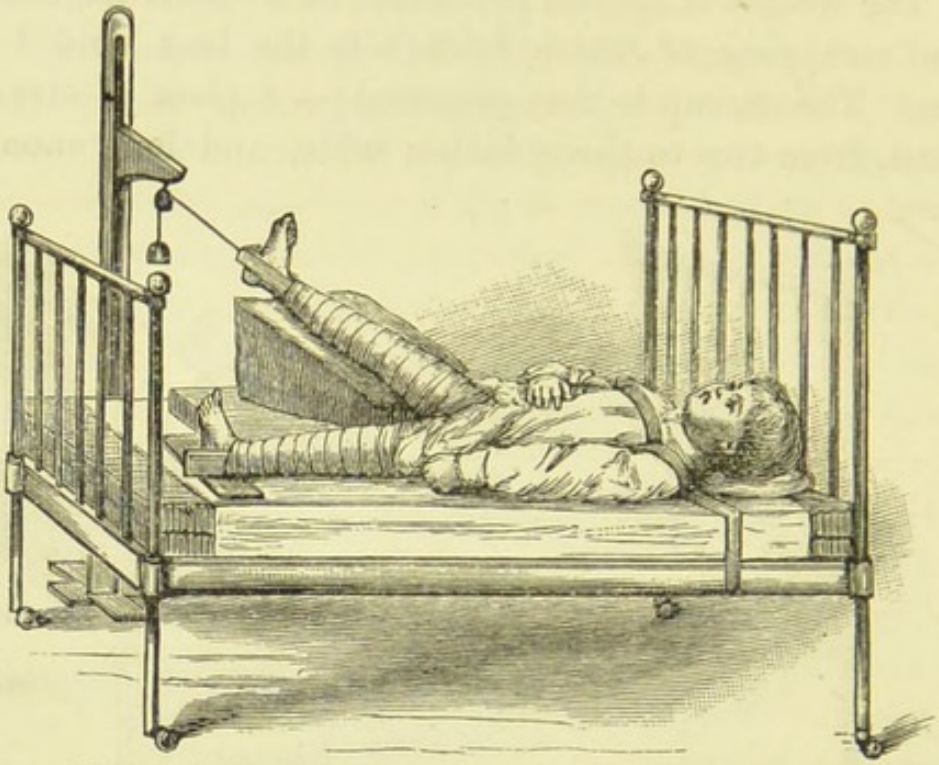

Fig. 59.—Method of using Extension when the Limb is Flexed and Abducted.

slightly warmed before it is applied, and the weight ought not to be put on for eight or ten hours, otherwise the stirrup, drawn upon before it has become firmly adherent to the skin, will slide down, and soon require renewal. A well-applied stirrup will last at least three months.

The next step is to substitute the real for the compensatory position of the limb. If there is lordosis, this means that the limb is flexed on the trunk. To remove it, therefore, the limb must be raised till the lumbar spine is in contact with the mattress (Fig. 58). If the anterior iliac spine on the affected side is lower than the opposite spine, so that there is apparent lengthening, this means that the limb is abducted. The limb must, therefore, be moved outwards till

the spines are again level (Fig. 59). If the iliac spine of the affected side is higher than the other, this means that the limb is adducted, and it must therefore be moved inwards across its fellow till the horizontal level of the pelvis has been restored (Fig. 60). Secondly, in whatever position the limb has now been brought to, it must be landed up on pillows, or some other support, on which it may lie at rest. In cases in which deformity is slight, the limb will be only a little raised, and either slightly abducted or adducted; but when deformity is great the limb must be landed up to a proportionate extent.

Thirdly, the pulley must be adjusted in a line with the long axis of the limb, so that extension is made exactly in this line. When this is the case the effect of the weight is,

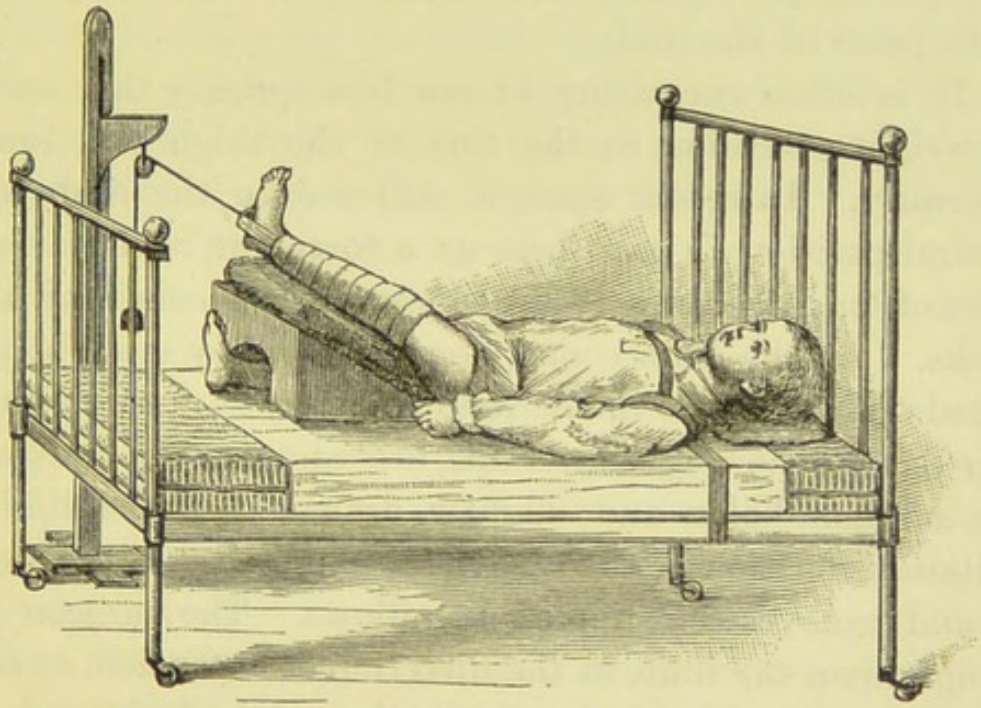

Fig. 60.—Method of using Extension when the Limb is Flexed and Adducted.

by tending to draw the head of the femur out of the acetabulum, to relieve interosseous pressure; while if the line of traction does not correspond with the long axis of the thigh, the femur is converted into a lever of the second order, and the acetabulum becomes its fulcrum, with the

effect of increasing, instead of relieving, interosseous pressure. (*See* page 269.) When the limb has been placed at rest under the influence of the weight, other points to be observed are the use of a cradle, to protect the foot from the weight of the bed-clothes; and in cold weather light wraps to keep the foot warm. The amount of weight to be applied varies with the age of the patient. In children under ten it should be from three to five pounds; more is very seldom either required or advisable. It is not to its amount, but to its continuous action, that the weight owes its efficiency in these cases. In young adults six or eight pounds may be required. A caution must be offered against the use of very heavy weights. They are certainly not in the least necessary, and they tend to do harm by the strain they put on the ligamentous structures of the knee, and on other parts of the limb.

It is often surprising to see how quickly this method of weight-extension in the line of the thigh will remove deformity. In recent cases it will reduce the limb to its natural position in ten days or a fortnight, while even in cases of long standing it will do so in the course of a few weeks. As the limb comes down the pulley must be readjusted. This is done in the following way:—Every three or four days, or at longer intervals, according to the case, while the surgeon holds and slightly draws upon the limb, to imitate the action of the weight, the nurse takes the weight off and removes the supporting pillows. The surgeon then brings down the limb, in the direction of extension, as far as it will come without the production of lordosis, and then moves it in when there is abduction, or out when there is adduction, towards the natural position, as far as it will go without tilting the pelvis. When the improvement has thus been ascertained the supporting pillows are readjusted to maintain the limb in the improved posture, and the situation of the pulley is changed so that extension is still made in

the long axis of the limb. Similar alterations in the direction of the limb and in the line of traction are made from time to time as they can be effected, until at last the limb has regained its natural position of full extension, and lies flat on the mattress, and parallel with its fellow.

In many cases, however, the form of weight-extension just described, although it removes flexion, has no marked effect on either abduction or adduction, so that when the limb has come down into the horizontal position, abduction, showing itself in apparent lengthening, or adduction, showing itself as apparent shortening, will still remain.

Abduction may be disregarded, for it will, if the joint retains any movement, gradually disappear as repair goes on ; while should anchylosis occur, the presence of abduction will be an advantage rather than otherwise, because the apparent lengthening to which it gives rise will, in its degree, compensate for the real shortening which the disease is so likely to produce. I have met with several cases in which the limb, from having become fixed in a posture of abduction, had the appearance of being the same length as its fellow, though measurement proved it to be in reality an inch and a half shorter.

Adduction is a much more serious element of deformity than abduction, for although the shortening which it produces is only apparent, yet, in its effect on the patient's power of walking, apparent shortening is practically the same as real shortening; that is to say, if there are two inches of apparent shortening the foot will be two inches off the ground, just as it would be if the shortening were real. A persevering attempt should therefore always be made to correct any adduction that is present—the more so, because, if allowed to remain, it usually shows a strong tendency to increase. The following plan may be adopted for its removal:—While the weight is still applied to the affected side, counter-extension

is applied to the sound side by means of a cord running from the lower end of the long splint (on this side), upwards to the head of the bed, where it turns over a pulley and supports a weight of five or six pounds or more, according to the patient's age. Thus, while one weight is acting so as to draw the pelvis downwards on the affected side, the other weight is acting so as to draw the pelvis on the sound side upwards. This method is often successful. In cases of old disease, in which there has been extensive absorption of the femur and of the acetabulum, so that the bones have become moulded to each other in a deformed position of the limb, little, of course, can be done; but in all cases in which adduction, though very marked, is not accompanied by any considerable change in the shape of the bones, it may generally be entirely removed by this plan in the course of a few weeks.

When the limb has been brought down into a position of extension, it may be found to be everted. Eversion may be merely an element in the position of greatest ease (page 390), and not dependent on any structural change. It may, however, be due to absorption of the head and part of the neck of the femur. Although it leads to no serious inconvenience, yet, like all other defects of position, it should be as far as possible corrected. This may be done in the following manner:—An outside splint, long enough to reach from the sole to a little above the knee, is furnished with a foot-piece and with a cross-piece at its lower end, about ten inches long. This splint is applied to the foot and leg, and is at first tilted so that it adapts itself to the outward rotation of the limb, and is supported in this position by two sand-bags, one of which is placed under the inner end of the cross-piece and the other upon the outer end. It is then gradually rotated by altering the inclination of the cross-piece by means of the sand-bags, until at last it corresponds to a slightly inverted, instead of an everted, position of the

limb, a change of posture which it imparts to the leg and foot, which are fixed to it.

Weight-extension generally quickly relieves any pain that is present. Often a child who has long been in acute pain, and in whom night screams have been urgent, will sleep soundly throughout the whole night as soon as the weight is in action. Before relief is obtained, the exact weight that is suitable must be experimentally ascertained. Sometimes, though rarely, for a child of 5, instead of the usual four or five, six or seven pounds may, at first, be necessary. If pain continues, careful search for an abscess should be made; and should pus be found, its evacuation, which should not be delayed, will probably give immediate relief. If no suppuration is detected, the benzoline cautery should be lightly applied, while the patient is under the influence of gas, to the front of the joint. This will sometimes procure immediate and absolute relief. Should pain still persist, the child should be anæsthetised, if this seems necessary, and a Thomas's splint should be applied in addition to weight-extension. In very few cases will pain continue where these several measures have been adopted, and where nursing is skilful.

When the disease is of long standing, deformity can be removed only slowly, and six weeks or two months will often be required. In some cases weight-extension, however long continued, will fail to rectify the position of the limb. In former years it was the custom to correct deformity by forcible movement when the patient was under chloroform. This proceeding often led to serious mischief. I have known it in different cases attended with fracture of the femur; rupture of the ilio-psoas, in one instance followed by abscess, pyæmia, and death; displacement of the upper end of the femur on the dorsum ilii; extensive suppuration around the joint; renewal of disease in an acute form. In almost all instances forcible straightening produces severe and

long-continued suffering. Such a violent operation calls for unqualified condemnation, and, indeed, there are very few surgeons who now practise it. But in the obstinate cases just alluded to, the following modification of this method, while it is free from objection, is very efficacious:—

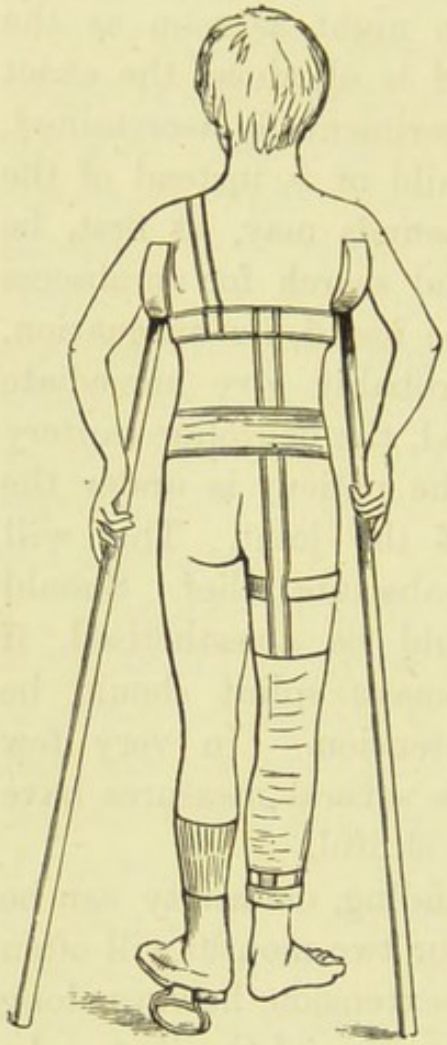

Fig. 61.—Thomas's Splint for Hip Disease (Back View).

When the child is under an anæsthetic, so that the muscles are relaxed, the limb is brought down through two or three degrees (so that the process of extension is started, but nothing more) by manipulation; only very slight force must be used. The weight is now to be re-applied. After this it will often be found that the limb will gradually come down. I have frequently found this method succeed, and when too much force is not used no harm results, and no pain is produced. In this way the various forms of screw apparatus formerly in use for straightening the hip joint may be dispensed with. This is a great advantage. They were very expensive, and, moreover, they all acted by leverage, and therefore induced interosseous pressure, with its attendant evil results (pages 236 *et seqq.*).

Bryant's splint resembles the apparatus figured in Hamilton's work on fractures, for the treatment of broken thigh in young children, and consists of two long wooden splints, one for each limb, which are fastened together by a

cross-bar at their lower end, and by an iron rod arched over the chest and connecting their upper ends. So far as I have observed, the objects aimed at by this appliance are generally more satisfactorily attained by the use of a double Thomas's splint.

The old shield-splint, consisting of leather, guttapercha, or plaster of Paris, moulded over the joint, is inefficient, for it neither fixes the joint, secures rest for the limb, nor prevents deformity. It is, in all its forms, and for all purposes, entirely superseded by Thomas's splint. The American surgeons have introduced splints intended to secure extension while the child is still allowed to move about actively. These are models of inventive ingenuity, and the object which they are designed to fulfil (that is, of conducting treatment without confining the patient to the horizontal position) is highly desirable. These splints, however, in the opinion of the great majority of English surgeons, act, as does a Thomas's splint, mainly by securing rest, while the latter appliance is less costly, and is more readily managed in cases in which technical knowledge cannot always be at hand.

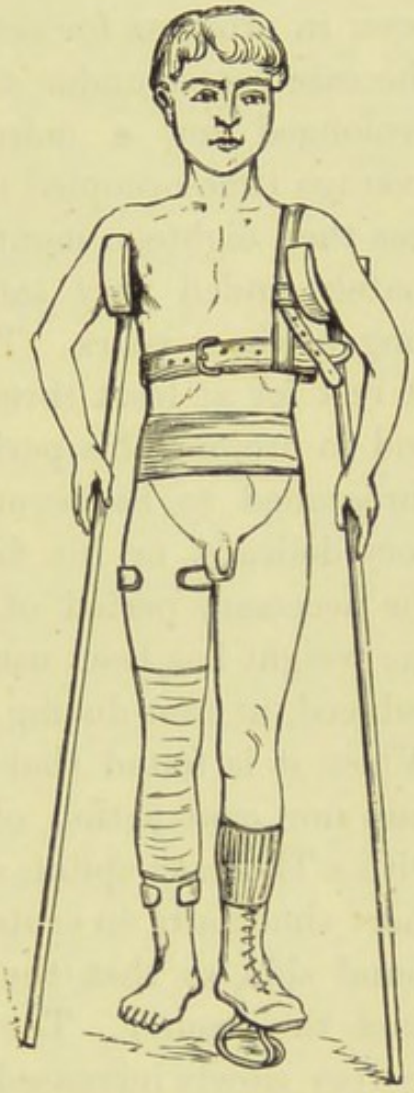

Fig. 62.—Thomas's Splint for Hip Disease (Front View).

During the treatment by rest, muscular wasting may be largely checked by the use of the continuous electric current applied daily ; six or eight cells should be employed.

As to the period during which treatment must be

continued, no precise rule can be laid down. Each case must be separately considered. It must, however, be remembered that, when once fairly established, the disease is very seldom cured in less than from nine months to a year; while as, in the majority of instances, the affection has been in progress for several months, or even longer, before the case comes under notice, the treatment must often be prolonged for a more extended period. Probably the average time occupied in the repair of this disease is not less than eighteen months, while many examples that ultimately ended very satisfactorily have been treated for as long as three years. The best course is to keep the patient at rest for at least three months after all pain has ceased, and to prolong this period in cases in which the disease has threatened to be severe, or in which the child's health is very delicate, or his family history unfavourable. When the necessary period of rest is thought to have elapsed, if the weight has been used, its amount may be very gradually reduced, at first during the day only, and then also at night. When it is found that this change is followed by neither pain nor contraction of the limb, the child may be fitted with a Thomas's splint, and he may be allowed to be up for a short time daily on crutches, and wearing a high boot on the sound side, so that the foot of the affected side does not reach the ground. The amount of exercise and liberty must be very slowly increased, and great care must be taken that the child does not fall. The weight had better still be worn for several months at night, and the chest band (Fig. 59) should be continued to ensure that the patient sleeps on his back. The case must be carefully watched, and if there is pain, night screaming, swelling about the joint, increased stiffness, or flinching of the patient on movement, no matter in how slight a degree any of these symptoms may be observed, a further period of rest must be insisted on.

Abscess.—Suppuration must always be regarded as an event of some gravity in the course of hip disease. No doubt there are many cases in which, although no suppuration has occurred, the patients are left in a crippled condition; while, on the other hand, although matter has formed, a very satisfactory result can often be obtained. The development of an abscess, however, is enough in itself to show that the disease has entered upon an advanced stage; and it is a condition which, unless appropriate treatment is applied, is apt to involve important consequences. A comparison of a series of suppurating, with an equal number of non-suppurating cases at once demonstrates the more serious character of the former group.

The period of the disease at which suppuration takes place has a considerable influence on the degree of danger which it implies. The most threatening cases are those in which the disease is acute from the first, and in which suppuration, accompanied by a persistent rise of temperature, occurs in the first few weeks. Such instances are more likely to be met with in patients, often young children, whose general health has been depressed by a recent attack of measles or one of the other exanthemata, or by some other cause. The tuberculous process not only rapidly invades the structures of the joint itself, but spreads to neighbouring parts. In such cases, when suppuration is developed, it extends over a wide area, a large quantity of pus is formed, and destructive erosion of the tissues is produced.

In other instances acute suppuration of the joint is brought about by the sudden entrance into its cavity of pus which has formed under the epiphysial plate or around a tuberculous centre in the head or neck of the femur, or in the floor of the acetabulum. In both these groups, unless pus is at once evacuated aseptically, disastrous consequences will follow.

When, as in the ordinary run of suppurating cases, an abscess gradually forms several months after the commencement of disease, if it is evacuated early, by the method described below, sound healing is obtained, and no serious results will be produced.

There is a third form of abscess which deserves particular attention, for it differs essentially from those which have been already mentioned. Its tendencies are, in fact, reparatory, and it is in many instances a necessary agent in the process of cure. When the tuberculous process has come to an end, its products, if not over-abundant, are gradually absorbed. In other cases, however, when they are in too large an amount to be thus disposed of, they undergo necrosis in mass, and constitute what is virtually a sequestrum. Acting, as would be the case with a piece of dead bone, as an irritant to the tissues, it leads to suppuration and the formation of an abscess by which it becomes surrounded. The result is that when the abscess is cleared out the "sequestrum" of effete tuberculous products is itself completely removed.

Cases are not rare in which, although all active symptoms have subsided, the joint remains month after month in an unsatisfactory state—irritable and sensitive. At length an abscess is detected and opened. After this the case progresses without further drawback, and in a few months sound repair is found to have taken place. The explanation is that a sequestrum of necrosed inflammatory products which had previously acted as an irritating agent has been got rid of. This form of abscess is a chief variety of the class which Sir James Paget has termed "residual," and of which he says :—"Most of them are formed where pus, produced long previously, has been wholly or in part retained, and has become dry or in some sort 'obsolete.' But some of them, it is probable, are formed in the thickenings,

adhesions, or other lowly-organised products of inflammations long past."

I have seen many of these "residual abscesses," in which, even when they have been of very large size, repair has been fully completed well within a month. One of the most striking was met with in a boy ten years old, who had recovered from hip disease of long standing, for eighteen months, when one day he walked with some companions much older than himself from Pimlico to Greenwich and back. Two days afterwards he was seized with great pain in the neighbourhood of his old disease, and ten days later a very large abscess had formed, and was found, when I was asked to see him, presenting both in Scarpa's triangle and also at the back of the joint. His temperature was 102°. I opened the swelling both in the front and behind, and evacuated sixteen ounces of pus. His temperature at once fell to normal, and within a month all traces of the abscess had disappeared, and both openings were soundly closed. He had no relapse.

There are thus three forms of abscess to be kept in mind: (1) Those which occur in the full tide of the inflammatory process; (2) those which are developed when the inflammatory process is subacute, or is dying out; (3) those which are produced when the tuberculous process is at an end, and when necrotic products of bygone disease have to be cast out.

Treatment of abscess.—In no part of the surgery of the joints has more sound progress been made than in the treatment of suppuration. Formerly abscesses were allowed to increase and burrow, and, after producing wide injury of surrounding structures, and undermining the skin, to burst spontaneously. The result was that sinuses, lined by tuberculous granulation-tissue, and admitting of very imperfect drainage, were formed. If, on the other hand, abscesses were emptied by either

aspiration or incision, they generally became septic, and free and prolonged suppuration, leading to disastrous consequences, followed. At the present day, when septic infection can easily be prevented, the advantage of removing collections of tuberculous pus, as soon as they are detected, is fully recognised. Indeed, the practice of opening abscesses aseptically, and while they are still of small size, has radically changed the course of tuberculous joint-disease; for prolonged suppuration, wide destruction of bone and the deformity which it produced, the development of lardaceous disease, and the loss of general health—in fact, all the grave dangers involved in these affections were, for the most part, the direct consequences of septic decomposition in abscess cavities. As soon as the aseptic removal of pus could be effected, such disastrous consequences were averted; and now diseases, instead of being often fatal, or leaving the patient seriously crippled, are reduced to the level of affections which, though still tedious, and apt to induce minor forms of lameness, yet in the great majority of cases end in perfect or very favourable recovery.

For an efficient method of dealing with tuberculous abscesses we are largely indebted to Mr. A. E. Barker. The proceeding aims, not only at the evacuation of pus, but also at the complete removal of the granulation-tissue with which the cavity is lined. When this has been effected, it often happens that abscesses, even of large size, are obliterated by the primary union of their walls.

The part having been carefully prepared by washing with soap and water, and with ether, and then covered for twelve hours with carbolic lotion—1 in 40—a free incision is made, and pus allowed to flow out. When the abscess is at all deeply placed, a director should be introduced into the cavity immediately the opening has been made, so that the passage is not lost. The cavity is then cleared by

detaching the granulation-tissue by which it is lined by means of a flushing gouge. This instrument consists of a hollow metallic stem, ending in a blunt-edged beak, and is connected, by tubing, with a large reservoir of either iodine water—one part of the tincture in four hundred of sterilised water, — boric acid lotion, or carbolic lotion — 1 in 40. I generally employ carbolic lotion. The gouge must be used with care, for otherwise blood-vessels or other important structures may be injured. Sponges, securely mounted on long holders, may also be used for detaching the lining membrane. When this has all been removed, and the lotion returns clear, and free from shreds, the cavity should be sponged out so as to be left dry. Some surgeons then introduce an emulsion of iodoform and glycerine ; others are content to bring the walls of the abscess together by carefully applied pressure, so as to check exudation. This has seemed to me the best course. Some close the incision by a continuous suture. But it is safer, when the abscess is large, or deeply placed, to insert a drainage tube, which is removed two or three days later, or when serum no longer drains away. The dressing consists of iodoform gauze next the skin, and of an ample amount of either perchloride, or cyanide, of mercury gauze well covered-in with a bandage. Many abscesses treated in this manner will be found to be healed when the dressings are removed at the end of a week. Others close more slowly ; but if asepsis is maintained there will be no rise of temperature, and no further suppuration will take place.

In acute disease, if suppuration occurs, the evacuation of pus, and the consequent relief of tension, is followed by the best results. The temperature falls, pain is relieved, and progress towards recovery is generally satisfactory.

There is no doubt that, under continuous rest, abscesses holding as much as six or eight ounces may be absorbed. Such an occurrence, however, is far too rare to be taken

into account in the management of any particular case. An abscess had better be opened as soon as it is found. Sir James Paget has recorded instances in which abscess cavities that had been emptied by absorption of their contents, have, either from some disturbance of the general health, over-exertion, or other cause, suddenly refilled, and I have seen several similar instances. Healing is more sound and complete when pus has been evacuated.

Results of hip disease.—Twenty years ago the mortality of hip disease in childhood was probably at least thirty per cent.,* while no small proportion of those who survived became cripples. This high rate of mortality was due either to the exhaustion attending prolonged suppuration (often at length producing lardaceous degeneration of the viscera), or to the intercurrence of phthisis, or acute general tuberculosis, in which case the immediate cause of death was often acute meningitis. Since that period the affection has been closely studied by many authorities in England, on the Continent, and in America, and the principles which govern its successful treatment have been ascertained. It has been proved that everything depends on the early recognition of the disease, and the use of long-continued and absolute rest of the joint. The introduction, into England from America, of the strapping stirrup for extension, and the invention of Thomas's splint, have furnished adequate methods for securing systematic rest. It has been found that the mere maintenance of the horizontal position, even for one or two years, in good air, has no prejudicial effect on the general health, and that it is only when confinement is combined with pain and suppuration that the health suffers. The old fancy that children kept on their backs would have bed sores is exploded; and it is now known that no child who is properly nursed ever

* Tables in the Report on Hip Disease, Clin. Soc. Trans., vol. xiv. p. 226.

has bed sores except when he is suffering from extreme exhaustion. The severe suffering which was formerly regarded as inseparable from the disease is so readily prevented by the agency of weight-extension, or other well-known means, that, in the great majority of cases, the patient, from first to last, is never in serious pain, while generally he feels nothing of his disease. Matter, as soon as it is detected, can be evacuated without either pain or constitutional disturbance, so that the mischief which in former years resulted from the accumulation and burrowing of pus, the pain, the prolonged fever, the profuse and persistent discharge, the formation of sinuses, and the development of lardaceous degeneration, or some fatal kind of tuberculous disease, can be averted. In these circumstances the mortality of hip disease adequately treated has fallen from about thirty to something under five per cent.

As to the condition of the limb. (*a*) In cases that are detected early and adequately treated perfect recovery, with complete restoration of movement, may often be obtained. In many others the only appreciable defect is a slight limp, due either to loss of free movement, to atrophy of the muscles, or to arrested growth of the limb. Even in instances in which disease has produced faulty position and suppuration, the treatment by rest, continued for a year or for a still longer period—combined with extension to correct distortion, and with the early evacuation of pus—will often lead to recovery without deformity, with almost perfect movement in the joint, and with very slight lameness. The old view was erroneous that, if suppuration once occurred, the only method of repair was by bony anchylosis. I have seen many cases in which, though suppuration has persisted for many months, considerable movement has been retained. (*b*) In some instances, though recovery takes place, growth proves to have been to some degree arrested, so that, as the patient

increases in height, the affected limb becomes more and more short in proportion to its fellow. I have met with one case in which this defect in length amounted, when the patient's growth was completed, to as much as four inches, so that even with a high boot lameness was very considerable. Such a result, however, is rare. (*c*) Parents among the poor often find it impossible to secure proper treatment for their children, and the average period during which disease has been in progress in patients admitted into children's hospitals is about twelve months. In the course of this time the affection has often advanced to extensive bone absorption and consequent deformity, to suppuration and the burrowing of pus, and to the serious injury of the general health. Even then, however, rest and extension, and the aseptic evacuation of matter, will, in the majority of instances, lead to recovery; although this may not be effected in less than from twelve months to two years. Ultimately deformity will be removed, though, of course, the limb will be short, suppuration will cease, and the general health will be restored. In many cases considerable movement will remain; while in others either firm fibrous, or, much more rarely, bony anchylosis will occur. The latter is the more favourable result, for when it has taken place no return of deformity can occur, whereas when anchylosis is only fibrous, not only may deformity recur, but the cicatricial tissue, subjected to constant strain, is apt to become involved in renewed inflammation. In some cases the patients walk with scarcely a limp, even when the union is bony. In others, however, owing to the presence of muscular atrophy and arrested growth, lameness is great. (*d*) The question of dislocation is important. Cases are occasionally met with, but they are extremely rare, in which the head of the femur, before it has undergone any diminution of size, and while it is still covered with cartilage, becomes dislocated

from a normal acetabulum, upwards and backwards on the dorsum ilii. I have notes of a case in which dislocation occurred when hip disease was only of about two months' duration. The dislocation had the characters of an ordinary dorsal displacement from injury. Reduction was effected under chloroform by manipulation. Displacement returned, but, after reduction had been again effected, and weight-extension applied, the dislocation did not recur. This was probably an instance of acute synovitis attended with large serous effusion into the joint, and relaxation of the capsule. Generally true dislocation does not take place; but, as the result of absorption of the head of the femur, and enlargement upwards and backwards of the acetabulum, the upper end of the bone becomes gradually drawn up by muscular action, so that the trochanter is placed considerably above Nélaton's line. In rare cases, after destruction of the head, the stump-like end of the femur may slip out of the acetabular cavity —rendered shallow by absorption—and pass upwards upon the dorsum ilii, with the result that the limb suddenly becomes shortened to the extent of an inch and a half or two inches. I have seen this take place even when Thomas's splint was being worn. Such an accident would be prevented by combining weight-extension with the splint. Should it occur, the limb should be carefully extended, under chloroform, and a weight should be subsequently worn. In some instances, after absorption of the head of the femur, the upper end of the bone is found, after recovery, to slide freely on the dorsum ilii through a range of an inch and a half. This condition gives rise to great lameness.

Excision of the hip joint is discussed at pages 320 and 325.

Amputation for hip disease. — The statistics of amputation at the hip for tuberculous disease of

the joint, like those of all capital operations, show that by present methods the percentage of recoveries has been largely increased within the last few years. The circumstances in which it is performed, however, differ so widely in different cases that it is impossible to make an exact statement of the mortality which it involves. The results obtained depend very largely on the bias of the operator in favour of, or against, the proceeding. In the view of many surgeons, this amputation involves so grave a mutilation that they shrink from employing it, except as an absolutely last resource, and when the chances of recovery are no longer very hopeful. Others regard it as a means by which, if it is not too long withheld, many cases that are otherwise hopeless can be saved. They therefore adopt it at an earlier period, with, of course, a much better prospect of success. There is a danger in both these positions, if they are carried to any extreme. There are cases, otherwise hopeless, in which a timely resort to amputation will secure for the patient a life of health and comfort. To withhold the operation in such instances is to leave the sufferer to his fate. On the other hand, to be over-ready to amputate is to run the chance of removing a limb which, if better judgment had been exercised, might have become sound and useful.

From what I have observed I am inclined to think the danger is greater in the direction of amputating prematurely. I have seen at least three cases in which, after the most careful estimate had been formed, parents were advised to sanction the operation, but refused their consent, and in which the children ultimately recovered with a useful limb. And I have elsewhere recorded the instance of a boy who seemed to be slowly dying of hip disease and profuse suppuration, and in whose case the only ground on which amputation was withheld was that he had not strength to bear it; yet he shortly

afterwards began to improve, and at length completely recovered. I have also seen cases in which children whose condition was believed to be hopeless, and who were therefore transferred to an incurable home, have gradually improved, and have been brought two or three years later into good general health, and with their wounds all soundly healed. Nor is it, I hope, presumptuous to say that the high point to which operative surgery has been developed may in itself, unless much deliberation is employed, be a misleading influence. The fact that the operation is now less dangerous than formerly is no reason for resorting to it unless its absolute necessity has, on careful consideration and after consultation with others, been established.

There are numerous methods by which the operation may be carried out. The two essential points, however, are to restrict hæmorrhage within the narrowest possible limits, and to complete the operation as quickly as shall be consistent with its careful performance. There is an excellent chapter on the subject in Mr. Treves's well-known work upon Operative Surgery, in which the relative advantages of different operations are fully and ably discussed. Of these methods, two only need be considered here; for they appear clearly superior to the rest:—(1) Amputation by the anterior racket incision, and (2) the method of Esmarch. (1) By anterior racket incision. The following description includes the main points of the operation, but those who are not already perfectly familiar with the proceeding will do well, before undertaking it on a patient, to perform it on the dead subject, and to study the details as Mr. Treves has stated them. The vessels are secured as soon as they are exposed, so that no tourniquet is employed; but in children the circulation can be much controlled by digital compression of the aorta. The first incision, which extends only through the

skin and subcutaneous tissue, begins at the middle of Poupart's ligament, and passes down in the long axis of the limb for three or four inches. It next runs in a curved direction inwards, and is then carried across the back of the limb to the outer side, and is completed by being prolonged in a curved direction upwards until it meets the point at which it commenced. The common femoral artery and vein are now each defined, tied in two places, and divided between the ligatures. As the muscles on the outer aspect of the limb are divided and allowed to retract, the external circumflex artery is exposed. It is tied in two places and divided. Farther back the gluteus maximus is cut at its insertion. The limb is now rotated outwards, and the ilio-psoas is divided, and the internal circumflex comes into view. This is double-ligatured and cut. The adductors are next severed, and then the muscles attached to the great trochanter. The limb is abducted, the capsule opened, and disarticulation is completed. Finally the muscles at the posterior aspect of the limb are divided by a sweep of the knife on a level with the incision in the skin. As the operation proceeds any vessels that bleed are immediately secured with pressure forceps, of which an abundant supply should be at hand.

(2) Esmarch's method is identical with that described by Veitch, Lacauchie, Volkmann, and others (Treves). All the soft parts down to the bone are divided by a single sweep of the knife around the limb, about five inches below the tip of the trochanter; the femur is next sawn across, and the vessels are ligatured.

"The bone is now seized in a lion forceps, and steadied, while a second incision is made, commencing two inches above the tip of the trochanter and carried down along the latter, so as to terminate in the first circular cut. The two borders of this incision being held apart by an assistant, the bone is cleared of the soft parts by the use of an

elevator inserted under the periosteum, and by the knife when the muscles are too firm to be otherwise detached. When the capsule is reached it is divided, and the head is dislocated in the usual way" (Barker).

The chief danger in amputation at the hip joint is hæmorrhage from the branches of the internal iliac artery distributed to the back of the limb. To obviate this several means have been proposed:—(1) Instrumental compression of the abdominal aorta. To this serious objections are that it interferes with respiration and may bruise the intestine. (2) In a thin subject, and in children, the aorta may be controlled by digital compression on the part of a steady assistant. (3) Mr. Jordan Lloyd has recommended "an elastic tourniquet encircling the innominate bone and checking the whole blood supply to the lower limb.' Full details of this method are given in the *Lancet*.* The drawback to this would appear to be that during the temporary paralysis of the vessels, resulting from compression of their vaso-motor nerves, very free oozing might occur which in the aggregate would amount to a serious loss of blood. (4) There is Mr. Davy's "lever." This consists of a cylinder about the size of the ring finger, and about eighteen inches in length, with an indiarubber sheath drawn over it to protect the tissues with which it comes into contact. It is introduced with great gentleness into the rectum, and carried up the bowel till its entering end reaches the brim of the pelvis, and lies over the common iliac artery in the interval between the lumbar vertebræ and the psoas muscle. The external end of the lever is then gently elevated—the sphincter ani acting as its fulcrum—with the result that the artery is compressed. Some practice is required in the use of this instrument, and great care is essential. Cases have occurred in which serious injury has been done. I have,

* Vol. i., 1883, p. 897.

however, employed it on several occasions, and have seen other surgeons use it, with the result that hæmorrhage has been easily and completely controlled. Before it is introduced, the bowel should be cleared by an enema and injected with a small quantity of oil.*

In either of the two operations which I have briefly described, if the patient is thin, the abdominal aorta may be closed by digital compression; or, as I should myself elect, Davy's lever may be used; or, again, the external iliac may be held. In the anterior racket method, however, hæmorrhage from all the branches of the common femoral is prevented by ligature of this vessel as soon as the skin incision has been made, and the branches of the internal iliac are taken up as soon as they are divided, so that little bleeding from vessels of any size is allowed to take place. In Esmarch's method the vessels, as they are cut after they have broken up into small branches, are easily dealt with. When, however, the soft parts around the joint have long been involved in inflammation, and have consequently become both vascular and brawny, a multitude of small vessels, unable to contract, pour out a quantity of blood. Such vessels can be tied only with difficulty, and with the expenditure of much valuable time. This form of hæmorrhage is best arrested by douching the surface with boracic lotion at 110° F., and by firm bandaging of the stump for six or eight hours after the operation. I have performed the operation on thirteen occasions: the first six, which occurred many years ago, were done by the old transfixion method. In the other seven, Esmarch's method was employed; and in the majority of these Davy's lever was used. In three, excision had already been performed. Of the total number five sank within a few hours, and two, though surviving the operation, ultimately died of lardaceous disease and exhaustion depending on extensive disease of

* *Brit. Med. Journal*, vol. ii. 1879, p. 685.

the pelvis. Of the remaining six four perfectly recovered, while in two, though the wound was still incompletely healed (in one four, and in the other six months after the operation), the general health had greatly improved, and albumin, previously copious, had disappeared from the urine.

These results, which extend over a period of upwards of twenty-five years, are, no doubt, less favourable than would be obtained in dealing with cases of a similar kind at the present time. The operation has been facilitated in many ways, and its safety has been enormously increased, by the method of wound-treatment now in use. The mortality attending the operation at the present day, in cases in which it has been advisedly performed, I should be inclined to estimate at about 25 or 30 per cent. I may add that much depends upon the degree in which the operator has familiarised himself with the particular method which he adopts.

The operation may be performed :—

1. When hip disease is complicated with extensive disease of the shaft of the femur, attended with copious and persistent suppuration, and especially if lardaceous degeneration is making its appearance.

2. When excision has been performed, but has failed to arrest suppuration, and the general health has given way. Here amputation is much simplified, and is, therefore, rendered much less dangerous by the previous excision.

3. When the patient, as the result of extensive disease of the joint, is steadily losing ground, and when it is believed that his general health would not enable him to carry out repair after excision.

4. In some instances of free suppuration associated with disease of the pelvis, amputation may be advantageous, either by securing free drainage, or by enabling the operator

to remove diseased bone that cannot otherwise be reached The presence, however, of disease of the pelvis which is either extensive or of long standing must generally be regarded as a strong reason against the operation. Indeed, this condition is the main local factor which interferes with recovery. It has certainly been the chief cause of the failures that have come under my own observation.

CHAPTER XXXII.

DISEASES OF THE KNEE.

THIS joint, like the hip, presents many important characteristics of it own which must receive consideration when the diseases to which it is liable, and their treatment, are being discussed. (*a*) The knee is the largest joint in the body, alike as regards size of the articular ends of the bones, the extent of its synovial membrane, and the area of its cavity. Any affection of this joint is necessarily, therefore, on a large scale, and the various forms of acute inflammation by which it may be attacked are liable to be attended with a proportionate amount of constitutional disturbance. Thus, in acute traumatic arthritis, should sepsis occur, a collection of pus to the extent of several ounces may rapidly form, and, unless at once evacuated, may burst the capsule, and become widely extravasated in the inter-muscular spaces of the limb—a local condition which is accompanied by grave general symptoms. (*b*) Owing to the shape of the articular ends of the two bones by which it is mainly formed, and the way in which the shallow facets of the tibia are constructed to slide and rotate upon the rounded condyles of the femur, displacement readily occurs when the joint is in the posture of semi-flexion, which it at once assumes as the position of greatest ease when it is involved in inflammation. In this attitude the tibia is in contact with the femur only over a very limited surface, and is easily drawn backwards towards the popliteal space by the hamstring muscles. (*c*) Whatever be its explanation, the fact is well known that the muscles surrounding the knee are, more than those surrounding any other joint — the hip, perhaps,

excepted—liable to be the seat of continuous and often severe reflex contraction, whenever inflammation is present. In these circumstances the joint is subject not only to the injurious results of interosseous pressure (page 265), but also to the occurrence of irremediable deformity, as the bones of the leg become displaced outwards and backwards towards the popliteal space, abducted, and rotated on their long axis outwards. (*d*) The joint is formed by the apposed ends of two long and powerful levers : it is situated in the middle of a limb which contains an elaborate system of powerful muscles, and which is connected with the trunk by means of a joint that allows of free movement in every direction. It is an articulation, therefore, which it is very difficult to place at complete rest : it is one also to which every movement of the trunk is readily conveyed. (*e*) The ends of the femur and tibia which meet at the knee are those at which growth in the length of the lower extremity is mainly effected, and any extensive interference with them, either by disease, or in surgical operations, is liable to be followed by arrested development of the limb. All these are circumstances with which the surgeon has to reckon. And they conspire to render treatment of diseases of the knee in many respects more difficult than is the case with any other joint. I shall endeavour, as I proceed, to indicate how the various difficulties that offer themselves may best be overcome.

In alluding to the characteristics of the knee, I may add that this joint is singularly liable to disease. Some of the affections which it presents are rarely seen in any other articulation ; while, if we pass in review the different diseases that involve the joints, and note their seats of election, it is the knee in almost every instance that is most prone to be attacked.

Simple synovitis of varying degrees of severity is, on account of the exposed position of this joint and its great

liability to injury by falls, blows, and sprains, of very common occurrence. The gravity of the case will vary, not only with the degree of violence that has been inflicted, but with the general health and the constitutional peculiarities of the patient. As a rule, the prognosis is quite favourable if the necessary treatment is adopted in good time. Suppuration is very rare, repair is usually complete, and free movement is regained. If, however, the patient is either gouty, rheumatic, or tuberculous, the original traumatic inflammation may pass on into one of these specific forms. It is especially necessary to remember this in the case of tuberculous patients. Instances are occasionally met with in the knee, and, indeed, in the other joints also, in which inflammation, due in the first place to a blow or wrench, gradually assumes the character of acute tuberculous disease. The danger is that this alteration in the type and tendencies of the case may escape notice. I have stated that prognosis in simple synovitis is good if only appropriate treatment is brought to bear without delay. But should the affection be allowed to progress, a tedious and destructive form will be developed and, continuing for an indefinite time, will lead to irreparable structural changes in the joint. It is the duty of the surgeon to place the state of the case clearly before the patient. A fortnight or three weeks devoted to treatment at the outset will often avert the occurrence of changes which, if they were left to advance, would end in serious injury to the joint.

Symptoms.—Synovitis is indicated by stiffness, swelling, pain, and heat. When the affection is acute the joint, assuming the position of greatest ease, is flexed at an angle of about 120°, and any attempt to move it is attended with severe pain. Swelling is considerable, and is observed to follow the outline of the synovial cavity. It obliterates the natural depressions at the sides of the patella and ligamentum patellæ, and is seen to extend upwards beneath the

quadriceps extensor, where, as the capsule is absent, the synovial membrane readily becomes prominently distended. In examining a knee for the purpose of ascertaining whether it contains fluid, the surgeon must be careful to place the patient in the horizontal position, with the limb supported, so that the quadriceps extensor and the other muscles are completely relaxed. Unless this point is attended to even a large amount of fluid may easily escape detection. Fluctuation can be obtained in all the axes of the joint, transversely as well as longitudinally and obliquely. The patella, raised by the fluid collected beneath it, rides on the summit of the swelling, and when pressed upon is felt to dip and strike the condyles of the femur. In cases in which the amount of fluid in the joint is slight, the riding of the patella and its concussion against the femur can only be detected when the hand grasps the front of the thigh just above the joint, and is made to press the fluid down and concentrate it in the lower half of the articulation.

Pain is very variable in its amount. When synovitis is of moderate severity, pain, when the joint is at rest, may be only very slight; but in acute inflammation, attended with rapid effusion, it is often extremely severe, and is described by the patient as being of a tense, bursting character. Pain, however, cannot be regarded as affording any very reliable index as to the severity of the case, for it varies widely with the sensitiveness of particular patients. In acute synovitis the surface heat over the joint is often considerably raised.

Treatment.—In acute synovitis, the only safety lies in placing the joint at once in a condition of complete rest. In these cases it is a grave error to depend merely on a pillow. The limb must be fixed and supported on a firm and accurately adjusted splint. The most convenient apparatus is either a McIntyre splint, or an ordinary back splint swung to the top bars of a cradle. Should the joint be

considerably flexed, an anæsthetic should be given, and the limb should be brought into a position a little short of full extension. This can be done, when the muscles are relaxed, without the use of the slightest force, and the step is a necessary one, for not only is it very difficult, from a mechanical point of view, to treat an inflamed knee joint satisfactorily when it is considerably flexed, but when it is in this position dislocation of the tibia backwards is extremely likely to occur. Care must, of course, be taken to avoid tight bandaging above the knee. As soon as the limb has been thus placed at rest it should be covered with an evaporating lotion, or an ice-bag should be applied to the joint. Leeches should be applied if the patient is strong, the inflammation acute, and the pain severe. Eight or ten may be used. I have seen very great advantage from their action. If tension is considerable, the joint may be aspirated. It is a well-known general fact that mere tension aggravates the inflammatory process, and that immediate relief often follows its removal. It is certainly the case in the instance before us. The proceeding, however, must be carried out with the most scrupulous care. A fine needle, sterilised by boiling, should be used, and all possible precautions against the entrance of septic material must be taken. The withdrawal of two or three drachms will often afford marked relief. In case of a violent wrench to the joint, which it is believed has been attended with large hæmorrhage into the synovial cavity, it may be advisable to withdraw the effused blood by the aspirator at once, on the ground that if it be allowed to remain it may, as it becomes organised, lead to the formation of adhesions which seriously impede movement. Here, as before, the utmost care must be used. Nor must it be forgotten that even a large amount of blood may, though the process is tedious, be completely absorbed.

When there is much muscular spasm, weight-extension

may be combined with the splint; six to ten pounds being used in adults, and three to six in children. It is very important that the extension should always be made in the long axis of the tibia. (*See* page 270.) Treated early, in the manner just described, inflammation will usually subside in the course of a few days, and swelling, pain, and heat will gradually disappear. If there is any material delay, two or three blisters should be applied, one healing before the next is put on. Then, should swelling still remain, the joint may be covered with the strong mercurial ointment spread on lint, and be strapped with emplastrum saponis. In addition, gentle compression with a Martin's elastic bandage, not too tightly adjusted, may be employed. The latter is a very useful appliance. In several instances it has produced the absorption of a considerable amount of fluid in the course of a few days. It also affords the patient a comfortable sense of security and support to the joint.

It is often difficult to determine when the joint may be used. There is a twofold probability of error upon this question: first, that rest may not be sufficiently prolonged; and, secondly, that it may be continued after all necessity for it has passed away. The former is so widely recognised that it need not now detain us. The latter calls for more definite notice. Cases are sometimes met with in which, long after all active mischief has subsided, the patient has been directed to move about on crutches, and not to bear any weight upon the limb. In these instances the joint has been kept carefully strapped. Such advice appears to partake too much of routine, or of subserviency to a vaguely applied general rule, and to indicate a want of discrimination between one case and another. It also exposes the surgeon to the vexation of finding that his patient has been set right by some irregular practitioner, who, by the rapid cure he has effected by moving the joint, has, in the eyes of the

patient and his friends, fully proved his assertion that one of the small bones was out, and that he has put it in. Such instances, ludicrous in their simplicity, but on this account all the more annoying, were much more common only a few years ago than they are now, yet they still occur with sufficient frequency to justify a special allusion to them. Reliable rules in these cases are the following :—As long as the joint is considerably swollen, or as long as swelling that does not soon subside follows movement ; as long as the joint is hot, or as long as heat that does not soon pass off is provoked by movement ; as long as there is persistent pain in the joint, and *à fortiori* as long as these symptoms are combined, rest, blistering, and pressure are still called for. On the other hand, when swelling has disappeared, when the surface is free from heat, and when there is no pain at night, or as long as the joint is at rest, movement of a tentative character should be used, and should be continued, if it is followed by neither pain, heat, nor swelling, or by only such as soon disappears when the limb is again at rest. Probably pain is the most deceptive symptom. It is often complained of, although the joint is quite fit for work. It depends partly on trivial adhesions, and in part on mere hyperæsthesia. Pain, however, may be disregarded when it occurs alone and unassociated with either heat or swelling. The patient should be advised to use the limb ; or if the joint is stiff it should be examined under an anæsthetic. It will then probably be found that it can be moved without force, although some slight adhesions are felt to give way. In such instances, if strongly assured that the joint is fit for use, and that the pain is not of serious import, the patient will very soon regain the full use of the limb (*see* case of Robert D——, at page 234) and pain will entirely disappear.

Acute suppurative arthritis.—This may ensue from a wound ; it may arise when matter, formed in the

course of tuberculous disease of the articular end of one of the bones, makes its way into the joint, or, again, in the course of some general disease, such as pyæmia, or other form of blood-poisoning. It is also met with after compound fracture extending into the joint, and sometimes from an incautiously-performed surgical operation, in the course of which the articular cavity is unintentionally opened, as, for example, when a bursa is punctured whose connection with the joint has been overlooked, or where the synovial membrane is wounded during the removal of an exostosis or of an enlarged bursa patellæ. (*See* page 174.) In accidents of this kind, if the surgeon at the time is working with due precaution against septic infection of the wound, no mischief will follow; but the necessity for the exercise of great care should never be lost sight of.

The *symptoms* of acute suppurative arthritis of the knee are usually of no doubtful interpretation. The inflammatory process is marked by its violence, and the rapidity of its development. There is excessive pain, especially on movement, or even when the bed is jarred by a heavy footstep in the room. Spasm of the surrounding muscles leads to starting of the limb. Swelling quickly increases, and soon amounts to distension; fluctuation becomes distinct; the skin assumes a suffused tint, and perhaps œdema occurs, so that the surface pits on pressure. These local signs are attended with all the evidences of severe constitutional disturbance. The temperature rises to 103° or 104°, the patient is restless and distressed, both his pulse and respiration are accelerated, he loses his appetite and power of sleep, and also rapidly loses flesh. There may be repeated rigors.

Treatment.—No time must be lost in the prosecution of the necessary treatment. The limb must be placed on a back splint and swung. If the case is seen early, the joint should be assiduously irrigated with iced

water; or ten or twelve leeches should be applied, and be followed by warm boracic fomentation.

Pain may be relieved by the hypodermic injection of morphia. Should effusion increase so that the synovial membrane is distended, the joint should at once be aspirated. If only synovial fluid (which will often be blood-stained) is drawn off, nothing more, for the present, need be done; but if the fluid is purulent, or even distinctly turbid, the joint should be freely opened by two incisions, one on each side of the patella, and well irrigated with carbolic lotion (one in forty), or with a solution of perchloride of mercury (one in two thousand). Two short drainage tubes should then be inserted, and the joint enclosed in a large antiseptic dressing. Vigorous treatment on these lines, if employed early, generally arrests the affection, and the patient will recover, sometimes with bony or close fibrous anchylosis; but sometimes, as I have seen, with perfect movement of the joint. In less favourable cases suppuration, in spite of good drainage and irrigation twice or three times in the course of twenty-four hours,* continues to be free, the temperature remains high, the patient loses flesh, and the joint, from erosion of its ligaments, tends to undergo displacement. In these circumstances the question of amputation must be raised. The necessity for this step can only be determined in a particular case by a consideration of all the symptoms that are present. It can only be said that the operation will seldom be called for if means are taken to prevent displacement, if irrigation, combined with good drainage, is perseveringly followed out, and if the patient's strength is maintained by quinine or mineral acid and cinchona and a nutritious diet and the moderate use of stimulants.

Acute arthritis of infants is met with in the knee

* For repeated irrigation either weak iodine water (one in four hundred) or boracic lotion should be used.

perhaps more often than in any other joint. The symptoms are clearly marked. In an infant under the age of two years, and frequently only a few weeks old, the joint is found to be stiff, painful, swollen, and hotter than its fellow. In the course of a day or two, or it may be even in a few hours, the articular cavity becomes considerably distended, and fluctuation, apparently close under the skin, is detected. Generally the child looks pale, ill, and distressed, constantly cries, wastes rapidly, and has a temperature of 100° to 102°. If an incision is made on either side of the patella, the joint irrigated, and drainage established, discharge will gradually diminish, the general condition of the child will improve, and, as I have several times seen, perfect recovery may take place. If, however, matter is allowed to collect, it will soon, after distending the joint, burst through the synovial membrane (probably beneath the quadriceps extensor, where the membrane is unsupported by the addition of a capsule) and will escape into the surrounding structures. All the soft parts including the ligaments, and then the ends of the bones, will be destroyed, and the joint, should the patient survive, will be left flail-like and, to a great extent, useless. More frequently, however, especially when other joints are similarly affected, and when in them, as in the knee, the requisite incisions are not made, death will result from exhaustion, or from septicæmia.

Treatment.—In the case of so small a limb, all that is required by way of mechanical support is a simple back splint, made of tin and padded. Often, indeed, it is best to leave the joint without apparatus, so little does the child move the limb. As repair goes on, care must be used that no contraction ensues. Any tendency to this must be met by placing the limb in a well-fitted back splint, and subsequently, when healing is complete, gentle passive movement may be resorted to.

Osteo-arthritis.—Osteo-arthritis involving the knee joint is somewhat more frequent in women than in men. It usually commences between the ages of forty and fifty. It is often limited to one knee, but cases are also frequent in which both joints are attacked, either at about the same time, or consecutively. The first symptoms are stiffness, especially after rest, and pain. Stiffness usually passes off with movement, but pain, though sometimes only slight, is not rarely so severe that the patient is unable to follow any active occupation. Pain may involve the whole articulation, but much more commonly it is felt chiefly at one spot, often over the inner condyle of the femur, and is accompanied by marked tenderness on pressure. Swelling varies considerably in its amount. It may be scarcely appreciable, but often the joint is puffy and somewhat enlarged. Sometimes the disease commences with the collection of several ounces of fluid in the joint, so that the outline of the capsule is clearly displayed. There may be some heat of the surface, but usually the joint is quite cool. The nature of the disease is almost always disclosed by the presence of grating or cracking, or a sensation as if there were coarse wet sand in the joint, felt when the hands are placed on the knee and the patient flexes and extends the leg upon the thigh. These phenomena may often be heard, as well as felt, during movement of the articulation. Distinct grating and cracking are due to calcification and erosion of the articular cartilage, or to the formation of rough cartilaginous nodules in the synovial fringes, which are rubbed together when the joint is moved. The sensation as if wet sand were being compressed seems to depend on the altered condition of the synovial membrane, the fringes of which become hypertrophied and studded with tufts and slender processes; and these, in different degrees of vascular congestion, convey a feeling of creaking or harsh friction as they slide upon each other somewhat

resembling that which is present in teno-synovitis. That the sensation is thus produced is, I think, rendered probable by the fact that while the creaking is sometimes distinct and plentiful, it is, in the same case, on other occasions, wholly or almost entirely absent. Indeed it may be present on one day and absent on the next, and I have known it disappear completely a day or two after the joint has been blistered.

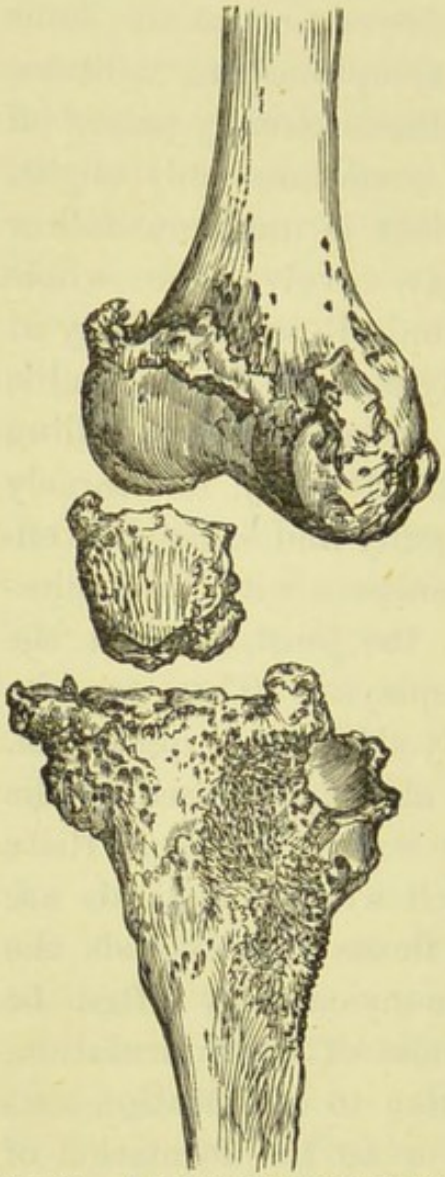

Fig. 63.—Advanced Osteo-arthritis of the Knee joint. (From specimen, No. 696, in the Museum of St. Bartholomew's Hospital.)

The general tendency of osteo-arthritis is to advance. The changes described at pages 55, *et seqq.* are developed, and gradually distortion, and a crippled condition of the articulations, are produced (Fig. 63). In many cases, however, there are periods in which, though the joint is more or less stiff after rest, and though creaking may be felt, the patient has little inconvenience, and is able to move actively about upon the limb. In the early stages the affection is, to a great extent, amenable to treatment. Gradually, however, as time goes on, the joint is apt to become more and more stiff, and weak. It also becomes enlarged, partly, in some cases, from effusion into its cavity, but generally from thickening of the synovial membrane and the formation of new bone about the articular margins (Fig. 7). Often considerable masses of fibro-cartilage that have

undergone calcification can be felt deposited in the synovial membrane. Some of these may be detached, and constitute one of the forms of loose bodies in the joint. In some cases no effusion is at any time to be detected. In others, effusion occurs to a very large amount. In the latter cases the knee becomes extremely weak, so that the patient has great difficulty in going up and down stairs, or in rising from a low seat, and at last even in walking any distance on level ground. Osteo-arthritis of the knee is often associated with disease of a similar kind in other joints, or with antecedent attacks of rheumatism or gout, but it frequently arises independently, and must then be regarded as mainly dependent on textural degeneration followed by, and complicated with, processes of a low form of inflammation. In some instances, again, it follows injury, and when this is the case it usually assumes an active form, and obstinately resists treatment. In these cases, the joint, within three or four months, becomes distorted by changes in the shape of the articular surfaces, and extensive lipping at the borders; the ligaments are partially destroyed, and the limb is painful, and very weak and crippled.

Treatment.—When the disease tends to be active and there is much pain, the joint should be kept, for the time being, at rest in the horizontal position, and should be sharply blistered. Every day's experience shows that considerable improvement, in respect both to the subsidence of stiffness and swelling, and the relief of pain, follows free blistering. Four or five blisters, an inch and a half or two inches square, should be applied in succession, one being allowed to heal before the next is put on. When the skin has healed, the joint should be well douched for ten minutes with the hottest water the patient can comfortably bear night and morning, and if pain continues, the knee should be wrapped at night in belladonna [or opium

liniment, sprinkled on lint and covered with oil-silk. If swelling remains, a Martin's elastic bandage may be applied, but it must not be drawn at all tightly round the joint. The patient should now resume the use of the limb, but should take only moderate exercise, and walk with a stick. The joint must be covered with a loose knee cap or flannel bandage to maintain a uniform temperature. In chronic osteo-arthritis similar remedies should be employed. Moderate exercise, hot douching, occasional blistering, and elastic pressure are the best local means within our reach. When pain has subsided the nutrition and strength of the muscles may be much improved by massage. The general treatment is described at pages 69 *et seq.* The management of large effusion into the joint is alluded to at page 79, and the question of endeavouring to restore movement in cases of osteo-arthritis is discussed at page 73.

Tuberculosis.—The knee joint is a frequent seat of tuberculous disease. This may originate in the synovial membrane or in the articular end of one of the component bones. In the latter case, in children, it begins either in the rapidly growing tissue of the diaphysis immediately beneath the epiphysial plate; or, although more rarely, in the substance of the epiphysis, in the neighbourhood of the ossifying nucleus. In adults, when it attacks the bones it may begin in any part of the cancellous tissue of their articular ends. It has been stated (page 385) that in a large majority of cases of tuberculous disease of the hip, the affection originates in the bones. In the knee, however, probably about half the cases begin in the synovial membrane and half in the articular ends. This fact, that approximately as many as half the cases of tuberculosis of the knee are synovial in their origin, has an important bearing on both the ultimate result, and on the time required for repair. For, undoubtedly, synovitis is a much less formidable condition than osteitis, and one from which

recovery may take place in a much shorter period. Whether in a particular case the disease has started in the synovial membrane or in one of the bones can be determined only in the incipient stage. At this period, however, a trustworthy opinion can generally be formed. In synovitis the early symptoms are swelling of the membrane, slight heat of the surface, early muscular wasting, and—except when the affection is more than usually acute—absence of pain even on movement, or when weight is thrown upon the limb. When the disease begins in the end of one of the bones, the first symptoms are pain in walking and marked

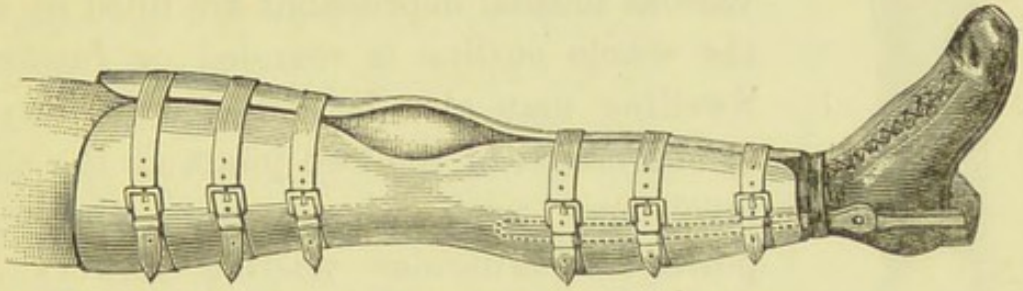

Fig. 64.—Leather Splints for Disease of the Knee Joint.

lameness, tenderness on pressure of some part of the bone, and perhaps surface-heat over the tender area; and an absence of marked synovial swelling and muscular wasting. This last symptom, however, although originally absent, will soon make its appearance. As to the date of recovery in synovitis, this may occur, under strict treatment from the onset, in the course of six or nine months. In bone cases of a like grade of severity the time required will be from nine to twelve months, or even longer. Often, tuberculous disease is preceded by a fall, or by some other local injury by which the resisting power of the tissues is impaired, and as the result of which they become occupied by inflammatory products. It is in tissues so circumstanced that the bacillus tuberculosis meets with a highly appropriate soil.

Symptoms. — These are stiffness, swelling, and soon some muscular wasting, while sometimes pain and surface-heat may also be detected. Stiffness is apparent in the fact that although the joint can be flexed it cannot be fully extended, a defect that is clearly seen when the two limbs are compared. This is a very material piece of evidence. Swelling takes the form of a puffy condition of the joint at the sides of the patella and its ligament, or when it is more considerable, of general fulness and enlargement of the joint, so that its various normal depressions are filled in, and the whole outline is rounded or fusiform. Swelling may also be detected by careful measurement of the two joints at the same level, and when they are in the same position. Muscular wasting, a very important feature, is most marked in the lower third of the thigh. It is sometimes already considerable at the end of three or four weeks; but even if it is slight, it must not be made light of. Nor must it be forgotten that, compared with the small circumference of the limb in a child, even a quarter of an inch represents a marked degree of atrophy. If the disease is allowed to advance, as it inevitably will unless opposed by adequate treatment, the synovial membrane becomes swollen and infiltrated, and can be felt thickened and elastic on pressure. The joint becomes more flexed, and the bones of the leg undergo displacement in two directions. They travel backwards and outwards, so that the head of the fibula is rendered abnormally prominent in the outer part of the popliteal space; and they become rotated on their long axis, so that the foot is everted. When

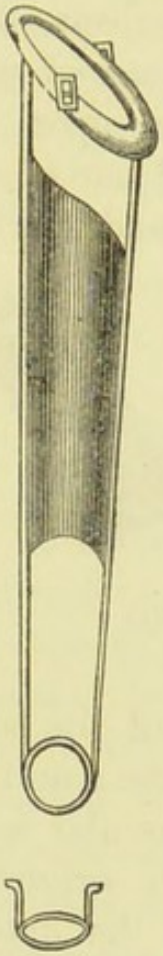

Fig 65.—Thomas's Knee Splint, with patten for sound foot.

this composite displacement is combined with considerable flexion, the limb is useless for progression, for the toe does not reach the ground, nor can the patient bear any weight upon the joint. In the later stages of disease suppuration frequently occurs.

The *treatment* consists in the persistent use of leather splints, such as are shown in Fig. 64. The statement so often made already respecting these tuberculous affections must be repeated here. If the disease is detected early, and absolute rest is at once enforced, and maintained for the necessary period, perfect recovery, or recovery with only slight loss of movement, may, in the great majority of cases, be secured. Nothing that I have seen in the last ten years has left any misgiving in my mind on this subject. In many cases in which children had been lame for three or four weeks, and in which, on examination, the knee was found stiff, painful on extension, swollen, and hotter than its fellow—cases, that is, in which all the usual symptoms of tuberculous disease were well marked—perfect recovery within from six to nine months has taken place. The splints should be worn by night as well as by day, and while any active symptoms remain the limb should be scrupulously kept in the horizontal posture. Subsequently a Thomas's knee splint (Figs. 65, 66) may be employed if the patient is old enough to manage crutches, and provided that no return of swelling, heat, or stiffness is, on careful watching, to be observed. In this very useful appliance

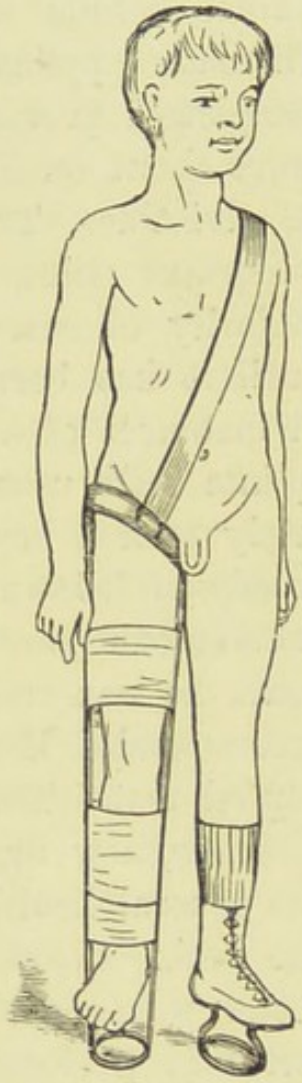

Fig. 66.—Thomas's Knee Splint in use.

the weight is transmitted through the tuber ischii, and the foot does not reach the ground. In young children, however, the leather splints (Fig. 64) should be used throughout. In cases in which the joint remains irritable and sensitive, or in which there is a tendency to deformity, the leather splints may, with advantage, be combined with Thomas's appliance. By this arrangement the joint is completely protected, and the patient can be allowed to move about on crutches much sooner than would otherwise be advisable. The prevention of displacement is a highly important point, for it may be fairly said of the great majority of cases that a knee joint is not past recovery until it has been allowed to get out of shape. Even in instances of advanced disease, prolonged rest in leather splints will usually at length secure repair. I have lately seen a boy, aged 9, the history of whose case is briefly as follows :—When two years of age he developed tuberculous synovitis of the left knee. For the next three years he was treated in a variety of ways. One surgeon recommended the use of leather splints to secure uninterrupted rest. These were worn for six months. Another, however, now urged the necessity of exercise to maintain the general health, and directed that the child should use the limb. Next, as the disease again increased, a bone-setter was consulted. He stated that a small bone was out and performed an operation to put it in. As a result, the joint became hot, considerably flexed, and enlarged, the synovial membrane was thickened, and the bones of the leg underwent displacement backwards and outwards. This, though it was distinct, was fortunately only moderate. When the disease had thus been in progress for three years, leather splints were again applied, and constantly worn, and the limb was kept in a horizontal posture. Gradual improvement took place ; flexion slowly gave way to extension, and as this change occurred, splints

adapted to the improved angle of the limb were applied. Swelling, also, became less. Repair, however, was very tedious; but at the end of four years—yet not till then—the joint had assumed a natural appearance, and was freely movable; and the displacement of the bones of the leg had entirely disappeared. This gradual and spontaneous disappearance of displacement demands attention. I have met with several examples of it. It may, I think, be regarded as an illustration of the tendency of parts, during the period of active growth, to return to the normal type when the immediate effects of disease or injury have passed off. Two examples of this tendency may suffice: the spontaneous straightening of limbs deformed by rickets, and the gradual, partial, or complete obliteration of scars; but another clear instance is the modelling of bones after the union of fractures. This tendency in the instance before us is of great importance, and constitutes, in growing parts, a material element in the recovery that may be obtained by prolonged rest and mechanical support.

It is usually best, when a case of active disease comes under observation, not to make any immediate attempt to remove the deformity that may be present. The splints should be moulded to the joint in its present position, and it will be found that when rest takes effect, muscular spasm will gradually cease, and the limb will admit of more and more extension until it has become straight. As this alteration advances, splints of a corresponding shape must be applied. Two or three changes may thus be required. The advantage of this method is that it is gentle throughout, and that no interosseous pressure is induced. (*See* page 269.) The objections to the practice of forcibly straightening diseased joints is stated at page 272.

Another instance to show that by prolonged rest an amount of recovery may be attained which some would be inclined to doubt is the following:—Charlotte P——

aged 5, had tuberculous disease of both knee joints, of eighteen months' duration, together with extensive ulceration of the skin of the right leg just above the ankle; the joints were flexed at an angle of about 120°, and much enlarged from thickening of the synovial membrane, so that they presented a globular outline; the skin over them was dusky, and the muscles of the thigh were much wasted. Leather splints were moulded to the joints in their flexed position, and the child was kept on a sofa and never allowed to put her feet to the ground. Improvement was immediate. Redness of the skin subsided; swelling decreased, so that the splints were too large at the knees, and muscular spasm passed off so that the limbs could be straightened through several degrees. At the end of six weeks, therefore, splints that were smaller opposite the joints, and much straighter, were applied. Gradually the knees returned to their proper size, the thickening of the synovial membrane disappeared, the limbs became perfectly straight, and at the end of two years, during the whole of which period the child had been entirely off her feet, the joints had completely recovered, and were freely movable. A few months later the only defect to be observed in the limbs was that the muscles were somewhat small and weak. Since that time, now fifteen years ago, the patient has been so well that it would be impossible to tell from the condition of the joints that they had ever been the seat of disease.

In cases of chronic disease, in which the knee has become fixed in a position of flexion, or in which flexion is combined with displacement backwards (provided backward displacement is inconsiderable), the limb may be brought into a straight position by the method of extension and counter-extension described at page 270; the objections to the use of forcible manipulation, or of splints acting with a screw, or a rack and pinion movement to secure extension, are stated at page 272. When displacement

backwards and outwards, combined with flexion, is considerable, it will be found extremely difficult, and in many cases impossible, to correct it, on account of the rigidity of the ligamentous structures at the back of the joint. This will still be the case even when the hamstring muscles have been divided. In instances of long standing a further difficulty is that the articular ends of the femur and the tibia have undergone an alteration in shape, the front part of the condyles of the femur having become overgrown so as to overhang the tibia; while the upper surface of the tibia has become oblique so as to slant downwards and backwards. In these circumstances, when extension is attempted, the bones in the fore part of the joint come firmly into contact and lock against each other; and if force, either immediate or gradual, is applied, the result is that the head of the tibia is carried back into the popliteal space. In these unfortunate cases the only course that remains is to perform excision; but this proceeding should be, if possible, postponed until the major part of the growth of the limb has been attained.

Charcot's disease of the knee joint is described in chapter vii., pages 81 *et seqq.*

Syphilitic disease is alluded to and illustrated by cases in chapter xi.

CHAPTER XXXIII.

DISEASES OF THE ANKLE.

Tuberculous disease.—Although the ankle joint lies close beneath the skin, so that it is readily accessible to examination, there are many instances in which it is by no means easy to avoid falling into an error of diagnosis respecting its real condition. At first sight the evidence that it is in a state of advanced disease may seem obvious, and yet the joint may be perfectly sound; and I have witnessed more than one instance in which Syme's amputation has been performed under the belief that the joint was disorganised, but in which it has proved that the disease was situated entirely in some of the surrounding parts. It is therefore necessary to consider the question of diagnosis with some care.

Disease may commence either in the synovial membrane, as is frequently the case, or in one of the bones that are in the immediate neighbourhood:—in the lower end of the tibia or perhaps the fibula, in the astragalus, or in the os calcis. The symptoms of synovial disease are swelling, limping, muscular wasting of the leg, stiffness of the joint, heat of the surface, pain, tenderness. I have endeavoured to place these different signs in the order of their relative value; they vary, however, so much in different cases that each one must be considered important and should be carefully estimated. The beginner will be wise to remember that here, as well as in the case of the hip joint, he is likely to fall into serious error unless he proceeds with caution.

(*a*) Swelling is always an early and a distinct symptom, taking the form of puffy fulness, to be detected in front,

where it fills out all the natural depressions and masks the course of the extensor tendons; at the sides around the malleoli; and at the back, where it produces enlargement on either side of the tendo Achillis, and gives the joint an appearance of increased width. Swelling in this last situation is a symptom which should never be overlooked. It is often well marked when swelling elsewhere is very slight. (*b*) Limping may be the first symptom observed by the parents, but it is sometimes striking to see how well a child will walk even though tuberculous synovitis has already made considerable progress. (*c*) Wasting involving the muscles of the calf takes place early, and is often very marked. Even when the limb is not distinctly smaller on measurement, the muscles can be felt to be flabby and less firm than those of the opposite leg. (*d*) Stiffness of the joint is usually present when full flexion and full extension are approached, but it is important to notice that the patient will often allow the joint to be moved, and will, indeed, move it himself, through all its middle range with unrestricted freedom. It is only when the extremes are approached that the impairment is detected. (*e*) Heat of the surface is an important symptom when it is present: but there are so many instances in which it is wanting that its absence must not be depended on as any indication that there is no disease. The same must be said of pain and tenderness. (*f*) Pain, though it is present in the more acute cases, is often absent, so that parents cannot persuade themselves that the condition of the joint is serious; and even a surgeon, who places pain before swelling and muscular wasting as a test symptom, will probably fall into error. (*g*) Tenderness may also be present, but frequently it is so entirely absent that it must not be trusted. On another ground it is a symptom to be very cautiously estimated, for rough pressure may give pain in a healthy joint, which may be easily mistaken for the evidence of disease.

Diagnosis.—The conditions with which disease of the ankle joint is liable to be confused are disease (1) of the lower end of the tibia, (2) of the tarsus, (3) of the synovial sheaths of the surrounding tendons. The recognition of the exact seat of mischief is not material while disease is still incipient, for the treatment is the same, and consists of perfect rest, secured by means presently to be described. Its importance arises when operative interference has to be considered and the question is whether it is the end of the tibia, the tarsus, or the joint itself that is involved. In obscure cases neither the situation of swelling nor the position of sinuses can be entirely depended upon. The only reliable evidence is that which is derived from the direction which a probe or a director takes when carefully used.

The patient should be under chloroform, so that a thorough examination can be made. If any doubt remains whether or not the instrument enters the joint, the surgeon should proceed with caution until, by an exploratory incision, this point has been set at rest. But guidance may often be obtained by noticing that, though at some parts swelling seems to involve the joint, in other parts the joint preserves its natural outline. Swelling may *e.g.* be well marked in front and on the outer side, but absent from the inner part of the joint. Swelling thus limited may indicate that the articulation itself is not affected. So far as I have observed, the joint is not rarely sound when to external appearance it is itself diseased.

The following cases will illustrate this point. A child, aged 3, had a sinus of five months' duration on the front of the foot opposite the articulation between the tibia and the astragalus. The surrounding soft parts were red and considerably swollen, and the swelling extended backwards around the malleoli. There was considerable discharge. The surgeon who was treating the patient, believing that the ankle joint was incurably diseased, proceeded to perform

Syme's amputation. But on making the anterior incision into the joint he found that the articulation itself was perfectly healthy, and that the disease consisted merely of necrosis of the head of the astragalus, with the formation of a small sequestrum that might have been very easily removed. In a second instance Syme's amputation was performed for disease limited to the os calcis, but which was believed to involve the ankle joint.

The *treatment* of tuberculous disease of the ankle must consist, in the early stage, of applying a pair of carefully

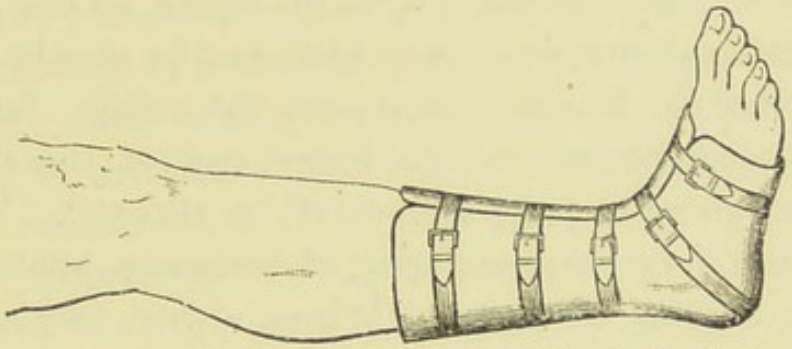

Fig. 67.—Leather Splints for Disease of the Ankle Joint.

moulded leather splints (Fig. 67), and not allowing the patient to put the foot to the ground. In moulding the splints care should be taken to keep the foot nearly at a right angle with the leg. If the foot is put up at a more open angle, and if any stiffness should remain, the heel cannot be brought to the ground, and, as I have twice seen, it may be necessary to divide the tendo Achillis and bring the heel down, as in ordinary talipes equinus. In one instance in which the extremely rare event of bony anchylosis of the ankle joint occurred (after prolonged suppuration), and in which the foot became fixed at an angle of 120°, the patient walked with great insecurity and difficulty, and would, I think, have had a more useful limb had Syme's amputation been performed. The splints should be constantly worn by night as well as by day. Incipient cases (those in which the disease has existed for not more

than a month or six weeks) may thus be cured in six months, if the patient is well fed, takes tonics, and is in good air. In instances of longer standing nine months or even a year may be required. But the result is not doubtful. Perfectly free movement will usually be regained, and the joint will escape all serious injury. If suppuration occurs matter must be at once evacuated aseptically, and if healing is long delayed arthrectomy should be performed (page 336). In the convalescent stage, and when the joint is free from swelling, the patient (if he is at any age above six or seven) may be allowed to go about with a Thomas's knee splint and crutches (page 449), but he should still constantly wear the leather splints for the ankle. In cases in which disease begins in the lower end of the tibia, the treatment given at page 449 must be adopted. This will ensure, in a very large majority of instances, that the joint does not become involved. When either the astragalus or the os calcis is the seat of tuberculous disease, rest secured by leather splints will usually lead to repair; but when suppuration has already occurred and the disease continues to advance, the affected bone may be dissected out. I have met with several cases in which a very useful foot has been obtained after removal of the astragalus, and in which the false joint between the os calcis and the bones of the leg admitted of a considerable amount of flexion and extension; while in instances in which the os calcis has been dissected out, though the prominence of the heel is lost, and the limb is shortened so that the malleoli occupy a lower level than natural, good flexion and extension remain, and, when the necessary addition to the thickness of the heel of the boot is made, the patient walks firmly and well on the limb.

There can be no hesitation in allowing that an admirable stump is obtained by Syme's amputation. Yet the loss of a foot must always be a serious matter; and certainly if

the treatment which I have just described, and which has been so strongly urged by Mr. Holmes and other authorities, is brought to bear, the removal of the foot can in a very large proportion of cases be avoided.

Acute suppurative arthritis.—Whether originating in some form of blood poisoning, in the extension into the joint of mischief in one of the contiguous bones, or, as I have twice seen, in acute inflammation following prolonged exertion of a joint that had previously been unsound, acute suppurative arthritis of the ankle is characterised by severe pain, rapidly increasing swelling, redness of the skin, and the constitutional disturbance and high temperature which accompany these local symptoms. The formation of pus is indicated by increase of swelling and pain, by a further rise of temperature, often by rigors, and by the appearance of œdema and pitting of the surface on pressure. The treatment is that laid down for acute arthritis at page 19. Should it be believed that the joint has become disorganised, should discharge continue profuse, should the temperature remain high, and should the patient be losing in general condition, Syme's amputation had better be at once performed, not only because it may be dangerous to the patient's life to postpone active interference, but also because there is no prospect that, even if the foot can be preserved, the limb will be more useful than will be the well-formed stump left after amputation.

Acute arthritis of infants.—This affection (page 129) presents no features in the ankle joint that call for detailed description. It runs its course quite as rapidly here as elsewhere, and unless active measures are at once adopted, the joint, together with the lower end of the tibia and fibula and the tarsal bones, will be destroyed. A case is mentioned at page 140 in which such complete disorganisation had occurred that though the parts had healed amputation was necessary. Early evacuation of matter, however,

with subsequent rest and antiseptic dressing will often lead to repair, when other joints are not involved, and when the general strength remains good.

Osteo-arthritis.—Not so frequent here as in many of the other joints, this disease is still occasionally met with. Both ankle joints are usually affected, and the nature of the case is generally disclosed by the presence of the malady in other articulations. The symptoms are stiffness, weakness, and pain, attended with swelling, and very soon with a disabling and very intractable form of flat foot, due in part to weakness of the muscles, but largely to the fact that all the ligamentous structures in the sole become involved. In many instances talipes valgus is also developed.

Treatment.—The general management of these cases is given at pages 69 *et seqq.* As for local means, the patient must be directed to be on his feet as little as possible, especially when the disease is in a period of exacerbation, and to take the opportunity of sitting instead of standing whenever he is able to do so. He should be supplied with boots made of soft leather, and large enough to allow for variations in regard to swelling. Some patients, however, can only wear loose cloth boots. An outside iron with T-strap, such as is used for ordinary flat foot, will be serviceable in patients not much past middle age; but in elderly persons whose muscles are weak, the extra weight of this apparatus is an objection to its employment. Relief from pain may be secured by temporary rest, blistering, and the use afterwards of hot bathing. Passive movements, during which the foot is carried up well within a right angle, will prevent stiffness, and do something also to arrest muscular wasting.

Part II.

DISEASES OF THE SPINE.

CHAPTER XXXIV.

TUBERCULOSIS OF THE SPINAL COLUMN—POTT'S DISEASE.

THE disease now to be described has, at different times, passed under different names, the chief of which have been caries of the spine, angular curvature, and Pott's disease. Of these, the term angular curvature points not to the disease from which the patient is suffering, but to one of its most prominent symptoms. Names of this order are open to the serious objection that they tend to divert attention from the disease itself, and to fix it on some single symptom or result, which is perhaps inconstant in its appearance, or which is developed only when the disease has made considerable progress, and when the period during which treatment is most effectual has passed by.

The phrase "angular curvature" should, therefore, no longer be employed as the designation of this affection. Nor should "caries of the spine" be used, for the word caries is out of place, and is rapidly becoming obsolete in the nomenclature of the present day. We are thus left with the name Pott's disease, which is in every way appropriate, and by the general adoption of which on the Continent and in America a graceful tribute has been paid to English surgery.

From a general point of view, there is an obvious similarity between the bones and joints of the extremities and

those of the spinal column, so far as their construction is concerned. The articular ends of the long bones consist, as do the bodies of the vertebræ, of cancellous bone enclosed in a compact layer, and the different segments in the spine, as in the limbs, are connected together by intervening joints. The main difference is that, while in the limbs the parts move freely upon each other, in the spine movement is much more limited, owing to the presence between the vertebræ of discs of fibro-cartilage. This general similarity of structure between the limbs and the spine has its parallel in the morbid anatomy and clinical history of tuberculous disease in the two situations. In the extremities, tuberculosis may originate in the articular ends of the bones, or in the synovial membrane. In the articular ends it begins either in the rapidly growing tissue of the diaphysis immediately beneath the epiphysial plate (p. 125), or—although with much less frequency—in the cancellous tissue of the epiphysis itself. In the spine, in the same way, it begins, as a rule, at the junction between the body and the upper or the lower epiphysial plate, or it may start at any other part of the cancellous tissue of which the general mass of the body of the vertebra is formed. A primary synovitis of the joints connecting the articular processes of the vertebræ is probably a somewhat rare condition. Yet that it does occur in the joints of the spine, as it does in those of the limbs, seems to be clearly indicated both by museum specimens and by the clinical history of particular cases. In museum preparations of tuberculous disease of the cervical spine it may sometimes be observed that, while the bodies of the vertebræ are but little affected, the articular processes and the adjacent portions of the neural arches—the pedicles and the laminæ—are deeply ulcerated, and that evidently the main stress of the disease has fallen upon these parts. Such disease, it appears safe to believe, must have commenced in the synovial membrane

by which the articular processes are surrounded, for it is very unlikely that it began in the compact bone of which the neural arches are formed. Clinical evidence in support of the view that tuberculous disease of the spine may begin in the synovial membrane, investing the articular processes, is given at page 462. Once established, the disease runs a very similar course in the vertebral column to that which it takes in the joints of the extremities. In the bodies it leads to a rarefying osteitis with early caseation of the tuberculous products. In childhood, when the vertebral bodies are formed of actively growing and vascular medullary tissue, very favourable to the advance of the tuberculous process, the affected structure is rapidly softened and broken down. At the same time the bodies of neighbouring vertebræ become involved, by extension of the disease; and the inter-vertebral discs, and the ligaments, are in great part or entirely destroyed, with the result that the column yields, and angular deformity is developed. The rapidity with which these changes may occur in early childhood is such that within three or four months from the commencement of the disease the bodies of two or three vertebræ may be entirely destroyed, and great deformity may take place. In individuals who are older, and in whom the external layer of the bodies and the plates of the cancellous tissue have acquired their full degree of compactness, the destruction of the bodies is a much more gradual process, and deformity is produced much more slowly and to a much more limited extent. In many instances, indeed, in the adult —especially in the lumbar region, where the vertebræ are of massive size, and are constructed of dense bone on the surface, and within of very strong trabeculæ—no deformity occurs, even in advanced disease, accompanied by suppuration.

Even if its effects were entirely limited to injury done to the skeleton, Pott's disease would be of very grave

import. But its gravity is much increased by the circumstance that, owing to its proximity, the spinal cord itself may become involved. Fortunately, in a large number of instances, the cord and its membranes escape, for the disease concerns only the bodies of the vertebræ, and the products of inflammation, whether they consist of granulation tissue or of pus, collect in front or at the sides of the column, and do not pass backwards to invade the neural canal. In other instances, however, this extension backwards does occur; while in others, again, the tuberculous process has its main seat, not in the bodies, but in the articular processes and laminæ.

When this is the case, inflammatory products accumulate between the bony walls of the canal and the external surface of the meninges, or in the meninges themselves, with the effect that the resulting pressure on the cord may lead to paraplegia. In his work on "Diseases of the Nervous System,"* in an admirable chapter on compression of the spinal cord, Dr. Gowers states very clearly that pressure produces myelitis. He writes:—"The cord (on *post-mortem* examination) usually presents evidence of the compression it has endured in considerable narrowing at the spot compressed, where it may be indented, flattened, or cylindrical. . . . At the compressed part the cord is usually grey in tint: its consistence is lessened in early cases, and is increased in those of long duration. The change in colour and consistence is due to inflammation of the substance of the cord, which always results from pressure, and may often be traced for some distance above and below the compressed part. When there is much compression there is always much inflammation, but considerable myelitis may occur when the amount of compression is slight. The inflammation may be chronic and slow, developing in proportion to the pressure, or it may be subacute or acute, even when

* Vol. i. p. 246.

the pressure is gradual. The signs of inflammation are very distinct on microscopical examination, and resemble those of other forms of myelitis."

In his able lectures on the surgery of the spinal cord and its membranes, Mr. Thorburn remarks, "The exact *modus operandi* of this pressure is still open to question. The school of Charcot attributes the mischief to myelitis spreading from the point of pressure across the cord; but most recent observers do not accept this view, and it is certain that pressure alone (without myelitis) may cause paraplegia. The simplest explanation of such a condition would be, that the pressure causes anæmia and subsequent degeneration of the cord, and in some cases we find the latter thinned and firm in texture, as if this were the true explanation. . . . Others find that œdema and swelling of the cord are more common than constriction, and this condition is generally attributed to an extra medullary compression of veins, and lymphatics causing congestion and lymph stasis."

Some further causes of paraplegia are met with, though they are certainly rare. It may be produced by the direct pressure of the bones themselves upon the cord. It is often seen in museum specimens that when—in the development of angular curvature—several of the vertebral bodies are destroyed, the corresponding neural arches, which are still entire as the column yields, are bowed out backwards, with the result that the canal is considerably enlarged. But, on the other hand, it must be pointed out that, when only one body—say, the fourth dorsal—is lost, the upper segment of the column leans abruptly forward, so that the space between the upper edge of the body of the fifth dorsal vertebra and the arch of the fourth is materially narrowed, and the cord is more or less compressed. In Fig. 68, the antero-posterior space left for the cord has been reduced to one-fifth of an inch. As the specimen is without a history, it

cannot now be said whether paralysis was present; possibly the cord had been able to accommodate itself. But with such a condition of parts in view—and many similar specimens could easily be produced—the compression of the cord by bone displacement is beyond doubt. Compression leading to paraplegia may, though such events are very rare, be produced by a displaced sequestrum, by fracture through a carious vertebra, followed by displacement, by hæmorrhage,* or by the sudden bursting of an abscess into the spinal canal.

Interference with the nerve supply to the parts below may occur as the result of disease at any level of the spinal column. This result, however, is much more frequently met with in the upper dorsal region than elsewhere. Here, as the spinal column is comparatively fixed, the neural canal is small, and there is very little space between it and the cord, so that a limited amount of granulation-tissue exercises injurious pressure. On the other hand, the canal in the cervical region is of large size, in order to permit the free movement of the column without injury to the cord, and here a considerable amount of granulation-tissue may collect without affecting the cord.

In the lower dorsal region, also, pressure symptoms due to granulation-tissue within the canal are rare. In the lumbar region they are still more rare, for the cord has broken up into the cauda equina, and the individual nerves are firmer in structure and protected by a sheath, so that they are tolerant of compression.

The construction of the upper part of the cervical spine has much to do with the degree to which the cord may suffer in Pott's disease at this level. In the first place, the bodies of the vertebræ in this region are comparatively small and are therefore easily broken down, and, secondly, provision is made for free flexion, extension and lateral rotation of the

* Thorburn, *Brit. Med. Journal*, 1894, vol. i., 1345 and 1401.

cranium upon the apex of the column. To allow of these movements the atlas has been deprived both of its body and its spinous process, and has been reduced to a mere ring. Thus, when the vertebræ in this region are examined, it is seen that a comparatively small destruction of bone will be attended with very serious results. The normal

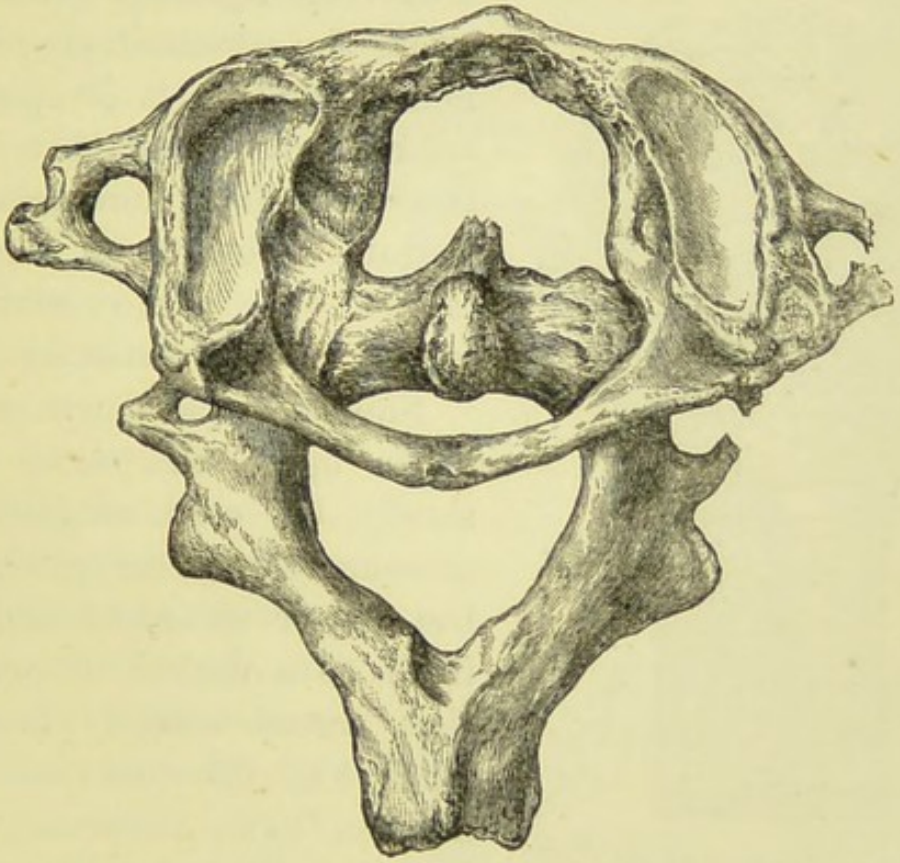

Fig 68.—Displacement of the Atlas forwards upon the Axis as a result of Pott's Disease. The bones are firmly anchylosed together. (From preparation, No. 1094, in the Museum of St. Bartholomew's Hospital.)

position of the head upon the apex of the column depends upon the integrity of the articulation between the atlas and the axis, the essential parts of which are the odontoid process and the transverse ligament. If either of these structures is involved in disease, the mechanism for the support of the head is thrown out of action. As to the odontoid process, it may be more or less removed by caries, or it may be so weakened that fracture occurs through its base at its junction with the body of the axis. As to the transverse

ligament, when it has become softened or eroded, it may suddenly give way. Whichever event occurs, the result to the cord will be equally disastrous. If the odontoid process gives way, and the head, with the atlas, falls forwards, the cord is drawn forwards also, and is crushed against the upper and back part of the body of the axis; while, if the transverse ligament gives way, while the odontoid process remains in place, it is upon the apex of the latter that, when the head falls forwards, the medulla oblongata is impaled. Either of these accidents is, of course, instantly fatal.

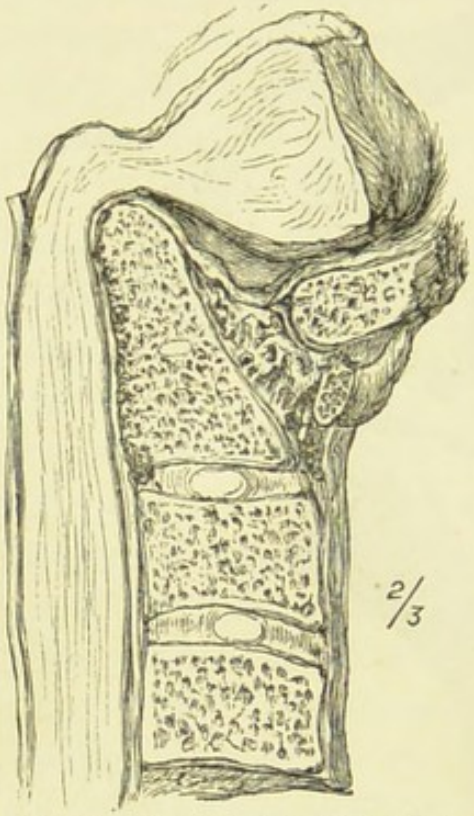

Fig. 69.—Compression of the Cord by the Apex of the Odontoid Process, following Displacement of the Head forwards in the course of Pott's Disease. (From preparation, No. 1092, in the Museum of St. Bartholomew's Hospital.)

Should displacement of the atlas upon the axis occur slowly, the cord, as numerous museum specimens prove, has the power of accommodating itself to a degree of pressure that seems scarcely credible. Thus Fig. 68 shows an atlas and an axis, between which firm bony anchylosis has taken place, and it is seen that the atlas has travelled forwards and downwards in relation to the axis, so that the space between its posterior arch and the apex of the odontoid (which space, of course, transmitted the upper part of the cord and the commencement of the medulla oblongata) is reduced to a mere chink. In the specimen this chink measures only one-fifth of an inch. No particulars of the case are known, but that the patient long survived the displacement is obvious from the completeness of the anchylosis which has occurred.

Fig. 69 shows a remarkable condition of things. In consequence of yielding of the transverse ligament, in the course of Pott's disease, the head, together with the atlas, has subsided in a direction forwards and downwards to such a degree that the spinal cord has become sharply bent over the apex of the odontoid process. The anterior part of the arch of the atlas, considerably displaced, is shown in transverse section.

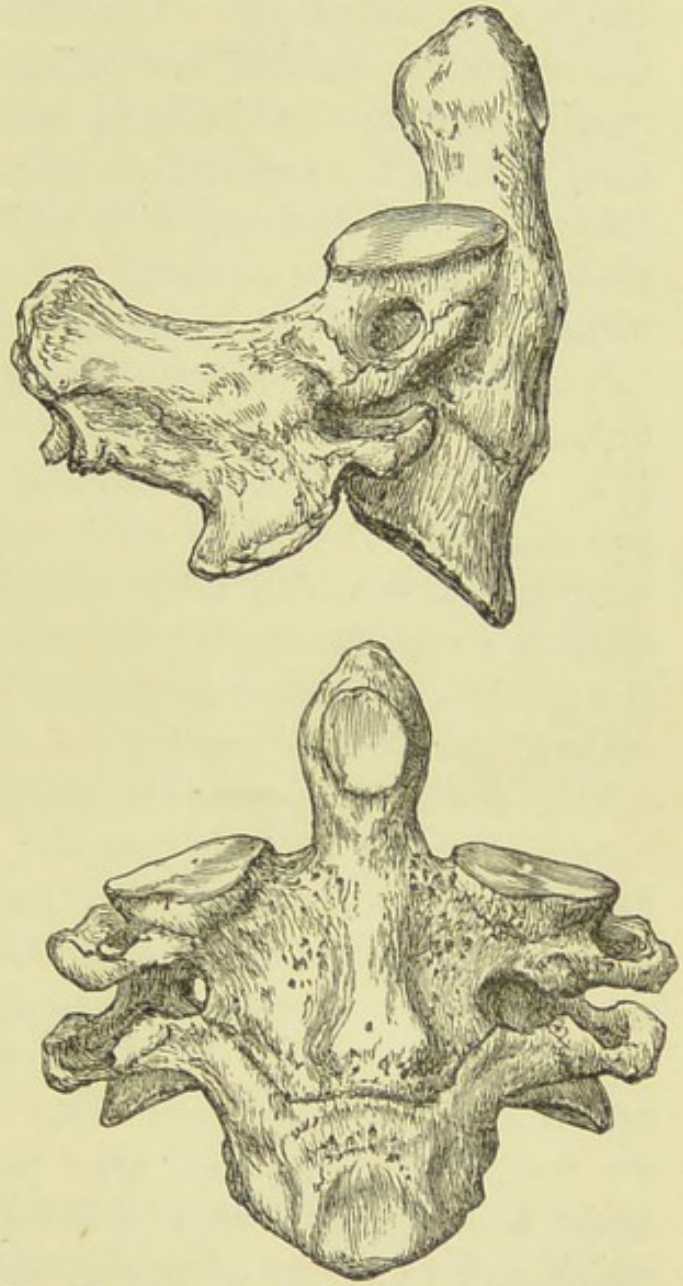

Fig. 70.—Complete Bony Anchylosis between the Bodies and the Neural Arches of the Atlas and Axis. (From preparation, No. 1078, in the Museum of St. Bartholomew's Hospital.)

It is mentioned at page 307, that when tuberculous disease of a large joint has reached an advanced stage, so that the articulation has been virtually destroyed, repair, if it occurs, is accomplished more often by fibrous than by bony anchylosis. This result depends upon the fact that the granulation-tissue, which ultimately becomes organised into cicatricial tissue, is derived largely from the remains of the synovial membrane and other soft parts, and has gradually grown inwards and insinuated itself between the ends of the bones. In the spine, however, the parts concerned in

repair consist mainly of the bodies and neural arches of the vertebræ—between which the discs no longer intervene, for they have been already absorbed—and the surrounding ligaments and periosteum. Thus the structures which furnish the reparative material are mainly osseous. Such structures readily produce new bone in abundance, and one of the most striking features in the reparative process in the spinal column is the readiness with which bony anchylosis takes place. Museum specimens are numerous in which the bodies of adjacent vertebræ which have been the seat of tuberculous disease are welded together either by direct bony union, or by strong buttresses and adventitious plates (Fig. 70). The neural arches, including the articular processes, are also often completely fused together. This readiness with which bony anchylosis is developed in the spine is a very favourable circumstance in connection with the repair of tuberculous disease in this situation. For if, after a considerable angular deformity had been produced, so that the upper segment of the column had been brought into a leaning position, repair was effected merely by fibrous cicatricial tissue, the angle of deflection would become, under the influence of the superincumbent weight, more and more acute, and thus deformity would increase, just as it is so apt to do in fibrous anchylosis of the hip or the knee; but when bony union has once occurred no further yielding can take place. No stronger proof could be brought forward of the completeness of the repair which may follow far advanced tuberculous mischief than is afforded by these examples of solid anchylosis of the spine after Pott's disease.

In considering the morbid anatomy of tuberculous disease of the spine, it is important, alike in regard to prognosis and treatment, to inquire whether bone which is destroyed perishes *en bloc*, so that massive sequestra are formed, or whether it is lost by a process of molecular

disintegration and absorption after it has been softened and rendered porous by rarefying osteitis. For if firm sequestra are formed and are lodged in the column in some inaccessible situation—for instance, in the front of one of the middle dorsal vertebræ—sound repair will be indefinitely postponed, or even rendered impossible; and, secondly, if sequestra are commonly present, operative measures, when the disease is within reach, should be adopted for their detection and removal. My belief is that sequestra substantial enough to retard repair, and therefore to call for removal by operative interference, are rarely present; nor should we anticipate that they would be of frequent occurrence. It is well known that sequestra, as a very general rule, are formed as the result of inflammation of hard or compact bone in consequence of the arrest of the circulation by effusion of inflammatory products between the vessels and the walls of the Haversian canals, by which the small arteries are compressed and the blood current shut off. The bodies of the vertebræ, however, especially in children—who furnish the great majority of cases of Pott's disease—are formed of soft and vascular cancellous bone, and the inflammatory process takes the form of a rarefying osteitis in the course of which the bone is reduced, by the absorption of its earthy salts, to little more than a connective tissue matrix permeated by numerous blood-vessels. In such a tissue, when it is the area of chronic inflammation, erosion and absorption very readily occur, with the result that the affected bodies of the vertebræ are completely removed. That this, rather than necrosis in mass, is what really occurs is definitely proved both by museum specimens and by clinical experience. In museum specimens it may frequently be seen that the bodies of several vertebræ have entirely disappeared. In St. Bartholomew's Hospital Museum in No. 1099 four, in No. 1110 six, and in No. 1096 eight bodies are lost,

and yet no sequestra are anywhere present. I have seen but very few specimens in which a sequestrum of any size or firmness is shown. Still, they do occur; and Lannelongue* shows a well-marked example of a large sequestrum lying loose in a cavity in one of the lower dorsal vetebræ. The cases in which sequestra may form are those in which the hard texture of the bodies of the lumbar or dorsal vertebræ in adults is involved. But even such cases do not contravene the opinion that, as a general rule, no substantial sequestra are present. With these observations clinical experience closely corresponds. Cases are frequent in which, although the amount of deformity present clearly indicates that several vertebral bodies must have been destroyed, and although suppuration has come to an end, and sound repair has occurred, yet no sequestra have either come away or been removed by operative interference.

The most common age for the development of Pott's disease lies between the third and about the ninth or tenth years. This accords with the rule which obtains, with very few exceptions, in all forms of surgical tuberculosis, yet it is important to bear in mind that no period of life, from a few months after birth to old age, is exempt. I have seen several instances in which the disease commenced in children who were less than a year old, the earliest being in a child of six months. This infant had well-marked angular curvature in the middle of the dorsal region. On the other hand, not only may the disease occur at any time in the course of middle life, but it may be developed in persons between sixty and seventy, or even in those who are older still. In 1893 a woman, aged 69, was in St. Bartholomew's Hospital with a sharp angular deformity of the spine in the upper dorsal region, the result of Pott's disease, from which she appeared to have been suffering for about nine months. These cases, however, which afford

* "Tuber. Vertébrale Mal. de Pott," Paris, 1888.

such striking examples of senile tuberculosis, are very rare. I have myself met with only seven instances in patients over 55. The following are illustrations:—A man of 63 was in the hospital, about eight years ago, with stiffness of the neck so that he could neither nod nor rotate his head; with considerable widening and bony thickening in the neighbourhood of the spines of the upper cervical vertebræ; and with pain radiating over the occiput and down the neck. His head had sunk forwards, so that his chin was nearly on his sternum, and he moved cautiously and turned over in bed with difficulty. When sitting up he supported his head with his hands, as children with Pott's disease of the cervical spine often do. No suppuration occurred while he was in the hospital. His subsequent history is unknown. A healthy-looking man, aged 67, was admitted into St. Bartholomew's Hospital late in 1886, under the care of Mr. Butlin. A month before he had fallen off a table, and struck his neck against a chair. This injury was followed by stiffness of the neck, which gradually increased. He was lost sight of till the following March, when an abscess formed in the neck, and Mr. Butlin opened it. About half an ounce of pus was evacuated, and the wound healed. Six months later he returned to the hospital, complaining of severe pain, increased on the slightest movement, and situated on the left side of the neck and head. Later, other abscesses formed and were opened, and a collar to support the head was applied. Mr. Butlin showed me this patient on two occasions, and there seemed no doubt that he was suffering from Pott's disease.

Diagnosis.—It has been remarked (page 387), in regard to hip disease, that while diagnosis in the majority of advanced cases is perfectly easy, in many early cases, and in some instances of disease of long standing, it presents difficulties which can only be overcome by the exercise of much care. The same is true in respect to tuberculosis of the spine.

Yet the formation of a correct opinion is, it is needless to say, of the greatest importance, for otherwise either early disease will be overlooked, or patients may be submitted to a long period of treatment for disease which does not exist. Here also, as in hip disease, the particular symptoms vary considerably in different cases. It is therefore necessary to scrutinise every point of evidence, both positive and negative, that is available.

Symptoms.—(1) Pain. This varies widely in different cases, both in its form and the degree of its severity. Sometimes pain is constant, and more or less severe either at the seat of disease, or radiating to more or less distant parts. In some few cases it is paroxysmal, and resembles severe cramp; in others it is slight in its amount, and is suggestive only from the situation in which it is felt, and its combination with other symptoms. Again, it is very important to remember that in some cases it is completely absent during the whole course of the disease. In disease between the atlas and axis, pain is referred to the occipital region, over the distribution of the second (great occipital) nerve. Pain in this situation, if it is persistent and associated with any stiffness of the neck, or altered manner of carrying the head, must always raise a suspicion, not to be lightly dismissed, that tuberculous disease is present. This has often proved to be the true explanation of cases which were at first regarded as instances of wry neck of muscular origin, or of some rheumatic or nervous affection. In disease situated in other regions of the spine, pain, when it is present, is felt either locally, or in those areas to which the sensory nerves which leave the cord at the level of the disease are distributed:—over the shoulders and in the arms; round the sides of the chest or the abdomen; in the middle line in front; over the back and sides of the pelvis, or in the lower extremities. Pain, except when the great occipital nerve is involved, is very seldom situated *above* the level of the

disease. If a patient complains of pain above the suspected spot, the presumption is either that the spot which is for the moment under suspicion is not the real seat of disease, which on examination will be found at some higher level in the spine; or that the case is not one of Pott's disease, but one in which the pain is of nervous origin, or due to muscular fatigue. A dental surgeon in large practice, who was engaged in the treatment of patients for seven hours a day, believed that he had Pott's disease. He had a tender spot over the tenth dorsal spine, and constant pain in the upper dorsal region, and about the shoulders. He was the more apprehensive as there was a marked history of tuberculosis in his family. The spine, however, was perfectly movable, and there was no pain below the level of the tender spot. A fortnight's rest removed all his symptoms.

In his classical Lectures on Rest and Pain, Mr. Hilton lays stress on the point that the pain which attends disease of the dorsal or lumbar spine is almost always symmetrical, and he relates a case in which, in a patient complaining of something wrong in his back, he was led to believe that, as the pain (in the course of the fourth dorsal nerve) was on one side only, and not symmetrical, the disease was one-sided. This view proved to be correct; for on tracing the fourth dorsal nerve backwards, he detected an aneurysm. I have, however, often met with instances of Pott's disease in these regions of the spine in which pain was entirely limited to one side. Nor, with deference to Mr. Hilton, is such limitation difficult to explain. Pain, in Pott's disease, may be unilateral, either because, as absorption of bone goes on, two adjacent vertebræ cave in, and become altered in their relation to each other in such a way that, of the pair of nerves issuing from the intervertebral foramina, one—say, the right—is pressed upon, while the other escapes. Or the same pressure effect may be produced by closely packed inflammatory exudation, or by one-sided

psoas abscess. A boy of 10 was sent to the hospital, a few months since, who, having lameness, flexion and abduction of the thigh, pain in the knee, and muscular wasting, was reported to be suffering from hip disease. On examination, the case proved to be one of Pott's disease in the lower dorsal region, with psoas abscess. Everyone will endorse Mr. Hilton's observation that in cervical disease pain is often limited to one side of the occiput, or to one shoulder or arm, for in this region disease, in many instances, involves the articular processes rather than the bodies of the vertebræ.

The true meaning of pain referred to distant parts in these cases is apt to escape notice. A child of 5 had been treated for several weeks with alteratives and regulated diet for pain at the epigastrium. It was, however, ascertained that the digestive organs were healthy, that he was free from pain when he was lying down, and worse after exercise, and that he held his dorsal spine stiff, and was unable to stoop. On examination of the spine, angular curvature was found in the upper dorsal region. A man of 30 came to the hospital, having suffered with such severe pain in his left hypochondrium that it "doubled him up." As he had not been relieved by aperients, fomentations, etc., it was thought he had malignant disease of the descending colon. He had, however, Pott's disease. Disease in the lumbar spine may be mistaken for sciatica or chronic rheumatism. A woman of 40 had been taking medicine and using liniments for eighteen months for gradually increasing "rheumatism" of the lower extremities. This patient, when she was examined at the hospital, was found to have advanced Pott's disease, attended with angular curvature and a lumbar abscess. Such oversights are becoming more and more rare in the present day, and it may be thought superfluous to make any reference to them. The writer alludes to them in the consciousness that the last attitude

of the mind to become habitual is that of thoroughness in the diagnosis of cases when the symptoms observed *primâ facie* suggest some trivial affection; and because, not infrequently, trivial symptoms are due to very grave forms of disease.

The feeling of constriction—as if a cord were drawn tightly around the abdomen—which is mentioned as a common symptom of Pott's disease, is occasionally met with, but in my experience it is but seldom well marked.

(2) When the patient, if he is old enough to do so in a trustworthy manner, has given his own account of the degree and situation of his pain, there are certain questions to put to him, the answers to which may be depended upon to help very materially in the diagnosis of the case. These are: whether it hurts him to laugh, cough, or sneeze, to travel in an omnibus or train, to make a false step in walking, to lift a heavy object? These questions apply chiefly to cases in which the dorsal or lumbar spine is under suspicion. They are of less value in respect to the cervical region. In many cases of disease in the middle or lower part of the column they elicit very characteristic answers. The patient, at the mere thought of coughing or sneezing, looks uneasy and apprehensive, and says that these acts hurt him dreadfully, or that he is afraid to perform them. As to a false step, he says, almost with a shudder at the mere thought of it, that it jars him terribly. The uneasiness or pain caused by driving or railway travelling is often very suggestive. Some patients who can walk slowly and cautiously without pain cannot bear the jar of a vehicle or a railway carriage.

It must be remembered that a negative answer to some or even all of these test questions must not be regarded as any proof whatever that spinal disease is not present.

(3) The next group of symptoms by which early Pott's disease may be recognised refers to the degree in which the

column retains or has lost its natural mobility. These symptoms must be developed by various exercises which the patient is made to perform. It must be ascertained whether, while standing with his heels together and keeping his knees straight, he can stoop without restraint, so as to bring the tips of his fingers towards his toes; whether he can stoop freely and raise himself freely in the act of picking up some small object from the floor; whether he can raise himself easily from the recumbent to the sitting or upright posture, and whether, when he lies on his back, he can turn readily on either side. In these various exercises it must be carefully observed whether all parts of the spine contribute their proper share of movement, or whether any part is kept rigid while movement is free above and below it. If the cervical region is suspected, in addition to the usual flexion and extension movements, the patient's power of nodding and rotating the head must be observed, in order to test the joints between the occiput and the atlas, and between the atlas and axis. The patient's manner of walking must also be scrutinised for the same purpose of seeing whether the spine is movable in all its parts, or whether any region is stiff. Especial attention should be paid to the manner in which he turns round. A defect either in movement or in the posture in which the spine is held is sometimes perceptible in the act of turning round which is not apparent while the patient is moving straight forward. Sometimes, again, it will be found that the column is defective in steadiness—that it seems insecure and difficult to balance. The test of picking up some small object, such as a pencil or a coin, is a very telling one, especially in children. If the spine is sound, the patient will stoop and raise himself without a pause, without hesitation, and without restraint. But if mischief is present, his proceedings are often very characteristic, and, in almost every case, peculiar enough to afford some information. A glance

will show that he is calculating how to manage so that he can keep his spine still. If his disease is acute, he will probably give up the attempt, and say that he cannot stoop. If he perseveres, he will often place himself so that the object is at his side; he will then cautiously bring his hand towards the ground, not by bending or inclining his spine, but by flexing his knees while his spine is kept rigid and nearly perpendicular. Having at length succeeded in grasping the object, he will pause so as to be sure of his balance, and will then raise himself by straightening his knees, while, as before, he keeps his spine rigid and upright. In children, the spine may be further tested by watching how the patient rises from the recumbent position. It may often be observed that he moves himself slowly round till he is on his hands and knees, and then carefully gets up. Another plan is to see how the patient can go up and down stairs. If there is disease, the spine is held stiff, movement is restrained and cautious, and the patient, especially in coming down, will use the bannisters for support.

This description is intended to be general, and, as far as may be, typical. In practice, numerous differences will be met with, but in almost every instance some of the defects of movement which have been alluded to will be apparent.

(4) Especially in children in whom the diagnosis must often be made, not by observing two or three conclusive signs, but by fitting together several fragments of objective evidence derived from different sources, the suspicion that Pott's disease is present is strongly confirmed by the observation that the patient has some device for relieving the spine of part of the work of supporting the weight of the head and trunk. Thus, in disease of the cervical spine, he may be seen to support his chin on his hand, or to support his head with his hands, especially in the effort of rising from the recumbent posture. Some children with cervical disease will sit for hours with their elbows on a

table, and with the hands supporting the head. Others, who have disease in the dorsal or lumbar region, have the habit of making their way to a chair, on which they place the palms of their hands, and over which, with their arms straight, they lean—so as to give themselves "high shoulders," and so that the weight is taken off the spine and transmitted through the arms. Another posture very suggestive of Pott's disease is that in which the patient, having slightly bent one thigh so that the limb rests on the toes, places his hand on the middle of his thigh, and then leans over to that side—so as to convey the weight from the shoulder through the arm to the thigh. These schemes for the "collateral transmission of weight" are always worthy of very careful attention.

(5) Examination of the spinal column itself. This should be made while the patient stands on a level surface, with his back to a good light. The first point—reserving the cervical spine for separate notice—is the presence or absence of deviation of any one or more of the spinous processes. In many instances it will be easy to be certain that each process occupies its strictly normal position, and that the outline of the column is intact. This is well. But such evidence is completely negative; it has no value whatever as against the existence of Pott's disease. It simply shows that as yet no caving-in has taken place. If, on the other hand, a posterior curvature, either sharply angular or somewhat rounded, is present, it is a proof that the shape of the column has undergone material change. In the great majority of instances such a deformity will in itself be enough to establish the diagnosis of Pott's disease. Yet this cannot be held without qualification, for such deformity does not necessarily depend on tuberculous disease. There are certainly three other causes of angular curvature—fracture-dislocation, malignant disease, and hydatid disease.*

* Targett, Guy's Hospital Reports, vol. l., 1893, p. 309.

Probably there is a fourth—infantile scurvy. In any case in which the deformity had resulted from fracture, the history would be known. As to malignant disease of the column (page 506), it must always be borne in mind that its symptoms present a most deceptive resemblance to those of Pott's disease. The differential diagnosis between the two conditions is discussed at page 507. As to the production of angular curvature by infantile scurvy, a few months ago, a child, aged nine months, was under observation, who was suffering in a very severe degree from this affection. Large hæmorrhages had occurred beneath the periosteum of the femur and tibia, and a considerable angular deformity of the dorsal spine had developed in the course, apparently, of about a fortnight. No *post-mortem* examination was obtained, but it seems probable that the curvature followed hæmorrhage into, and breaking down of the body of one of the vertebræ by a process similar to that which, after hæmorrhage into the growing tissue of the diaphysis of a long bone immediately beneath the epiphysial plate, may lead to detachment of the epiphysis.

But between cases in which deformity is on the one hand obviously absent, or on the other obviously present, there are some in which the appearances observed are open to an embarrassing degree of doubt. In many individuals who are perfectly sound the spinous processes are markedly irregular in length. One or two of the series are either longer or shorter than those to which they are immediately adjacent, so that either they are themselves too prominent, or, being too short, throw others into a too salient position. When this false outline of the spinous processes is met with in a patient who is either hysterical, or whose back is painful from weakness or fatigue, only very careful and repeated examination, and careful balancing of all the points in the case, can obviate a mistake. Instead, however, of attending

entirely to some particular spinous process which looks suspicious, the outline of the parts of the column immediately above and immediately below must also be observed. Often it is clear that a spinous process is merely either too long or too short, and that those next it are in a natural line with one another. But, on the other hand, it may be seen, especially in the upper dorsal region, that one particular spinous process seems over-salient, and that immediately above this the spine has lost its normal curve, and has become for some distance absolutely straight. This straightening of the spine, directly above a distinctly prominent spinous process, however slight the projection may be, is a piece of evidence of very great force in any doubtful case.

The presence of lateral curvature in the early period of Pott's disease in the lumbar or dorsal region is by no means rare, and may be very deceptive. It is found in cases in which all the direct symptoms of the disease are absent, with the exception of slight stiffness of the spine, and a minor degree of pain, such as is frequently felt in cases of mere lateral curvature. If, however, the fact that there is some rigidity of the spine secures attention, and so excites suspicion, further observation of the case will lead to a correct conclusion, especially when it is found that the lateral curvature sometimes entirely disappears after horizontal rest. A close observer may also find, where the upper meets the lower segment of the lateral curvature, some marked rigidity of the erector spinæ on one or both sides of the line of the spinous processes, so that the muscle stands out and produces a perceptible fulness. A posture which is very suggestive of Pott's disease is that in which the column leans over either laterally, or laterally and at the same time backwards, so that the patient seems to have a difficulty in keeping his balance. This leaning-tower position of the trunk is usually combined with an unsteady or insecure gait, and with rigidity of the spine, and also

with marked inability of the patient to stoop, or to lift even a light weight. It always indicates grave disease, and shows that no time must be lost in the adoption of adequate treatment. It probably depends on the fact that the disease has extended on one side to, or has primarily involved, the neural arch of the vertebræ, so that the articular processes are concerned. When this is the case, the spine leans over to the opposite side in order that pressure may be removed from the affected structures; or it may be that the disease, instead of being situated mainly in the bodies, has its chief seat in the lateral parts of the column, so that the upper segment leans to the side rather than in a forward direction.

There is another condition of the column which requires notice. In cases of slowly advancing Pott's disease in the lumbar or the lower dorsal region, the spine at this part becomes rigid, and then, between two vertebræ a little higher up, a degree of compensatory movement is gradually developed, which, *primâ facie*, would seem almost impossible. It is so free that, as the patient walks, the trunk above the level of rigidity oscillates with an obvious jerk from side to side.

I must now venture on some repetition of what has been said as to the absence of deformity of the spine in cases in which Pott's disease is not only present, but has become considerably advanced. In the dorsal region, deformity, either angular or of a more or less rounded outline (when the bodies of two, three, or more vertebræ are undergoing absorption) generally makes its appearance early, and this is especially the case in children. But, in the lumbar region, posterior curvature, whether angular or rounded, occurs much more slowly, for, in the first place, the bodies of the lumbar vertebræ are larger and firmer in structure than are the dorsal; and, secondly, the dorsal spine has already a posterior convexity which, in the presence of disease, readily becomes an angular curvature,

whereas the lumbar spine presents a posterior concavity. So that, although, as the result of loss of substance of the bodies of the vertebræ, the column is yielding and altering in shape, this alteration will not at first show itself as a posterior projection: it will consist merely in the obliteration of the normal concavity. In other words, the first effect will be that the spine becomes straight. Angular deformity will be developed only when a still further destruction of bone has taken place. In examining the lumbar spine, therefore, it is not enough to ascertain whether or not angular curvature is present. It is necessary also to observe whether the normal posterior concavity is preserved, or whether this concavity has been obliterated so that the outline of the spine is straight. If the lumbar spine is found to be straight, particularly if there is any thickening and filling up of the vertebral grooves on either side of the spinous processes, a suspicion must be entertained that disease is present.

In the cervical region, where the bodies of the vertebræ are small, Pott's disease quickly produces deformity, but deformity does not present itself as angular curvature: for, in the first place, here, as in the lumbar region, the column is concave posteriorly; and secondly, the spinous processes are, with the exception of that of the axis, comparatively small. Moreover, in the cervical much more often than in the dorsal and lumbar regions, disease is situated in the articular processes and the adjacent parts of the neural arch as well as in the bodies (page 462). The result is that, under the weight of the head, the column yields not only in front, but laterally, and some form of wry neck is produced.

Instead, therefore, of looking for angular curvature when disease is suspected in the cervical region, one must notice whether there is any appearance of wry neck, whether the neck seems to be abnormally short (as if the patient were

high-shouldered), whether the spinous processes can be felt to be thrown out of line and displaced to one or other side, and whether there is any widening of the column behind, by thickening or swelling at the sides of the spinous processes.

While discussing the diagnosis of Pott's disease, I should like to remark that certain tests which are sometimes employed appear to be of second- or third-rate value in comparison with those which have just been described. Certainly, if in any particular case diagnosis is still doubtful after the tests already mentioned have been applied, those now to be considered will be very apt to mislead. There is, first, the searching for local hyperæsthesia by applying a hot sponge from above downwards along the line of the spinous processes. In many cases no local hyperæsthesia of the skin is present in Pott's disease. It is much more frequent in neurotic patients whose spines are weak and painful; while children will wince when a hot sponge is applied, although their spines are perfectly normal. The same objection must be raised to the method of tapping with the knuckles, or dealing a slight but sudden blow with the closed hand on the spinous processes of the suspected vertebræ. This proceeding is very likely to make a child or a neurotic adult shrink, although the spine is free from disease; while, on the other hand, cases are quite common in which, although angular curvature is present, so that Pott's disease has obviously reached an advanced stage, this test does not produce any pain, or even the slightest discomfort. Some surgeons deal the blow on the top of the head, or press the shoulders down with a slight jerk. Sometimes patients complain of sharp pain when these proceedings are employed, but the result is often negative, while such tests are not always free from risk, especially if disease involves the upper cervical vertebræ.

Quiet Pott's disease.—The symptoms of Pott's disease vary considerably in different instances as to the

degree in which they are developed (pages 474 *et seqq.*). In some cases pain, stiffness, and impaired function are so marked that they at once challenge attention, while in others all symptoms are so nearly absent that the main evidence of advancing disease is a slowly increasing angular deformity; but cases are occasionally met with which go still farther in this direction, and in which the usual symptoms are entirely absent. Thus I have met with a patient, aged 19, who had a perfectly distinct angular curvature of the lower dorsal spine, of which he could give no account. His back was strong, and he was leading an active life; nor could he remember any period at which his spine had given him any inconvenience. In another case, a man, aged 45, while rubbing himself after a bath in a room in which there was a large looking-glass, noticed a swelling in his back of which, till that moment, he had been totally unconscious. Feeling alarmed, he consulted a surgeon about it, and I saw him three weeks later. The swelling was produced by a well-marked angular curvature, due to the projection of the tenth dorsal spine. So far as could be said without dissecting the parts, the case was one of angular curvature following Pott's disease. The patient, however, was quite clear upon the point that his back had never, as far as he could remember, given him any inconvenience. Even when he was told how difficult it was to believe the condition could have been developed without some attendant symptoms, he still maintained that he could throw no light upon the subject. Such cases are very remarkable. To some, they may appear inconceivable; but I may confirm my own observations by mentioning that both Sir James Paget and Mr. T. Smith have told me that they have met with exactly similar instances.

How can such cases be explained? One view might be that the patients were careless and unobservant; for it is not rare to see a person who has overlooked

some affection from which he is suffering, but which, it would be thought, must have attracted his attention. Both the patients I have mentioned were intelligent men: one was reading for the law, the other was a retired officer of the British army. Some light may, I think, be thrown on the subject by a reference to what is not rarely seen in tuberculous disease of the joints, namely, that the inflammation which the tuberculous process provokes may be plastic in its character, and may end, apparently in a few months, in firm fibrous or complete bony anchylosis. In these cases a joint (it has been either the elbow or the shoulder) is found to be firmly anchylosed, but how or when the anchylosis occurred the child's parents have been quite unable to explain. It would seem as if the tissues, although unable to prevent the establishment of the tuberculous process, yet maintain a vigorous struggle against its advance, and, gaining the day, speedily undergo sound repair at the cost, however, of anchylosis. In this way, perhaps, a case which occurred a few years ago may be explained. A boy, aged 9, had an obvious and advancing angular curvature of the dorsal spine, for which complete rest and a plaster-of-Paris jacket were employed. When the treatment had been followed for six months, the patient was taken to a bone-setter, who said that one of the buttons of his back was out. The button was accordingly "put in" by manipulation, and the bone-setter then ordered the boy to go about as usual. This he did, and no further development of spinal symptoms has since occurred. Now, the fact is well known that when angular curvature has become marked, and is still increasing, sound repair does not generally take place in so short a time as six months; but the form of plastic inflammation leading to rapid anchylosis, which I am alluding to, may run its course well within this period.

It may be useful to draw attention in a pointed

way to these cases of quiet disease of the joints and spinal column. Clinically, they are of much interest, because they are opposed to common experience in two respects: first, they run their course much more rapidly than average cases do; and, secondly, they always end, so far as I know, in firm anchylosis, which the surgeon can do nothing to avert. Anchylosis is a result which, unless an authentic statement can be made to the contrary, parents will attribute to the use of splints; but, in the cases I am referring to, splints are certainly not responsible for the result. It would have occurred just the same (but probably after, for the want of them, serious deformity had taken place), if they had never been employed. This is shown by the examples of quiet disease which have been mentioned; while, on the other hand, it is frequently seen that tuberculous joints, which have been kept uninterruptedly in splints for eighteen months or two years, recover, with absolutely free movement. In short, anchylosis is determined by the plastic character of the inflammatory process, and not by the fact that the joint is kept at rest. In practice these cases—in the instance of the joints—can generally be recognised by the circumstance that, whereas usually, when the limb is kept at rest, the movements of the joint steadily become more free, in these plastic cases the joint becomes more and more fixed, so that any movement that was at first present is soon entirely lost. In Pott's disease these cases disclose themselves by the early subsidence of pain and sensitiveness, so that the patient can turn in bed and execute other movements with freedom; and by the development of solidification and stiffness of the spine, so that the column appears as firm as a united fracture.

The wide variations in the symptoms to which allusion has been made in the foregoing paragraphs indicate that, in the management of Pott's disease, great care and close

observation are required. Without them, in some instances, treatment will be continued long after all disease is at an end; while in others, misled by the absence of characteristic symptoms, the surgeon will be induced to interrupt treatment, although serious disease is still in progress.

Treatment.—As the nature and the tendencies of the morbid process are the same in the two cases, the principles upon which tuberculous disease of the spine is treated are also identical with those which are followed in dealing with tuberculosis of the joints. The object in both instances is to arrest the tuberculous process by establishing conditions which place the bacillus tuberculosis at a fatal disadvantage. It is now well known that this micro-organism is possessed of but a low degree of vitality, and that it readily perishes when its surroundings are unfavourable. The conditions which are most suitable to it are diminished resistance of the tissues, and an area occupied by inflammatory products—materials which furnish a highly appropriate medium for its cultivation. The main objects of treatment, therefore, are to improve the general health, and to bring the local inflammation to an end. As to the general health, nothing here need be said. But the measures to be adopted for the arrest of local inflammatory action demand careful attention. The question is how can the structures concerned be protected from mechanical injury, and placed at physiological rest. The disease, as a very general rule, involves the cancellous tissue of the bodies of the vertebræ, and consists, in effect, of a rarefying osteitis. The column, at the level of attack, is therefore weakened, and rendered unfit to support and transmit the superincumbent weight. The result is that it yields, and the structures involved in the disease are compressed as they lie in the angle of deformity. To appreciate fully the gravity of this state of things it must be remembered that the spinal column is a single stem which has

alone and unaided to support the entire weight of the head, trunk, and upper extremities, and to act as the fulcrum of the powerful levers that are connected with it. In numerous instances in the economy, the principle of compensation comes to the assistance of organs whose functional capacities have become impaired by disease or injury. By this vicarious service damaged organs are, to a great extent, relieved from the necessity of struggling on in the discharge of functions which they are no longer qualified to perform. Thus when the elbow joint is diseased, its movements are to a large extent readily transferred to the shoulder and the wrist. If the shoulder joint is diseased, its movements are performed between the scapula and the trunk, or at the elbow. If a large artery is obstructed, a collateral circulation is established. The spine, however, from the point of view of its functions, is an isolated part of the skeleton. No other part can come to its relief and work in its stead. And thus it is that, although in its normal state its endowments enable it easily to discharge its functions, yet when one of its component segments (*i.e.* the body of one of the vertebræ) is diseased, it is reduced virtually to the condition of a broken pillar. Moreover, the more it leans, the greater is the force with which the affected structures are compressed. Obviously the most efficient method for putting the spine so circumstanced at rest is to place the patient in the horizontal position, and to prevent, as far as possible, any disturbance of the parts.

In order to carry this method into effect, the patient is placed on a well-made and firm mattress, and is never allowed in any circumstances to sit up, or to move his limbs freely. For washing, he is very gently rolled over to the necessary extent. In disease of the cervical spine still further precautions are required. (*See* page 497.) It cannot, however, be denied that this treatment by complete horizontal rest, extending over many months, or even, in

advanced cases, over two years or more, is tedious and trying to patients and relatives alike. And, in order, if possible, to avoid it, persistent endeavours have been made to treat the disease while the patient is up and moving about. To effect this purpose, two conditions have to be fulfilled. In the first place, the downward pressure of the superincumbent parts must be removed from the point of disease, and the spine must be defended from movement and other forms of mechanical disturbance. To carry out these indications, appliances of various kinds have been introduced. Of these the best known are the plaster-of-Paris jacket, which was introduced by Professor Sayre, with the "jury mast" when disease was situated above the middle dorsal vertebræ; and the poro-plastic, or felt jacket. As the principal points which have to be considered in the treatment of Pott's disease while the patient is up and about are clearly presented when Sayre's jacket is used, it is advisable to examine the method in which this apparatus is supposed to act, and to see what it is really able to effect.

When a Sayre's jacket is applied in spinal caries, how are the functions of the column performed? How is the weight above the seat of disease supported and transmitted to the pelvic arch, and how are the acts of walking, stooping, rising, lifting objects, etc., carried on? Either the patient is using his spine, or he is using the jacket instead of his spine. If he is using his spine, the theory of the jacket breaks down; while, if it is maintained that he is using the jacket instead of his spine—that the jacket becomes vicariously a part of the skeleton, and replaces the spine in respect to the bearing of weight and the execution of various movements—the proposition is one which seems to deserve close examination. Now, can the jacket remove the superincumbent weight from the spine at the point of disease? Can it support the weight of all the parts above the level at which disease exists? Let us suppose that the

disease involves the body of the sixth dorsal vertebra, and, in order to simplify the question as much as possible, that the patient is standing still. When the body of the sixth dorsal is in process of destruction, the fifth tends to descend towards the seventh, with the result that the column bends forwards, and that the parts in the angle of deformity are compressed. It is therefore required of the jacket that it shall take the weight of the upper part of the column off the lower part, and transmit it by a collateral route to the pelvic arch. If this is to be done, two conditions appear to be essential: (1) There must be an efficient base on which the jacket may rest. (2) The jacket must have a secure hold on the part of the column which it is required to sustain. Let us first examine the base. In young adult females, in whom the pelvis is broad and much greater in circumference than the thorax, and in whom the waist is small, the jacket rests on the expanded iliac crests, and the adjacent shelving bony framework of the hips, and the basis of support is good. In male subjects, however, the pelvis is much less expanded, and its circumference is often less than that of the thorax, while in children under seven (frequent subjects of Pott's disease), while the circumference of the pelvis measures, say, twenty inches, that of the thorax is often from twenty-one to twenty-four inches. Thus, while the thorax and pelvis in young adult females form a cone with the base directed downwards; in males, and quite as markedly in children, these parts form a cone, the wide part of which is above. How then can the pelvis afford the jacket an efficient basis on which to rest? But more than this. In estimating the efficacy of the basis of support afforded by the pelvis, it must be remembered that the tendency of the spine is to fall forwards, and that therefore it is required that the purchase should be especially firm in front. In front, however, there is no bony point except the symphysis pubis. But this presents no horizontal

surface looking upwards on which the jacket can rest. I believe no one supposes that the symphysis does, as a matter of fact, afford any support. Yet, besides the symphysis, there is nothing but the muscular wall of the abdomen, with intestines behind it--structures which, in respect to their capability of giving support to an instrument, may fairly be compared to a more or less tightly filled air cushion. They yield and recede as soon as any pressure tells on them. It is held by some surgeons that the purchase anteriorly is not on the abdominal wall, but on the anterior iliac spines and the iliac crests. But can this really be the case? In children these parts are so little salient, and are, so to say, so embedded in the abdominal wall that the jacket cannot "clip" them. Even if they could be made to serve as points of support, would the skin over them bear the pressure representing the weight of the parts above the curvature? If they were thus used, should we not meet with pressure sores over them? Though there is a great liability to pressure sores over the spinous processes of the vertebræ, they are very rarely, if ever, met with over the anterior spines or the crests of the iliac bones. I believe that these points, as a matter of fact, even where the jacket is pinched in above them, so that it has, what a child of seven has not, something like a waist, afford but very slight support. This is evidently the view of Dr. Sayre, who at p. 17 of his work says, "A detail of practical value is the application over each anterior superior spine of two or three thicknesses of folded cloth three or four inches in length. If these little pads are removed just before the plaster has completely set, such bony processes will be left free from pressure."

Thus one of the great difficulties of the problem is that no efficient base for the support of the weight which the jacket is required to support and transmit can be obtained. But next to a firm base to rest upon, the jacket should

have a secure hold of the part of the thorax which it is called upon to support. It has been said that the jacket fits so closely that it moulds itself to the alternate ridges and hollows formed by the ribs and the intercostal spaces, and thus securely grasps the chest (Sayre). Nothing of this kind, however, is practicable. The movements of the ribs in respiration would be arrested, and the breathing would be entirely diaphragmatic. Nor would the skin, compressed between the jacket and the ribs, bear such pressure. Nor, again, in a child do the ribs and intercostal spaces form alternate ridges and depressions. Moreover, as a matter of fact, the finger, so far as I have ever seen, can easily be passed down between the jacket and the surface of the chest. In considering the hold which the jacket should have on the thorax, in order that it may remove weight from the point of curvature, it must be remembered that the work must be done, so to speak, on a fine scale. The diseased surfaces cannot be separated with safety, so that there is any wide interval between them. It is rather a question of relieving the mutual pressure of the opposed surfaces than of separating these surfaces from each other. So, if the support is to be adequate, it must act within about the sixth or the eighth part of an inch. In other words, if the jacket, after it is applied, allows the upper segment of the spine to subside the sixth part of an inch towards the lower segment, pressure at the seat of disease returns, and the jacket, so far as its lifting capacity is concerned, loses its effect. And the difficulty of maintaining this slight amount of separation is increased by the structure of the spine itself. If the portion of the spine above and that below the disease were two solid rods, any extension that was applied would tend to separate their adjacent ends, and diminish their mutual pressure; but in the spine—formed as it is of a chain of alternate solid blocks and elastic discs—

the extension used is to a great degree lost in the general mobility of the column, and cannot be made, with any amount of precision, to act on the point at which the disease is situated.

Thus when it is seen that the amount to which the two segments of the spine can safely be separated does not exceed about the sixth of an inch; that the extending force must be conveyed through a column permitting in its whole length considerable mobility; that the apparatus employed is a case not applied so as to surround the spine itself, but the whole thorax and abdomen as well; that there is no adequate base from which the case can take its pur chase, that, in fact, this base is usually no larger, but often much smaller, than the part above for which support is required; that, in order that the function of respiration may be carried on, the case must be sufficiently loose to allow the thorax some play beneath it, I cannot but feel the doubt that arises whether the jacket is competent to carry out the principle upon which it is supposed to act.

Thus far, however, I have supposed that the child is standing still. I have discussed the effect of the jacket without reference to muscular action. This part of the question, however, calls for some remark. During muscular action, the spine works both as a whole and in all its parts by leverage. Thus, for example, when the dorsal is extended on the lumbar spine, it forms a lever, the lumbar spine acting as its fulcrum, while the erector spinæ is the power. When a lever acts it is pressed against its fulcrum. Therefore every movement of one part of the spine on another part is attended with intervertebral pressure. Now, when a person with spinal caries is fitted with a jacket, and allowed to go about, what happens when he moves his spine—when *e.g.* he rises from the stooping to the upright position? If it were possible to detach the muscles from their insertions into the spine and fix them to the jacket, the spine might

remain passive, and be carried up in the apparatus; but, as it is, the spine, with the parts appended to it, is raised by muscular action, precisely as it is in health, and with the same amount of intervertebral pressure. It is the jacket, and not the spine, that is passive. The only material effect of the jacket is to add to the weight which the spine is called upon to raise.

The value of a given method of treatment, however, must be determined, not so much by *à priori* reasoning—although this is not altogether out of place—as by its results in actual practice. In former years, at the Hospital for Sick Children, and in the orthopædic department of St. Bartholomew's Hospital, I used Sayre's jacket in a large number of cases of Pott's disease, in patients between the ages of three and ten. In those in whom the disease was active, the jacket often produced decided improvement. It relieved pain, and enabled the patients to move about with less difficulty. It steadied the spine, and limited movement at the seat of disease. In other words, it secured some amount of mechanical rest. But its effect was not sufficient to exercise any very marked influence on the course of the disease. It did not prevent the further increase of deformity, or diminish the proportion of cases in which suppuration occurred; while paraplegia was, I believe, certainly more common than it is when patients are treated in the recumbent position. Moreover, the treatment, even in cases in which recovery ultimately took place, extended over a very long period of time, amounting in some instances to four or five years. As to the "jury mast," although a contrivance of considerable mechanical ingenuity, it was disappointing in practice, and was given up. It is now very seldom used by English surgeons.

In the case of out-patients, however, for whom nothing can be done but to employ some simple form of apparatus which requires no skilled supervision, the plaster jacket may

be used with some advantage. Though inadequate, it is often the best means which the surgeon has at his disposal.

As to the poro-plastic or felt jacket, this has appeared, for hospital cases, to be inferior to Sayre's apparatus. It is much more costly, and it does not fit so accurately.

In young female adults, with wide hips, a well-applied plaster or felt jacket (the latter being strengthened by narrow metal bands where the strain is greatest), may be used if the disease is not in an active stage.

The method of complete horizontal rest is, in my experience, the best that is known for the treatment of Pott's disease. For children, a well-made and sufficiently firm mattress, a few inches longer and a few inches wider than the patient, is placed in a shallow tray made of light wood. This tray is just large enough and just deep enough to form a framework for the mattress, and its floor is perforated for ventilation. Two slots are cut in the head end and two in the foot end, so that it can be easily carried. In cases of disease involving the atlas and axis, a small pillow is placed under the nape of the neck, and the head is fixed by a horse-shoe sandbag. The pillow under the nape of the neck has the effect of throwing the head slightly backwards. This is a necessary precaution; for if the head is allowed to move forwards, the task of supporting its weight falls on the transverse ligament and the odontoid process, and when these structures are weakened by disease one or other of them may give way—an accident which will be attended with an immediately fatal result (page 468). The horizontal position, with the shoulders constantly flat upon the mattress, is secured by the shoulder straps shown in Fig. 59. In cases in which children are restless, movement of the lower limbs may be checked by applying a Liston's long splint to each limb, and connecting the lower ends of the splints by a cross-piece (Hamilton's splint), or by using a carefully fitted and

well padded double Thomas's splint. When the disease is situated in the dorsal region, a poro-plastic jacket is often useful as a means of protecting the spine from movement. It is left soft at the level of the disease over an area large enough to receive the prominence of the curvature, so that the skin is not injured. It has always seemed to me impracticable to keep a child at rest in the prone position, and for my own part I never advise its use. During the treatment, the child should be kept both by night and by day on the mattress, from which he should be moved to another bed, once in every fortnight, while the mattress is turned and the bed linen changed. A bed pan must be used, and for washing and good nursing the child should be turned over on his side only so far as is absolutely necessary. The patient should be out in the fresh air as much as possible, lying in his tray, on a spinal carriage.

This treatment is doubtless beyond the reach of the children of the poor, except for the few who can be kept, at the expense of the parish, or in some of the institutions for chronic cases. But, in the latter who are in this fortunate minority, and in those whose parents are in good circumstances, the prognosis of Pott's disease, when treatment is begun while the mischief is still limited, is very much more favourable than many would readily believe. If curvature is not already developed, complete recovery will take place in from eighty to ninety per cent. of these cases. Curvature already present, in the great majority of instances, will not further increase. In some instances a curvature which, without being extensive was yet perfectly well marked, has disappeared. After recovery, the spine, at the level of the disease, usually remains fixed, probably because bony anchylosis has occurred. The period during which horizontal rest should be continued varies. In incipient cases it must be six months (very rarely sufficient), nine months, a year, or

even longer. The surgeon must take into account the stage the disease had reached before treatment was commenced, and the degree of its activity; and must be further guided by the time that has elapsed since the curvature has shown any tendency to increase, and since the patient has complained of pain, or has seemed sensitive on slight movement, or on coughing, sneezing, or forced inspiration. It can only be said, in general terms, that when Pott's disease has once been established, recovery is very seldom complete in less than twelve months. In more advanced cases the time must be commensurately extended. A large proportion of cases which have been in progress for from three to six months will recover in the course of the second year of horizontal rest. In some instances of advanced disease, recovery without subsequent relapse has occurred after rest had been maintained for four years; while in the case of a woman of 44, in whom disease had existed for two years, recovery, apparently with bony anchylosis, took place only at the end of seven years. This patient, however, is now sound and active. These periods may doubtless appear long, but the necessary time is well spent. The same result cannot, I believe, be obtained in any other known method of treatment in so short a time with the same degree of certainty, and with such a limited amount of deformity and infrequency of suppuration.

When the allotted period of horizontal rest is over, the patient is allowed to sit up very gradually, and at length to move about; and any evidence that recovery is not complete must be at once accepted as showing that rest should be continued for a further period. For a few months after the patient is allowed to be up, a poro-plastic jacket may be usefully applied, and in some cases crutches are an assistance. In disease of the cervical spine, a well-moulded leather collar, resting by a wide base on the shoulders and supporting the occiput and the chin, should be employed.

Should suppuration occur, the abscess should be at once evacuated, and treated by the method described on page 420. Managed in this way, the great majority will heal either at once or in the course of a few weeks. Abscesses in connection with disease in the cervical region should be opened in the posterior triangle, behind the sterno-mastoid muscle, care being taken not to injure the spinal accessory nerve. When a retro-pharyngeal abscess is to be opened, deep anæsthesia should not be induced, for in that condition respiration may become very seriously embarrassed.

In 1884 Mr. Treves * urged the evacuation of psoas abscesses through an incision in the loin. Here the incision is, when the patient is recumbent, in the most dependent position, and further, it allows of the removal of any sequestra or carious bone that may be present. I have used this method on several occasions, and the results obtained have been very satisfactory. I have never myself met with sequestra of any material size, nor do I believe they are often present. Yet seeing that they may occur, the condition of the affected bodies of the vertebræ, in cases in which the seat of disease can be reached through the lumbar incision, should be ascertained, and any loose bone should be removed. The following are the main points of Mr. Treves's operation:—An incision of about two and a half inches is made on the vertebral side of the outer border of the erector spinæ (about two and a half inches from the spinous processes), and the muscle itself is exposed by dividing the vertebral aponeurosis. The erector is easily recognised by the vertical arrangement of its fibres. Its outer edge is now defined, and the whole muscle is drawn, by means of retractors, as far as possible to the middle line of the back. When this has been done the anterior part of the sheath of the muscle, that is, the middle layer of the fascia lumborum, is exposed.

* Med. Chir. Trans., vol. lxvii. p. 113.

Through this layer the lumbar transverse processes are sought for. The longest and most conspicuous is that belonging to the third vertebra. The anterior layer of the sheath of the erector spinæ, already mentioned, is then divided, and the quadratus lumborum is thus exposed. The quadratus in this situation is thin, and between its fibres are to be seen tendinous bundles arising from the tips of the transverse processes. The muscle should be divided close to the extremity of a transverse process, and the incision cautiously enlarged to the full extent of the skin wound. It is at this stage that there is danger of wounding the abdominal branches of the lumbar arteries. The psoas muscle will now be exposed: its fibres, like those of the quadratus, running downwards and outwards. The interval between the two muscles is marked by a thin layer of fascia (anterior layer of the lumbar fascia). Some of the tendinous fibres of the psoas being divided close to a transverse process, the finger is gently passed down to the anterior aspect of the spine, and the condition of the bones ascertained. The incision in the psoas can be enlarged to any necessary extent. Mr. Treves lays great stress on the necessity of avoiding injury of the lumbar arteries. Patients with psoas abscess are usually young, and also thin; while, if any moderate deformity exist, it serves to render the region of the disease more easy of access; so that in actual practice no great difficulty is likely to present itself in the operation. Those who propose to undertake this method should consult Mr. Treves's account,* and, if possible, gain practical familiarity with the proceeding on the dead subject.

Paraplegia.—It has been already stated that paraplegia is comparatively rare in Pott's disease. I am unable to give any exact statistics; but probably it is not met with in more than about five per cent. of the total number

* "A Manual of Operative Surgery," 1891, vol. ii. p. 731.

of cases. In instances that are adequately treated in their early stage it is almost unknown. The probability of its occurrence bears no close relation to the amount of deformity which the spinal column has undergone. In fact, when several vertebral bodies have been destroyed, the size of the neural canal, instead of being diminished, is often considerably enlarged. When, on the other hand, only one vertebral body is lost, the column bends at an acute angle and there is much more danger that the cord will be subject to direct pressure. Motor paralysis is accompanied by exaggeration of both the superficial and the deep reflexes. Knee-jerk is increased, and more or less ankle clonus is present. Sensation is usually unaltered; but there may be hyperæsthesia, or patches of anæsthesia, in the course of the nerves which leave the cord at the level of the disease. Often there is considerable wasting of the muscles in the parts below.

Paralysis commonly involves both lower extremities, but only one may be affected. A child of 9 was recently admitted into the hospital on account of complete paralysis of one leg. She had been, according to the mother's report, well till four days previously, when the paralysis suddenly occurred. The cause was at first obscure, but when the spine was examined an angular curvature at the level of the sixth dorsal was found. In some instances, together with loss of movement there is muscular rigidity (spastic paraplegia). The lower extremities are rigidly extended, and sometimes crossed over each other; and the heels are drawn up, so that the feet are in a position of talipes equinus. Occasionally there is loss of control over the bladder and rectum. As the disease, in the great majority of cases in which paraplegia occurs, is situated in the upper dorsal region, paraplegia is frequently accompanied by paralysis of the abdominal and intercostal muscles. In not a few instances this is

overlooked. It may, therefore, be useful to specify the symptoms by which it may be recognised. (1) It will be noticed that during the most forcible inspiration of which the patient is capable, the lower ribs are neither raised nor abducted, so that when a tape measure is placed around the base of the thorax, it registers no increase of circumference when the attempt at a full inspiration is made. (2) During inspiration the abdomen, owing to the descent of the diaphragm and the flaccid condition of the abdominal muscles, becomes more prominent. (3) During inspiration, also, the intercostal spaces, as the intercostal muscles are flaccid, are depressed. (4) The patient cannot cough loudly: for he can neither fill his chest by a strong inspiration with his intercostals, nor forcibly empty it by a vigorous contraction of the abdominal muscles.

Paraplegia is generally developed slowly, and is indicated by gradually increasing weakness of the lower extremities and difficulty of walking, especially in the act of going upstairs. In some instances, however, paraplegia comes on rapidly, or even suddenly.

Prognosis.—The various causes of paraplegia in Pott's disease have been mentioned at page 465. Although it is occasionally produced otherwise, it is very generally due to the pressure of granulation-tissue developed between the bony walls of the neural canal and the dura mater enclosing the cord. When this is the case, and when the patient is kept at complete rest in the horizontal position, the paraplegia, as the granulation-tissue is absorbed, will disappear. The time required for the restoration of movement varies with the case. In some instances it is complete in the course of a few weeks; in others, it takes place very slowly. No improvement may be perceptible for six or nine months, or even for a still longer period. Yet, in the great majority, recovery will at length be accomplished.

In a limited proportion of cases, however, although horizontal rest has been fully tried, no return of movement has been obtained. This failure may depend on inflammatory softening of the cord itself, or on pressure produced by a displaced sequestrum, or some other cause (page 465); but it is generally due to one of two conditions: either granulation-tissue has become organised into cicatricial material, by which the cord is permanently constricted; or the lumen of the canal has been seriously encroached upon by displacement of the bones themselves.

It is for those cases in which no return of power has followed prolonged rest, that operative treatment by laminectomy has been introduced. This operation consists in the removal of two, three, or more spinous processes and laminæ, so that the spinal canal is opened at the point of curvature in order that the cause of the paraplegia may be ascertained, and, if possible, removed. The proceeding, in carefully selected cases, undoubtedly affords excellent results, and secures recovery, which would otherwise be hopeless. It is necessary, however, not only to point out that in the great majority of instances of paraplegia supervening on Pott's disease laminectomy is quite uncalled for, but to emphasise the fact that the proceeding is one which, however skilfully performed, may be attended with grave results. It must be remembered that in advanced Pott's disease the bodies of the vertebræ concerned may be in great part, or completely, destroyed, so that, as far as they are concerned, the continuity of the column is more or less interrupted. Now, while the neural arches and their ligaments are entire, these structures serve to connect the segment of the spine above with the segment below the disease, and brace them strongly together. As this is the case, it is readily seen that their removal must tend to weaken the column to a perilous extent. This anticipation has been confirmed by actual cases. In some

instances the result of laminectomy has been a rapid and considerable increase of deformity, while I know of one in which, on the completion of the operation, the spine had become resolved into two distinct portions, which moved freely upon each other, and which were separated by an interval of upwards of half an inch. The spinal cord, deprived of all bony support, passed like a bare rod across this interval. The case ended fatally.

The operation, so far as present experience may be taken as a guide, should be limited to the following cases: — (1) Those in which, although absolute rest has been maintained for at least six months, no improvement can be detected. Six months is the shortest time; but, if the treatment by rest can be continued, it will be best to postpone laminectomy for a further period of three or even six months. Many cases which have been allowed the more extended period have ended, without laminectomy, in complete recovery. (2) In which paraplegia has followed disease situated in the neural arches instead of the bodies (page 469). In such instances, as Mr. Thorburn remarks, laminectomy "is clearly indicated, as here we can readily both treat the paraplegia and remove the whole of the tuberculous tissues." It must, however, be allowed that the differential diagnosis of this group can seldom be made with any degree of certainty. (3) In which complications are present which place the patient's life in urgent danger— such as difficulty of breathing, which has suddenly become more marked; or in which symptoms appear to indicate that an abscess has burst into the spinal canal. The prospect of recovery under these conditions is, however, very unfavourable, and the imminently dangerous nature of the case ought to be fully explained to the relatives of the patient.

CHAPTER XXXV.

MALIGNANT DISEASE OF THE SPINE—NEUROTIC SPINE—OSTEO-ARTHRITIS OF THE SPINE.

THE spinal column is liable to be invaded by two forms of new growth of a malignant character.

Sarcoma.—Primary sarcoma may be either periosteal or endosteal. The endosteal variety usually begins in the cancellous tissue of the body of one of the vertebræ. The periosteal may involve either the body or some part of the neural arch. The endosteal, from the specimens I have been been able to examine, is more common than the periosteal form. Microscopically, the growth is found to consist of either round, or spindle, or mixed cells. Myeloid sarcoma of the vertebræ appears to be very rare, even if it ever occurs. When sarcoma becomes disseminated secondary deposits may take place in the spine. Thus, No. 1130 in the Museum of St. Bartholomew's Hospital is a specimen of sarcoma involving the right side of the sixth cervical vertebra of a woman who had primary sarcoma of the uterus : other deposits were found in the lungs and pericardium ; and No. 483 shows secondary deposits in the spine in a case of melanotic sarcoma of which the primary seat was a cutaneous mole.

In whatever manner the disease originates, it usually undergoes rapid development. As the growth increases in size it may protrude in front or at the sides of the bodies of the vertebræ ; or it may extend into the neural canal and speedily involve the cord. The affected vertebræ become widely infiltrated and broken down, and the destruction of bone is usually great.

The clinical history of sarcoma of the spine is extremely grave. The disease steadily and, as a rule, quickly advances, and few of those who are attacked by it survive more than from three to six months.

Symptoms.—These are, in general terms, identical with those of Pott's disease; yet, on close examination, certain differences are to be observed which should before any long period has elapsed raise a strong suspicion as to the real nature of the case:—(1) Pain is generally much more severe from the first—altogether a much more prominent symptom—in sarcoma than it is in even the most acute cases of Pott's disease. In some cases it soon amounts to agony, especially on any attempt at movement. (2) Paraplegia, or paralysis of a limb or of a single group of muscles, is commonly present early; and, instead of passing off when the spine is placed at rest, as paralysis usually does when produced by Pott's disease, it steadily, and often quickly, becomes more marked and extensive. (3) Incontinence of urine and fæces is soon developed, and pressure sores are very apt to form. These features of severe pain, persisting in spite of rest, increasing paralysis, incontinence of urine and fæces, and pressure sores, all show that the spinal cord itself has become involved, either by extension of the disease to its substance, or by pressure of the new growth upon its surface. Such symptoms are not usually present in Pott's disease, and their occurrence should, therefore, always raise a suspicion in any case in which they are observed that a new growth may be present. (4) The disease advances rapidly, so that deformity (often distinct angular curvature) is developed early, perhaps in the course of a few weeks. It should, however, be remembered that deformity is not always present, even when sarcoma is extensive and far advanced. (5) The patient, instead of improving in health and gaining flesh, as is to be observed in those who are placed at rest for

Pott's disease, continues to waste and become feeble and cachectic.

The following cases will serve as illustrations :—A girl of 6 had, as it appeared, clear symptoms of Pott's disease in the cervical region. The head and neck were kept in a fixed position ; movement was painful. The child supported her head with her hand, as children do when they have Pott's disease. The spine yielded so that the position became that of wry neck. Soon a deep-seated elastic swelling appeared in the right sub-occipital region which was regarded as an abscess. This gradually enlarged and approached the surface, and when superficial enough for full examination seemed to fluctuate distinctly. When, however, an incision was made only blood escaped. Subsequently what was obviously a sarcoma rapidly attained a large size, and the child died in about two months. On *post-mortem* examination the left halves of the three upper cervical vertebræ were almost entirely destroyed and replaced by new growth.

Dr. Lewis Jones has recorded* a case, of which the following is a brief abstract. A girl of 9, admitted under the care of Dr. Gee, with slight albuminuria, and a temperature of 101°, had been complaining for a week of pain in her right hip and knee. At first the pain subsided when the child was resting in bed, but soon returned, and she steadily wasted. Seven weeks later she had complete motor paralysis and impairment of sensation in the lower limbs, with incontinence of urine and fæces, and a bed sore. Death occurred about four months from the commencement of the illness. On examination after death, all the vertebræ below the fourth dorsal were found infiltrated with sarcoma (round-celled, under the microscope), and there were two or three nodules in the upper dorsal vertebræ. The sacrum was entirely occupied by the new growth. The left ilium

* St. Bartholomew's Hospital Reports, vol. xx. p. 225.

was also extensively infiltrated, and a large growth protruded into the left iliac fossa, and involved the psoas muscle. The lumbar glands were infected, and there were secondary deposits in the ribs and the first bone of the sternum; the right sterno-clavicular joint was completely disorganised. In this patient no tumour was anywhere perceptible, and there was no angular curvature of the spine. "In fact," Dr. Lewis Jones remarks, "during the period of two months, during which her chief symptom was pain in various parts of the body, there was nothing to give a clue to a correct diagnosis." The spinal cord itself was not directly involved in the disease, but the meninges were thickened by growth on the outer surface of the dura mater for about two inches in the lower dorsal region. No. 438A in the St. Bartholomew's Hospital Museum (Fig. 71) shows a sarcoma, in a boy of 18, springing from the laminæ of the sixth, seventh, and eighth dorsal vertebræ which, as it grew, destroyed the cord. In this case the first symptom observed was sudden paraplegia. An acute bed-sore developed forty-eight hours later. The patient died at the end of six

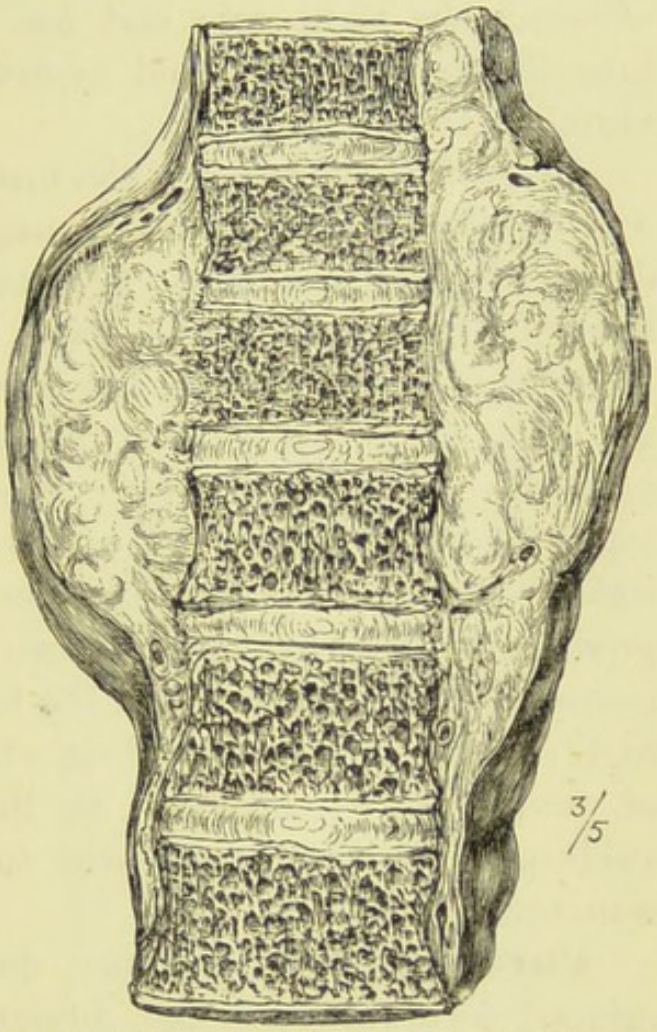

Fig. 71.—Sarcoma of the Spine, which led to sudden Paraplegia. (From a specimen, No. 438A, in the Museum of St. Bartholomew's Hospital.)

months. No. 1130 shows sarcoma of the sixth cervical vertebra secondary to sarcoma of the uterus in a woman aged 22. There were secondary deposits also in the lungs and pericardium. The patient had paralysis especially affecting the right arm and leg. The growth projected into the spinal canal, and protruded through the intervertebral foramina.

In the following case, if the history was correct, sarcoma was developed in a spine which was the seat of Pott's disease of long standing. A woman, aged 24, was said to have had curvature of the spine when she was 18. She had always been delicate, but she could walk till she was 22. She then moved with difficulty, and complained of pain in her back and sides. When I saw her, two years later, she was lying in bed with considerable deformity of the lower part of the lumbar spine, exactly similar to that produced by the excavation of two or three vertebræ in the course of Pott's disease. In the left iliac fossa was a large highly elastic and tense swelling, which occupied the position of, and exactly resembled, an iliac abscess. When this swelling was incised, it proved to consist of a large sarcomatous growth.

Carcinoma.—Carcinoma does not originate in a primary form in the spinal column. But when dissemination takes place in carcinoma of the breast, or some other part, the vertebræ are liable to be the seat of secondary deposits. As long ago as 1841, Mr. Cæsar Hawkins contributed a paper on this subject to the Transactions of the Medico-Chirurgical Society. Of the cases he related, twelve in number, one half followed scirrhous carcinoma of the breast. In one, recorded by Cruveilhier, the primary disease was in the testis. In the St. Bartholomew's Hospital Museum, No. 1131B shows deposits of carcinoma in the right half of the second, third, fourth, and fifth cervical vertebræ in a case of primary carcinoma of the thyroid gland.

No. 1129 consists of the upper cervical vertebræ of a man, aged 35, who had suffered for eight or nine months from pain in the neck and shoulders, which was attributed to rheumatism. For the previous four or five months an alteration of his gait had been observed; the shoulders were elevated and the neck was shortened. For two months he had been unable to wear a collar. One month before death the limbs and trunk became paralysed. Power in the left arm and leg failed first, and in the course of a few days the paralysis was complete. The urine and fæces were passed involuntarily. The immediate cause of death was paralysis of the respiratory muscles. On examination, the second and third cervical vertebræ were found to be almost entirely destroyed by carcinomatous growth. The seat of primary disease is not mentioned. No. 1131 (Fig. 72) consists of seven cervical vertebræ from a man who died of scirrhous cancer of the breast, and secondary deposits in other organs. Five vertebræ are affected with scirrhous cancer. In the first and last two the cancellous tissue is loaded with the growth, whilst the

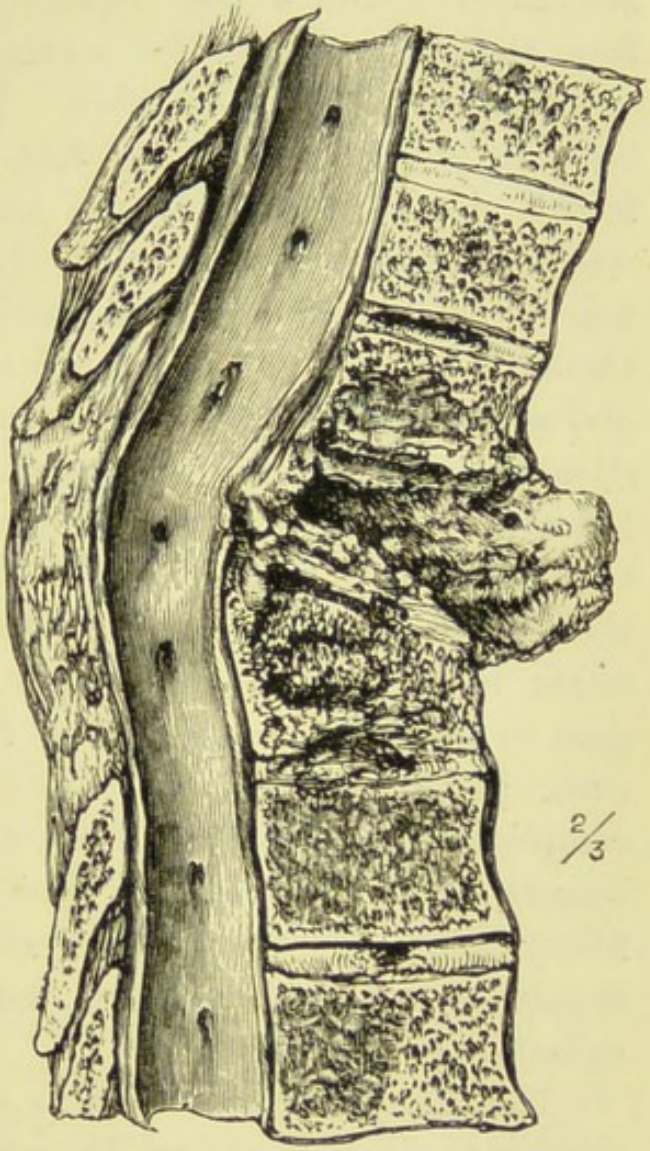

Fig. 72.—Carcinoma of the Spine, secondary to Carcinoma in a Male Breast. (From a specimen, No. 1131, in the Museum of St. Bartholomew's Hospital.)

two intervening vertebræ are almost entirely destroyed. The chief indications of the disease consisted of severe pains like those of rheumatism in the loins and lower limbs. It is not stated whether any paralysis occurred. No. 2540 shows a soft brain-like carcinoma, projecting from the left side of the cervical spine from the fourth vertebra to the sixth vertebra. The growth is attached to the posterior surface of the dura mater. A portion of the fourth vertebra is infiltrated and softened. The disease was secondary to carcinoma of the pancreas. The patient was a man, aged 46, who came under the care of Dr. Ormerod in July, 1879, complaining of constipation and abdominal pain. He had already had pains in the left shoulder, and in the previous week had lost power in his left arm. This pain and loss of power in the arm increased, and the muscles became atrophied. He had numbness in the fingers and he quickly lost flesh. Two months later he began to lose the use of his right hand, and complained of pain in the right biceps. In a few days both his legs became paralysed, and the paralysis extended and became complete in all parts except the right arm. The respiration became embarrassed, and he died in about four months after his symptoms were first observed. The tumour remained deeply seated, and was not noticed till the *post-mortem* examination was made.

The changes which occur in the spine in carcinoma are similar to those produced by sarcoma. The bodies of one or more of the vertebræ become infiltrated and softened, and the growth, when it protrudes from within the bone, may be placed in front or on the sides of the bodies, or it may project backwards so as to involve the lateral parts of the neural arches, and fill up and escape from the intervertebral foramina. In this situation it infiltrates or compresses the spinal nerves. Or, projecting into the spinal canal, it infiltrates the membranes and compresses or

destroys the cord. The first symptoms are severe pains in the lower extremities, or in the parts supplied by the nerves which leave the cord at the level of the disease. These are followed by increasing weakness of the spine, severe pain on movement, and by more or less extensive paralysis.

When the lower cervical region is the part involved, paralysis of one arm is often an early symptom. Or there may be paraplegia, with incontinence of urine and fæces, and the formation of pressure sores. In many cases a well-marked angular deformity is produced. This, however, is not by any means always present, even when the disease is far advanced. The affection, like sarcoma of the spine, makes rapid progress. The patient loses flesh and strength, and dies in from three to six months, either of exhaustion, or of lung complications, the result of impaired action of the muscles of respiration. In other instances, again, death results from secondary deposits in the lungs, liver, or some of the other viscera.

Malignant disease—whether sarcoma or carcinoma—of the spine, may fairly be spoken of as rare. Yet it is not so rare, either in children or in adults, that it can be safely left out of account in the diagnosis of obscure spinal cases.

Symptoms.—Its recognition, in the early stage of its development, is often very difficult. The chief symptoms to be observed at this period consist of increasing weakness and difficulty of movement, and severe pain, either local or referred to the peripheries of the nerves concerned. The situation in which pain is felt depends upon the level at which the spine is involved, and the degree in which the cord itself, and the spinal nerves, as they issue from the intervertebral foramina, are infiltrated or compressed. But these symptoms of weakness and pain are often vague and inconclusive. In many cases weakness is deceptive, for it may seem to be due to mere loss of general health, and the pains

of which the patient complains may present no feature in any way characteristic of their spinal origin. In carcinoma, moreover, the fact that primary disease is present may be unknown, for not rarely patients with carcinoma, of the breast for example, are so terrified by their anticipations that they keep the matter to themselves, and, if asked whether they have a swelling, will persist in their denial that any is present. A woman, aged 43, had severe girdle pains round the lower ribs and pain in the spine, with weakness of the legs. The pain was sometimes intense, and she moved with difficulty. Evidently serious mischief was in progress. At first sight the case might have been regarded as one of acute Pott's disease, but the severity of the symptoms was out of all proportion to the local evidence, for all that could, at this period, be made out was that the spine was stiff; there was no angular deformity. As it was thought that possibly a new growth was in progress, the patient was asked if she had any swelling elsewhere, particularly in either breast, but she said that nothing of the kind was present. When further pressed, however, she allowed that she had known of a swelling in the left breast for eleven months. On examination a far-advanced scirrhus was found, together with extensive enlargement of the axillary glands. A few weeks later angular yielding of the spine became apparent, and pain in spite of recumbency remained very severe; the right lower limb and, three weeks later, the left became paralysed, and the patient lost control over her bladder and rectum, had large bedsores, and died, eight months after the first symptoms were noted, from exhaustion.

Further: In regard to diagnosis, it must always be borne in mind that in the early stage of the affection the symptoms of a new growth in the spine are indistinguishable from those of Pott's disease. It is, therefore, only by remembering the possibility that malignant disease may be

present, and by studying the collateral as well as the direct evidence, that mistakes can be avoided.

As to the treatment of malignant disease of the spine, there is very little to be said. Palliative measures can alone be adopted. The only position in which the patient can escape severe suffering is that of horizontal rest on a tolerably firm mattress, with pillows arranged to obviate pressure. A poro-plastic jacket, soft opposite the curvature, may, by steadying the spine, afford some relief from suffering, and render the necessary movement of the patient less painful. Anodynes must be used, though their amount should be carefully guarded. The hypodermic injection of morphia, sparingly employed, will be required in the later stages of the case, and will be the only means by which some palliation can be secured.

It may be well to add that the patient should be kept strictly in the recumbent position; for I have met with two instances in which the spine (as may be the case with a long bone involved in a new growth) underwent spontaneous fracture attended with sudden displacement of the fragments and compression of the cord.

Neurotic spine.—Female patients between fifteen and thirty-five are often met with who complain of pain in some part of the spine, and of inability to undergo active exertion. Their spines are, they state, weak, and ache severely after even slight exercise, or when the sitting position has been maintained for more than a few minutes. They also complain of some particular spot which is tender, and so sensitive that even the pressure of the clothes is distressing or intolerable. This spot is generally over one of the dorsal or lumbar spinous processes, or a little to the side, over the lower part of the erector spinæ. Usually these patients are unmarried, and often obviously neurotic. This group however, includes also some young male adults, and occasionally patients of both sexes up to the age of forty-

five or fifty. Whenever such symptoms are observed it is necessary to investigate the case with care. It is important to take into account any evidence which indicates that the patient is neurotic; and, the larger the neurotic element, the greater the probability becomes that no structural disease is present. This probability must not, however, be mistaken for conclusive proof. The latter can only be obtained when, after critical investigation, the direct symptoms and characteristics of structural disease can be pronounced absent. Obviously the presence of a neurotic element in a case cannot be accepted as any guarantee of the absence of some other morbid condition. The two constituents may, and often do, coexist. The forms of structural disease which a neurotic spine may imitate are chiefly tuberculosis and, though much more rarely, osteo-arthritis. The evidence on which a conclusion must be formed will be circumstantial and objective. If the case is one of mimicry only, it will be observed that, in spite of weakness and the severe pain of which complaint is made, the patient can do many things which those who have Pott's disease find difficult or even impossible. They can move up and downstairs, stoop, turn in bed, cough, and sneeze, with freedom and without complaint. Many, when they are following their own inclinations, are capable of considerable exertion. The things they like are easily done. As to pain, this is either limited to the "tender spot" or it is felt from that point upwards, as high perhaps as the nape of the neck: but it does not extend round the trunk, or occur in the middle line in front, *i.e.* there is no reference of pain to the peripheries of the spinal nerves. On examining in the region of the spine itself, there will often be a spot of marked hyperæsthesia of the skin. The least pressure over this spot makes the patient not only flinch, but writhe with pain. There is no trace whatever of angular curvature, and, in the majority of cases, no trace of stiffness. When the patient

—keeping the knees straight—is asked to bend forwards, all the different segments of the spine take their share in the movement: no part is rigid, and the trunk can be bent far backwards without restraint—an almost impossible attitude in Pott's disease. The difficulty of excluding tuberculous mischief is much greater in those instances in which some rigidity of the spine is present; but when the neurotic element is well marked, and when all the other symptoms of tuberculous disease beyond the stiffness are absent, the mimetic nature of the case may be looked upon as established—pending, however, the possible development of further symptoms at a later period.

Sometimes on examination it is noticed that one or two spinous processes are so prominent that they are out of line with the rest as the patient stands upright. This observation raises a suspicion of angular curvature. Such spinous processes are perhaps covered with thickened dusky and stained skin—appearances produced by rubbing by the dress. These prominent spines may have quite recently attracted the patient's attention, and the inference may be drawn that their presence points to deformity in active progress. On making the patient stoop, however, the prominent spines will (if there is no structural disease) fall into line with the rest, and all appearance of irregularity will be lost (page 481); while, at the same time, it will be noticed that the spine is free from rigidity. It will thus be seen that in the presence of a single symptom of Pott's disease (*i.e.* curvature), when this symptom stands alone, and when all other direct evidence of this affection is absent, the surgeon will usually be right in depending on the general body of negative evidence, and in coming to the conclusion that mimic disease only is present.

The history of the onset of the affection varies in different instances. It may be slowly developed without any apparent exciting cause; or it may follow prolonged

fatigue, such as that involved in the nursing of a sick relative; or be produced by a fall, a severe strain, or some other kind of local injury. One of the most severe examples I have seen occurred in a lady aged 35, who was highly neurotic, and had for several years complained of almost unbearable pain in her spine and right hip, which had been the seat of tuberculous disease in her childhood, but which had long ago undergone complete repair. In this case a predisposing cause was, no doubt, the weakness following very marked atrophy of the spinal muscles which had taken place during prolonged recumbency.

Treatment.—The treatment of these cases is often difficult, and the results obtained are in many instances unsatisfactory. Of the true nature of the affection nothing definite can be said. It is important, however, to bear in mind that the symptoms observed do not depend on any structural alteration in the spine itself. The condition must be regarded as one of the many possible local manifestations of the neurotic state or habit. The worst cases are those in which there is a family history of insanity, epilepsy, or hysteria of an aggravated type. The most favourable are those where the family history is good, and in which the condition has followed injury, prolonged fatigue, or some severe temporary strain of the nervous system. The treatment must be general and local. It is best to adopt a very hopeful tone, and to indicate that, as no active disease is present, recovery may be confidently expected. A highly important element is that of complete change of occupation and of surroundings, especially so far as injudicious relatives are concerned. In slight and early cases removal to the seaside, or to some country district where the climate is dry and bracing, and where rest may be combined with cheerful society, and alternated with moderate exercise, will often be all that is required, and is always advisable. If

the patient is anæmic, and menstruation is deranged, the requisite means must be adopted. The treatment of the spine itself consists of a good deal of rest in the horizontal or reclining position and of massage, skilfully used, and never carried to the point of fatigue. It may be used for half an hour daily, or for a somewhat longer period four times a week. In the generality of instances in which the condition has been provoked by overwork or by injury, and in which the neurotic element is not largely present, if these three measures of change, rest, and massage are adopted recovery will ensue. But where the neurotic element is predominant no improvement may follow, and the patient is very likely to say that she is unable to bear the massage. Sometimes the temporary use of a light poro-plastic jacket may be advantageous. It gives support to the spine, and exercises a good influence on the patient's mind. It should however, not be worn at night, or for more than a few weeks, and while it is employed the patient should be encouraged in the belief that her strength is returning, and massage should, if possible, be used so that the nutrition of the muscles is maintained or increased. There are patients in whom it produces a good effect to have a liniment rubbed in over the lumbar region, and over the erector spinæ. In such, the belief or impression that benefit will follow should always be turned to account. In some instances electrical treatment is of service. Such agents as counter-irritation, the hot button, or the actual cautery should not be employed. In cases that have resisted all treatment, and in which the patient has long been an invalid, spending much of her time in the horizontal position, recovery has followed the diversion of the mind into a new channel. A married lady, aged 34, very highly neurotic, who had previously suffered with a hysterical knee, had been lying down for five months, on account of weakness and severe pain in the lumbar spine

whenever she sat up. She also had a spot which was so tender that she could not bear it to be touched. While matters were in this position, and all treatment had failed to give relief, her only child, a boy of seven, developed a severe attack of typhoid fever. In her great mental distress she seemed to forget her spine, and she left her sofa and attended constantly to the child. Unhappily he died. She proved, however, to have shaken off her spinal trouble, and henceforth, in memory of her boy, she employed herself actively in charitable work. In some extreme cases the Weir Mitchell method has been successful after all other means have failed.

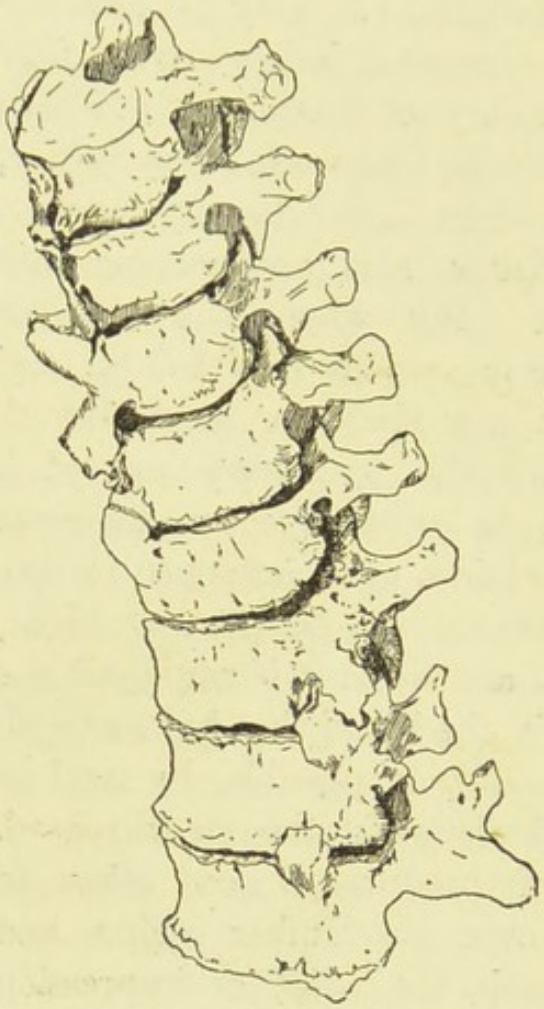

Fig. 73.—Osteo-arthritis of the Spine, showing Buttresses of Bone which pass between the Bodies of adjacent Vertebræ, and connect them firmly together. (From a specimen in the Cambridge Museum.)

Osteo-arthritis. — In those who are the subjects of osteo-arthritis, involving the joints of the extremities, the spinal column is often affected also; while in some instances the disease occurs in the spine when all other parts are free. The structural changes which osteo-arthritis produces in the spine are, with one remarkable exception, similar to those met with elsewhere, in respect to the wearing away of the articular cartilage, the alteration in the shape of the bones, and the formation of osteophytic outgrowths, with lipping of the articular borders. The feature in which the disease in the spine differs from all other

cases is that it commonly leads to extensive and complete bony anchylosis (Figs. 73 and 74). Fig. 74 shows

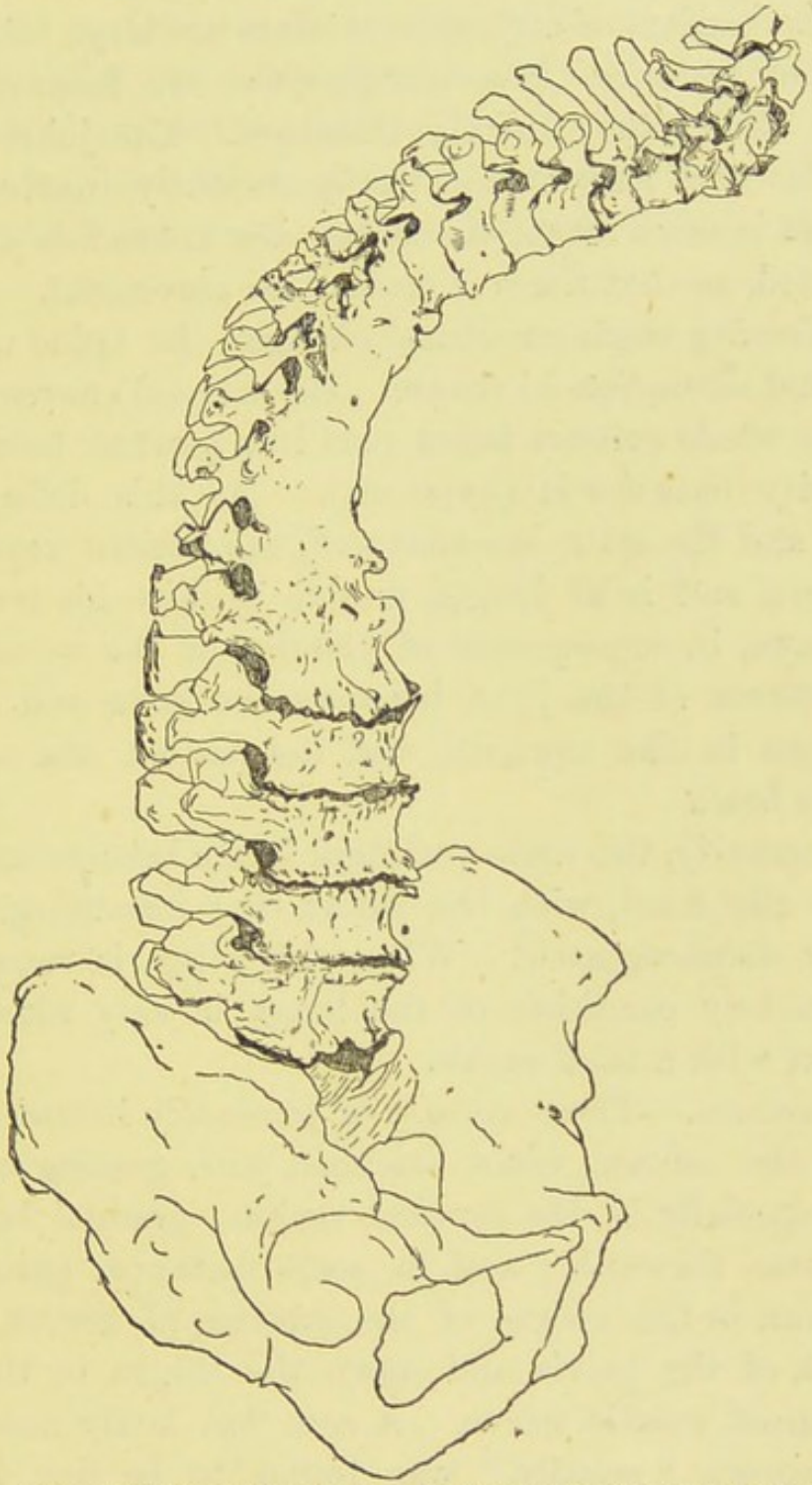

Fig. 74.—Osteo-arthritis of the Spine, showing extensive bony Anchylosis. (From a specimen in the Cambridge Museum.)

a spinal column, the seat of osteo-arthritis, in which nearly all the dorsal vertebræ are thus welded together into a solid

stem. This change concerns not only the vertebræ themselves, but also the surrounding ligaments. The anterior common ligament is converted into hard bone. Springing from the borders of adjacent vertebræ are large osteophytes. In some instances these outgrowths are fused together; but in others they merely interlock. The joint between the atlas and axis is not rarely seriously involved. The cartilage is worn away, the bones are altered in shape and eburnated, so that there is grating on movement.

Following these structural changes, the spine undergoes a gradual alteration in shape. The normal curves are lost, and the whole column takes part in a general bow with its convexity backwards (kyphosis). As this deformity advances and the spine becomes stiff, the patient stoops more and more, and is at length unable to raise his trunk. In some cases, in consequence of yielding of the cervical spine and stiffness of the joint between the atlas and axis, the chin rests in the sternum, and the patient can no longer turn his head.

Ultimately, the costo-vertebral joints become anchylosed and the ribs fixed, with the result that breathing becomes entirely diaphragmatic. When this stage is reached, any inflammatory condition of the lungs is very likely to be attended with a fatal result.

Symptoms.—These consist of gradually increasing stiffness of the column, often attended with grating on movement, especially in the cervical region; gradual bowing of the column forwards; and in some instances pain around the thorax in the course of the intercostal nerves, or over the back of the pelvis and down the thighs in the course of the great sciatic nerve. A case was lately met with in which severe "sciatica" was found to be due to osteo-arthritis of the lower part of the spine. The pain is no doubt produced by pressure on the nerves where they emerge from the intervertebral foramina.

Treatment.—This must be similar to that recommended (pages 69, *et seqq.*) for osteo-arthritis of the joints of the extremities. Should yielding and forward curvature show a tendency to increase to a serious degree in the cervical region, so that the head droops towards the sternum—instrumental support should be employed, and the patient should, when not taking exercise, be kept in a reclining attitude with the head thrown backwards and well supported.

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