**The etiology, pathology, and treatment of diseases of the hip joint / by Robert W. Lovett.**

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# THE ETIOLOGY, PATHOLOGY, AND TREATMENT

OF

# DISEASES OF THE HIP JOINT.

BY

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"I knew the mass of men conceal'd
Their thoughts, for fear that if reveal'd,
They would by other men be met
With blank indifference, or with blame reproved."

*Matthew Arnold, "The Buried Life."*

BOSTON:
PRESS OF GEO. H. ELLIS, 141 FRANKLIN STREET.
1891.

THE Trustees of the Fiske Fund, at the annual meeting of the Rhode Island Medical Society, held June 11, 1891, announced that they had awarded a premium of three hundred dollars for the best essay on "The Etiology, Pathology, and Treatment of Diseases of the Hip Joint" to an essay bearing the motto,—

> "I knew the mass of men conceal'd
> Their thoughts, for fear that if reveal'd,
> They would by other men be met
> With blank indifference, or with blame reproved."

The author was found to be Dr. ROBERT W. LOVETT, of Boston, Mass.

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## Chapter I.

# INTRODUCTION AND CLASSIFICATION.

In the present state of Pathology it is impossible to present any classification of diseases of the hip joint which shall be exact, or which shall be sanctioned by authority weighty enough to give it pre-eminence. It is essentially a time of transition in the history of the pathology of bone and joint disease, a time when tuberculosis has sprung into such prominence that the tendency is to refer to it the great mass of all chronic bone and joint disease. Coming as it did upon a pathology in which tuberculosis played a minor part, this change has disturbed the former arrangement; and enough time has not yet elapsed for the evolution of a new and permanent basis of classification. Consequently, each one who deals with these subjects has to formulate for himself, as best he can under the existing conditions, the phenomena occurring in diseased joints.

The classification given here is merely a scheme of abnormal conditions, which are to be clearly recognized in the hip joint, and which, it is hoped, has at least the merit of being practical. It follows no authority, because there is none to follow; and it must stand on its own merits as a practical working classification. It does not enter into the refinements of subdivision, and so far as is practicable it rests upon a pathological basis. It has not been possible, for obvious reasons, to follow this out rigidly; but, so far as possible, a pathological rather than an etiological basis has been adopted.

*Acute Diseases of the Hip Joint.*

Acute Arthritis.
Acute Synovitis. { Serous. / Purulent.

*Chronic Diseases of the Hip Joint.*

Chronic Synovitis. { Serous. / Purulent.*
Chronic Ostitis (Tubercular).
Chronic Ostitis (Gummatous).
Arthritis Deformans.
Charcot's Disease.
Malignant and other Tumors.
Loose Bodies.

*Miscellaneous Conditions.*

Congenital Dislocations.
Functional Affections.

* Chronic purulent synovitis is considered together with chronic ostitis.

The discussion of the subject has been confined strictly and entirely to the subjects of Pathology, Etiology, and Treatment, as prescribed by the Trustees of the Fiske Fund. Each affection has been considered separately, and the pathology, etiology, and treatment of each are discussed individually in the order designated. Inasmuch as in so extensive a subject as this it is manifestly impracticable to treat all parts with equal thoroughness, it has been the aim of the writer, so far as possible, to present the more practical side of the question, and to lay particular stress upon the discussion of the *treatment* of the various affections, and particularly the treatment of that most common of all affections of the hip described under the name of hip disease. Where it has been possible, the writer has endeavored to give the scientific reasons for the different modes of treatment. The consideration of the pathology and etiology was of necessity of the nature of a compilation; but, in discussing the treatment of the various affections, it has been the aim of the writer to make it, to a certain extent, individual, by giving

the results of his own experience in addition to that of other authors. It was a question in the mind of the writer whether congenital dislocation of the hip should be considered in this connection. It seems, however, that any consideration of diseases of the hip would sadly lack completeness that failed to include so important and so comparatively common a condition as this, and on this ground that deformity has been placed upon an equal footing with the other conditions.

A few words should be said with regard to the anatomical relations of the hip joint. The joint lies so deeply buried in the soft parts that it possesses a remoteness that is not a condition in any other joint. As a result of this, in hip joint inflammations the seat of the disease itself is not accessible to examination and observation, as is the case in the more exposed joints. One must depend more upon the remote symptoms, such as muscular spasm and the various malpositions, than on the direct evidences furnished by palpation and direct examination of the hip joint cavity.

This adds an unfortunate complication to the study of diseases of the hip, because nowhere is the early diagnosis more important than here, and nowhere are the disastrous results of overlooking the disease more distressing. On account of its remoteness and its firm protection by the strongest muscles and ligaments of the body, the joint is not one which is liable to traumatic affections, as any force exerted upon the leg is more likely to find its expression in traumatic inflammation of the less protected knee and ankle.

The development of the femur is by one centre of ossification for the shaft, and one for each of the four epiphyses. A single centre for the lower epiphysis appears shortly before birth, one for the head of the femur in the first year, one for the great trochanter in the fourth year, and one for the trochanter minor in the thirteenth or fourteenth year. A neck is formed by extension of the ossification from the shaft, and the head is not united to the shaft by bony union until the eighteenth or nineteenth year. The physiological

development is most rapid and most marked in the upper epiphysis, and especially in the neighborhood of the epiphyseal cartilage.

Certain points are of practical interest as considered in Mr. Morris's "Anatomy of the Joints."

1. The head of the bone is completely included in the acetabulum.

2. The whole upper epiphysis of the femur is within the joint.

3. The direction of the axis of the neck of the bone is such that a force applied to the trochanter will tend to obliterate the angle between the neck and the shaft of the bone, and consequently will be largely expended upon the inner aspect of the neck.

4. The main vessels of supply to the bone enter upon the upper surface of the neck.

5. The fact that the nerve supply is derived from the anterior crural, the obturator, and accessory obturator nerves, along with the sacral plexus, and that these are to a large extent the same nerves which supply the important muscles controlling the hip joint.

6. That the psoas bursa frequently communicates with the joint through the thin triangular space between the ilio-pectineo-femoral band.

7. The cartilage covering the head of the femur is not all articular, in the sense that it forms a part of the bearing surface of the joint. A considerable zone, which may be designated "marginal," extends around the rest, and is more or less provided with synovial membrane. This cartilage often persists after destruction of the articular surface, and through this zone numerous vessels pass, which in disease are often enlarged. These vessels are apparently derived from synovial membrane; and in most cases, no doubt, inflammation reaches the synovial tissue through their agency.

8. The ligamentum teres forms, as it were, a channel through the articular cartilage to the bone,— a fact of impor-

tance in determining the extension of disease from the bone into the joint.

9. The normal range of movement of the joint is through 145–150 degrees.

Flexion is checked by contact of the thigh with the abdomen and hyper-extension by the Y-ligament.

Finally, it is important once more to call attention to the very active physiological hyperæmia which exists in the neighborhood of the epiphyseal cartilage, and which is an important factor in determining the location of tuberculosis ostitis.

## Chapter II.

# ACUTE ARTHRITIS OF THE HIP JOINT.

### BEING A FORM OF THE ACUTE ARTHRITIS OF INFANTS.

The affection has also been described as *Peracute Articular Ostitis*, or *Epiphysitis* (Barwell and Stromeyer *), *Acute Epiphysitis* and *Suppurative Ostitis* (MacNamara †), *Meningo-osteo-phlebitis* and *Epiphysentrennung* (Klose ‡), *Acute Osteomyelitis* and *Necrosis of Epiphyses* (Jones §).

Earlier writers describe what appears to have been this affection under a multiplicity of names, which it seems of little use to catalogue. A complete list of them is given in Townsend's article upon the subject.‖

The many different names applied to this condition point to an obscure pathological process, which is differently interpreted. Later usage has adopted the name of Acute Arthritis of Infants for the particular condition under discussion, which describes accurately enough the disease, and does not postulate any definite pathological theory. The term was first used by Terisse¶ in an inaugural thesis in 1833; but its present use is due to the classical article of Mr. Thomas Smith in 1874, which was the first clear description of the affection and from which dates its modern recognition.**

* Diseases of Joints. R. Barwell. American Ed. 1881.

† Diseases of the Bones and Joints. MacNamara. London, 1887.

‡ Prager Vierteljahrschaft. 1858.

§ Diseases of the Bones. Thomas Jones. London, 1887.

‖ Acute Arthritis of Infants, American Journal of Medical Sciences, January, 1890.

¶ Observations d'Arthrites aiguës chez l'Enfant nouveau né. Paris.

** St. Barth. Hosp. Rep. 1874, vol. x.

## Pathology.

It is not probable that the term acute arthritis of infants represents any pathological entity, as was first considered to be the case by those who described it. Rather it is to be considered as an acute joint destruction, in most cases pyemic, but also to be attributed to other causes. Clinically, all these cases are described as acute arthritis of infants.

Pathologically, this affection may be the result of (1) a syphilitic osteo-chondritis, (2) a catarrhal synovitis passing on to ostitis, (3) a tuberculous ostitis running a rapid course, (4) a juxta-epiphyseal osteomyelitis of a septic character.

The first three divisions will be described under their appropriate headings in other parts of the essay, and here will be considered only the last named, originally supposed to be the sole condition found in acute arthritis, and which constitutes the bulk of all cases of arthritis of the hip occurring in children less than a year old.

Acute arthritis of infants in most cases is, then, an acute infectious osteomyelitis of the upper epiphysis of the femur.

This was the view of Mr. Smith in his original article, and later investigations have borne out this idea.

In most cases, therefore, the disease is to be considered as an affection primarily osseous. The great formative activity which exists at the upper epiphyseal cartilage of the femur in the early years of life is an explanation of many of the phenomena of this disease.

Bone disease of all sorts is more likely to originate on the diaphyseal side of the epiphyseal cartilage than on the articular side. Fourteen-fifteenths of the length of the bone are due to the growth on this diaphyseal side, if we may accept Ollier's estimate; and this great formative activity, of course, means a state of physiological congestion. On the diaphyseal side of the cartilage one finds a dense capillary network, surrounded by a venous plexus; a spongy tissue, in short, predisposed by its structure and its function to acute

congestion, venous stasis, and rapid disintegration. Moreover, it is easy to see, as Mr. Neve * explains, why external causes tend to locate disease of the bone in this region. When a child is exposed to a sudden jar or a traumatism of any sort, much of the force will be transmitted to the cartilage and modified by its elasticity. But the maximum effect of the injury will be manifested, for mechanical reasons, at the junction of the rigid bone and yielding cartilage.

Moreover, the fine capillary network above alluded to will act as a filter for infectious material and pathogenic organisms.

For these reasons infection and traumatism in predisposed subjects favor a juxta-epiphyseal location of the disease, and this explanation serves equally well to explain why chronic articular ostitis is located so often in the same region.

The first stage of the process is an increased hyperæmia of the vessels in the neighborhood of the epiphyseal cartilage. Stasis and cellular infiltration follow, and with the distention of the vessels the nutritive supply is cut off over large or small areas, because swelling is impossible on account of the rigid cortical layer, and strangulation follows, causing the necrosis of larger or smaller areas of spongy tissue.

An acute purulent inflammation being present under such conditions, the destruction of bone is rapid. Melted down by the pus or shut off from its blood supply, it disintegrates, and the process extends, most often in the direction of the joint.

At an early stage the naked eye sees on section an area of spongy tissue of considerable extent, which is bright red or dusky; and the marrow is transformed into a semi-fluid mass of pus and melted fat, often offensive in odor, colored more or less red by extravasated blood. The periosteum is generally thickened, and purulent periostitis may be present secondarily. The cancellous tissue is pink and somewhat thickened. If the detritus is washed away, the spongy tissue

* Arthur Neve, Practitioner, January, 1891.

appears red and softened, with, perhaps, spots of disintegration or bits of necrosis. In some cases, the necrosis may have been sufficient to show a sequestrum of considerable size. At times the pus may be dark and thin, or it may be profuse, and resemble laudable pus.

In most cases, the process tends to involve the joint. Commonly, the inflammation extends by the spongy tissue to the articular surface, and destroys the cartilage over a larger or smaller area, entering the joint to start up an acute purulent synovitis. In other instances, it may burrow under the periosteum, having started as a subperiosteal abscess at some more remote point, and enter the joint in that way. In still rarer instances, it may seek the surface of the bone, and, discharging into the soft parts, come to the surface and be evacuated without infecting the joint.

The relations of the epiphysis and the joint capsule in young children are such that a focus of disease beginning in the epiphysis is practically within the joint from the beginning, as the epiphyseal cartilage is indistinguishable from the articular cartilage, and is in immediate relation with the capsule of the joint.

When the joint is infected, destruction is rapid. The cartilages and the articular ends of the bones melt down into pus, the capsule bursts, and, if the process continues, the ligaments and the capsule melt away. Sinuses form to drain away the products of destruction, and it seems difficult to set a limit to the process.

The destruction about the epiphyseal cartilage may be so much that it is loosened from the diaphysis and lies loose, as if a section of the neck of the femur had been made. This results in a flail-like joint, and simulates very closely in walking and manipulation the condition known as congenital dislocation of the hip. This is a common ending in cases of acute arthritis which recover.

In other cases, an extensive sequestrum may remain. In young children however, the usual victims of this affection,

the process is of such virulence that necrosis is of little account compared with the rapid and extensive destruction of the bone and soft parts and the general sepsis, which is most marked.

The character of pyogenic germs in the pus of acute arthritis is a matter of much interest. In the pus one finds various forms of the staphylococci, notably the *S. aureus*. Exceptionally, the streptococci may be present as the cause of suppuration; and Volkmann found a coccus resembling the diphtheritic coccus of Loeffler.

Metastatic abscesses may be found present, and the other pathological signs of general pyæmia are common in the cases of longer duration.

In cases which have successfully withstood the acute attack of the disease, several conditions may be found which speak for the virulence and destructiveness of the affection. As has been said, (1) the epiphysis may be separated from the femur and a flail-like joint be the result, (2) the head of the femur may be so eroded and the capsule so disintegrated that dislocation may have occurred, (3) the articular ends of the bone may be roughened and destitute of cartilage, so that joint movement is accompanied by grating, (4) or, finally, more or less complete fibrous or bony anchylosis may be present; but this is not so common as the other terminations.

## Etiology.

The etiology of this form of joint disease is obscure; and, in the present state of knowledge regarding it, the question can only be briefly discussed, and dismissed as unsettled. The pathological knowledge is imperfect, as it must have already appeared, largely because the data are insufficient, and, from the etiological side, the data are even more unsatisfactory.

Traumatism is, of course, assigned a place in the etiology, and certain cases seem clearly traumatic in origin, as in one

of Mr. Smith's cases, where rough handling at birth seemed to have been the cause of the subsequent joint trouble. But for a simple traumatism to cause so violent and destructive a process seems unlikely and not reasonable.

Rosenbach* demonstrated by experiments upon animals that neither mechanical injuries nor comminution of the marrow by violence were sufficient to cause suppuration at the seat of injury. He showed, further, that the marrow was extremely sensitive to the influence of septic substances, such as rancid butter, or the products of decomposition in general. Krause's† experiments form a very interesting complement to these. He showed that in animals who had been infected by the injection of *S. aureus* and *albus* cultivated from osteomyelitic pus the fracture of the bones was followed by suppuration at the seat of the injury, which was like an ordinary septic infection occurring there, except that the marrow was more extensively involved.

These experiments would lead one to infer that traumatism alone was not enough to cause so great a destruction as occurs in these cases, but that, in connection with infection, either general or local, it might serve as the exciting and determining cause of the affection. Such a state of affairs is quite parallel to what will be observed later in speaking of the etiology of tuberculous disease.

Pure cultivations have been made from the cocci of acute osteomyelitis,‡ and, as has been said, it was found that, if they were injected into the blood, bone injuries and fractures suppurated.§ By their injection into joints, purulent arthritis was started up, and great quantities in the circulation killed rabbits and guinea pigs. Rosenbach found the same coccus in furuncles, empyæma, abscesses, and pyæmia.

The place of traumatism, then, in the etiology becomes

* Cent. f. Chir., 1884, No. 5; 1877, p. 289.

† Fortsch. der Medicin, 1884, Nos. 7 and 8

‡ Rosenbach, Mikro-organismen b. d. Wundinfectionskrank. Wiesbaden, 1884.

§ Krause, Fortsch. der Med., ii. 1884.

subordinate to that of infection of the general system from some source. An injury may be enough to locate a destructive process in some one joint, or, on the other hand, so far as can be told, the disease may originate without trauma.

The obscure question arises, when one asks, Why children under one year are the ones particularly liable to this affection, and how do apparently healthy children become suddenly infected, and by what channels?

In this connection the statement of Escherich is of particular interest, who found in all children at the breast, whether well or ill, the *Staphylococcus aureus* and *albus* in the liver and the superficial layers of the skin.

In the acute infectious diseases, pyemic affections are not uncommon, and acute destructive joint disease occurs in older and in younger children. The acute arthritis of infants is one of the forms of this manifestation, and the pyemic infection after the exanthemata is one of the most common and the most satisfactory of explanations for the presence of the pathogenic germs in this disease. Of a comparatively small number (about 75) of these cases on record, a larger proportion are to be traced to the exanthemata than to any one cause.

Cases have been reported due to chicken-pox,* and to variola,† measles, and scarlatina,‡ and, finally, pertussis,§ and typhoid fever. The definite etiological character of the joint affections following the exanthemata has not been formulated further than to class them as pyemic. The frequency of such affections requires no comment.

As an instance of a direct source for purulent infection may be mentioned cases of suppurating umbilicus. Such cases came under the observation of Townsend. In one case, empyæma seemed to be the cause. Again, a wound

* Holmes, Surg. Treat. of Dis. of Inf. and Childhood.

† McLeod, Indian Med. Gazette, 1883, p. 232; Ancell, Archives of Medicine, 1830, vol. iv. p. 491.

‡ Eustace Smith and Ashby and Wright, in their Diseases of Children.

§ Ashby and Wright, Diseases of Children.

may appear to be the site of the infection; but, in most cases, one must fall back necessarily upon a theoretical explanation of the entrance of the germs, and assume "that the infection may occur through the ears, eyes, nose, mouth, pharynx, respiratory passages, mucosa of the alimentary canal, or skin; . . . furthermore, from any subcutaneous phlegmon, however small." *

In this connection, one passes to the question of the pathogenic germs which are to be found, and the rôle which they play. Ollier quoted Rodet † as stating that all the varieties of juxta-epiphyseal ostitis might be produced by the inoculation of the *Staphylococcus aureus*. And no form of coccus has yet been discovered in the acute arthritis of infants which is different from those found in acute osteomyelitis, so that the conclusions of Park may be stated as defining the character of the pathogenic germs present in the affection under consideration.

"It is a manifestation of the pathogenic properties of several micro-organisms possessing common specific pyogenic activities. It is a phlegmon of bone or local pyæmia." To quote further, his conclusions are: (1) that there is no specific microbe for the production of acute infectious processes in bone; (2) most of the staphylococci can cause them, and exceptionally the streptococci; (3) of all the forms the *Staphylococcus aureus* is the most pernicious, and of the general causes which favor the entrance and influence of these germs the tubercular, syphilitic, and post-febrile conditions are the most prominent.

In short, the affection is to be considered as a form of pyæmia. It is not so much that the arthritis is the cause of pyæmia as that the joint disease is pyæmia from the beginning, and that traumatism operates chiefly as an exciting cause rather than as the real originator of the affection.

The relation of tuberculosis to this affection is very ob-

* R. Park, Am. Journ. Med. Sci., July, 1889.

† Revue de Chir., 1885; Ann. de Gyn. et d'Obstet., 1888, p. 81.

scure. Acute arthritis occurs most often in feeble children, perhaps the offspring of tuberculous parents; but a tuberculous history is not constantly or commonly present. The affection is not one which has attracted much attention of late years, since the range of tuberculosis in joint disease has been better understood; and pathological data are wanting to establish the proportion of cases where the bone inflammation is tuberculous in character. It would seem reasonable to suppose that some of the cases were of that nature, and that in these the tuberculous process was of exceptional virulence and rapidity, although following the same course, pathologically, as in the chronic affections of older children. A careful search of recent literature has not enabled the writer to present any more definite conclusions than these with regard to the rôle of tuberculosis in the etiology of this affection.

The same may be said with regard to inherited syphilis. It is not recognized as a cause of the affection, nor is it known what influence it has. On general principles, it might be classed as a predisposing cause, inasmuch as it would tend to depress the general condition of the patient.

Dismissing, then, for the moment the more theoretical considerations, one finds that practically this affection attacks most commonly children in the first year who are not as healthy as they should be. Of the 71 cases analyzed by Townsend, 20 were less than four weeks old, and several were in their first week, 10 were less than two months old, and 6 were in their third month, making half of all the cases which occurred in the first 12 weeks of life.

It can be seen from this that one is dealing in most cases with a well-marked joint affection, which stands off clearly enough from the usual forms of the affection and which merits its separate name and justifies its individual consideration.

One point, however, deserves comment. The cases of this affection, so called, which occur in older children,

are open to the suspicion of being the ordinary forms of tubercular joint disease which are running a rapid course. Tubercular joint disease in young children is, as a rule, acute and rapid, and would closely resemble the affection under consideration.

To sum up in a word the results of this consideration of the etiology, one would be justified in stating that the disease was a pyæmic affection of bone, occurring in very young children ; that the rôle played by syphilis and tuberculosis in the causation of the affection was not, as yet, understood on account of insufficient pathological findings, and that in older children the affection closely resembled, and was likely to be confused with, typical but rapid cases of bone tuberculosis ; that, however, acute arthritis occurred in young children as the result of syphilis, and probably as a distinctly tubercular affection, which will be considered under the proper divisions of the subject.

## Treatment.

The acute sepsis which is so prominent a feature in this disease is, as a rule, the point against which the first attack must be made in the treatment of the affection. It is this which threatens life, and which kills the patient in fatal cases. Consequently, a strongly supporting treatment must be entered upon, as in the treatment of pyæmia in general ; and it is of course more difficult to carry out such treatment in the case of such young children than in adults.

The use of alcoholic stimulants in appropriate doses is indicated from the first, with the administration of quinine ; and much dependence must be placed on frequent feeding with appropriate and easily assimilated food, preferably, of course, the mother's milk. In the older children, the use of beef juice and meat extracts is of much benefit from their stimulant properties. In the more asthenic cases, digitalis and ammonia might prove to be of use. Iron should be ad-

ministered as the syrup of the iodide, and is of much benefit in the convalescence.

The local treatment is often of greater importance than the general, and in the milder cases it is the chief interest. Rest to the joint and free incision are the aims of local treatment. Acute sensitiveness of the diseased joint is a constant accompaniment of the affection, and mechanical fixation of the joint should be directed to the relief of that symptom. Inasmuch as the hip is almost invariably flexed in acute arthritis (and perhaps adducted as well), it must be fixed and held in the position of deformity without any attempt to straighten or correct it, which would cause very much pain. Fixation of the joint in its deformed position can be obtained by (*a*) a wire frame, (*b*) a plaster of Paris spica bandage, (*c*) by bed extension with the leg on an inclined plane.

The posterior wire frame known as the Cabot frame is the most convenient apparatus for use in such young children. Plaster of Paris becomes soaked with urine, and softens and irritates the skin so that it becomes a foul and irritating dressing; and rest in a recumbent position is almost impossible to enforce in children of this age. So that in all cases of acute arthritis of the hip, before and after operation and where no operation is indicated, a fixative appliance is an essential; and this is furnished in the Cabot frame. It is made of copper washed iron wire, one-fourth inch in diameter; and it reaches from the angle of the scapula to the bottom of the calf. Above it should be as broad as the body, and at the level of the sacrum it should turn at a right angle, and below that consist only of one leg piece, which should be as wide as the leg. It is a posterior wire splint for the body and for one leg.

The leg piece can be bent to suit the flexion. So far as possible, the wire should follow the curves and outline of the trunk. The body piece should be padded and provided with a Canton flannel body swathe, and the leg piece padded with Canton flannel. At the junction of the leg piece and the

body piece the wire should be protected by rubber tubing, and the padding should be omitted here.

The leg piece should be bent as much as desired, and the child laid on the frame. The swathe is pinned about the trunk and the leg bandaged to the leg piece. The child can then be handled without jarring the diseased joint.

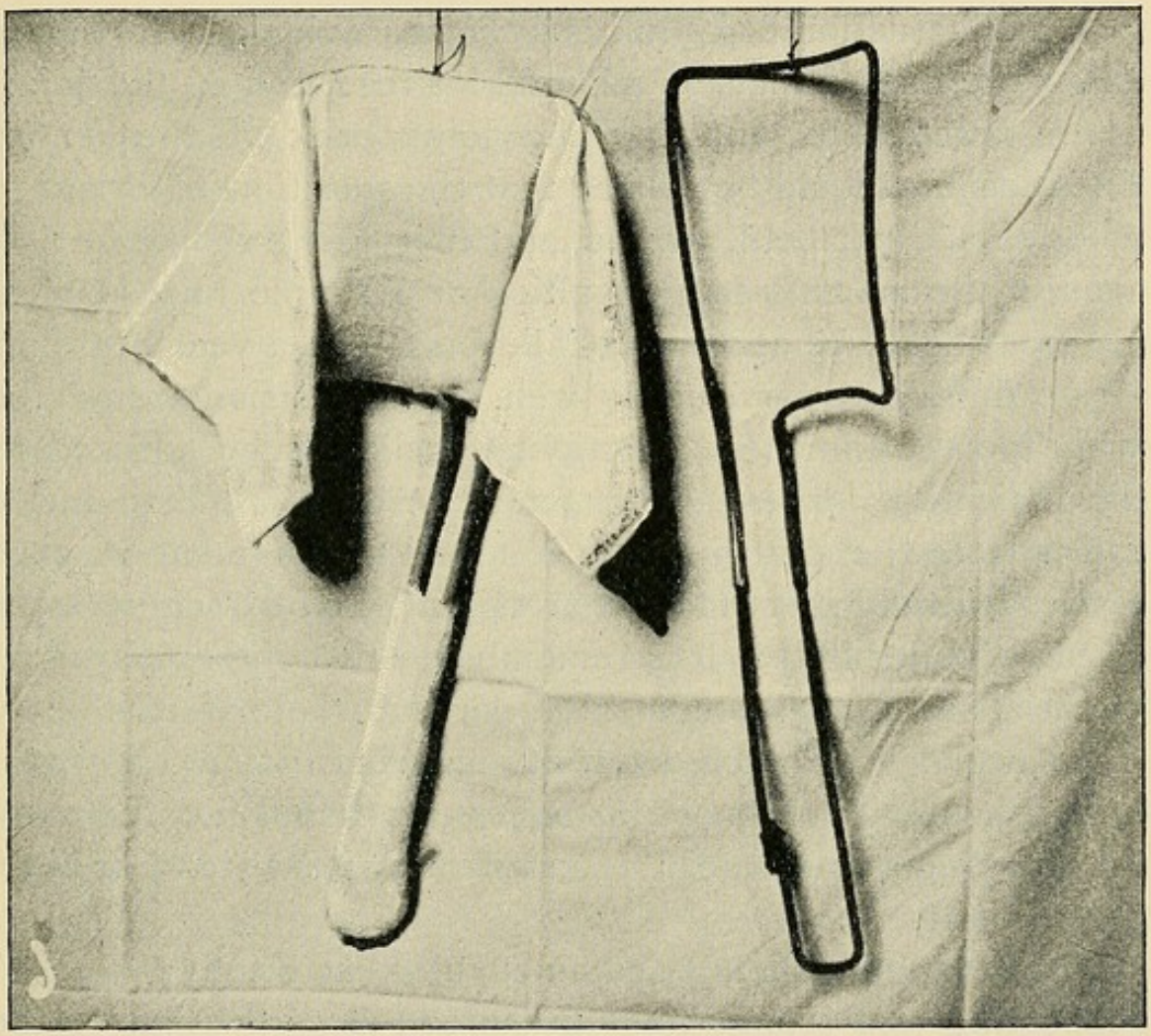

Fig. 1.— CABOT'S POSTERIOR WIRE FRAME FOR FIXATION OF THE HIP.

Where the disease is seen in an early stage, and especially after operation, this splint is of the greatest use. Traction is not necessary, but it may be of relief in quieting the pain. It is, however, exceedingly hard to apply traction to children under one year of age.

If anchylosis is to occur, it is desirable that the joint should be in a good position, and not with a flexed or ad-

ducted limb. Hence the importance of early and accurate fixation to soothe the joint and reduce the muscular irritability to the minimum.

If anchylosis in a faulty position occurs, the treatment is the same as in the case of older children with hip joint disease.

Incision of the joint, free and deep, should be made as soon as fluctuation or cellulitis becomes evident. It should follow the line of incision adopted for resection of the joint, where practicable, entering the joint back of the femur. The incision should be so free that the question of drainage tubes should not be discussed, and everything should be left open, while an antiseptic poultice or a simple linseed meal poultice should be applied. Children under a year bear corrosive dressings particularly well. An incision cannot be made too early in these affections if cellulitis be adopted as the indication for it. Any attempt to do more than incise and irrigate the joint must be left to the judgment in each case. It would seem more thorough at least to scrape away diseased bone; but, if it is remembered that the epiphysis is diseased and that the removal of part or whole of it is likely to be attended by much deformity and retardation of growth, it will seem wiser in most instances to attempt nothing more than the most superficial removal of diseased and disintegrated bone.

The treatment can be summed up very briefly: *general*, supporting and stimulating measures; *local*, fixation of the diseased joint and early free incision.

The bibliography is given and the reported cases are tabulated in the article of Townsend already referred to.

## Chapter III.

# ACUTE SYNOVITIS OF THE HIP.

Inflammation of the synovial membrane is also spoken of as arthromeningitis, hydrops articulorum acutus, serosynovitis, and acute serous or purulent synovitis, while purulent affections are spoken of as empyæma articulorum and pyarthrosis.

It may be permissible to allude to the limits and functions of the synovial membrane, in so far as the question affects inflammatory affections of this structure. The synovial membrane is structurally much the same as serous membrane; but it differs from serous membrane in secreting a peculiar lubricating fluid,—synovia,—from which it derives its name. All diarthrodial joints are lined with synovial membrane, except where the articular surfaces are in contact, where the cartilage is bare. The ligaments and folds of the capsule are all invested with a synovial covering. The synovial fringes diversify the otherwise smooth surface of the membrane, appearing as tufts or folds, which are reduplications of the membrane richly supplied with blood, or else protrusions of periarticular tissues into the joint.

It is an important fact that the nerves supplying the joint surface are the same as those which control the muscles of the limb.

Acute synovitis is to be classified according to the character of the effusion, as either serous or purulent. The latter is at times the outcome of the former, but either may begin independently, and continue as it began throughout its course. Acute synovitis of the hip is classified, according to the character of the effusion, as serous and purulent.

## Acute Serous Synovitis of the Hip.

### *Pathology.*

This affection first manifests itself as a hyperæmia of the vessels of the synovial membrane, which is followed by stasis of the blood current and dilatation of the capillaries. The ordinary phenomena of inflammation follow in regular sequence, and migration of white blood corpuscles occurs, with a profuse outpouring of fluid from the dilated vessels. The surface cells of the membrane are cast off with undue rapidity, and often give a flaky appearance to the effusion. The effusion may be slightly discolored with extravasated blood, especially in traumatic cases.

The membrane at this stage looks bright red and soaked and boggy. This latter appearance increases as time goes on. When the contact with the fluid has been longer, this appearance is more to be noticed in the synovial fringes than elsewhere. The ligamentum teres appears swollen and soft.

The cartilage is not changed in appearance, but continues bluish-white, and shows sharply in contrast to the bright red and sharply defined border of the synovial membrane.

The effusion which is poured out and distends the joint capsule is at first thinner than normal synovia, but later it may become very rich in fibrine and more scanty, in some cases being deposited as a fibrinous layer on the joint surfaces, being then classed as a dry synovitis. Distinct flocculi may be formed from the cast-off endothelial cells, which may be enough to render the fluid opalescent. There may be much periarticular swelling.

This is briefly the state of affairs to be found at the height of an acute synovitis of the hip joint.

Two courses are now possible: resolution may take place, or the affection may pass into the purulent form.

If resolution is to occur, the inflammatory process subsides

and the distended capillaries in the synovial fringes resume their normal calibre, while the newly formed blood-vessels in the membrane and its fringes become obliterated and retrograde to connective tissue. The undue activity in the formation of endothelial cells is checked, and those already cast off furnish mucin to the synovial fluid. With all this the effusion is gradually absorbed, and a continuance of these processes leads to a cure of the synovitis; and in simple cases the joint should return to its normal state without having suffered permanent injury. If, however, the effusion has been one very rich in fibrine, it is likely that a certain amount of connective tissue formation will have resulted, which is likely to cause adhesions between the folds of the capsule, and even a fibrous connection between the joint surfaces themselves. This, of course, results in impaired motion of the joint. Fortunately, it is an occurrence which rarely takes place in simple acute synovitis.

It seems proper to speak of the atrophy of the muscles which occurs in connection with acute inflammation of the joints, and which seems to arise not so much from disuse of the affected limb as from an active trophic disturbance of those muscles. The work of Valtat* did much to elucidate the matter, who found experimentally that acute synovitis in animals induced a rapid and progressive atrophy of the muscles controlling the inflamed joint, which was more than the atrophy of disuse. He found incidentally that the extensor muscles wasted more rapidly than the flexors. The question of the origin and reason of this muscular atrophy has been much discussed, but is still to be explained satisfactorily.†

* Emile Valtat, L'Atrophie Musc. dans les Mal. Artic. Paris, 1877.

† Paget, Clinical Lectures and Essays, p. 209; Hilton, The Therapeutic Influences of Rest, p. 156.

## Acute Purulent Synovitis of the Hip.

### *Pathology.*

If, however, an acute serous synovitis does not undergo resolution, it goes through a series of changes which make it a purulent synovitis.

These changes are practically only a continuation of the processes already alluded to as leading up to acute serous synovitis. The cell migration goes on unchecked and to a greater degree, and the cell proliferation from the surface becomes more active. The synovial surface becomes glazed, and then red and velvety, and the fringes seem to take the most active part in the process.

From the admixture of cellular elements the fluid in the joint becomes turbid or purulent, although merely by a continuation of the same processes which led to a serous effusion.

The process may not go beyond this stage, and from this point undergo resolution. It is this degree of the affection which is described by Volkmann* as "catarrhal inflammation," which he speaks of as "rather a perversion of excessive secretion than an inflammatory tissue degeneration."

It should also be noted that the same end may be reached by the infection of a serous inflammation. A resolving or quiescent serous inflammation may rapidly pass over into the purulent stage if pyogenic germs are introduced, as is sometimes done by tapping. Or the purulent character of the inflammation may be determined in the beginning by the entrance of germs through a wound. Yet, however powerful this element is, it should be noted that outside infection is in no wise necessary for the establishment of a purulent synovitis of a catarrhal or a more destructive character.

If the synovial inflammation is to go on still further than

* Pitha and Billroth, Hdbch. der Chir., Bd. ii. 2.

the stage already described, the same processes merely continue and increase. The cartilages become yellow and opaque, and are the seat of cell proliferation and fibrillary degeneration, to be considered in detail in the next chapter. Spots of erosion form, and bone may be more or less bared; but these extreme changes belong rather to the domain of chronic synovitis, as do those more advanced conditions of the synovial membrane where the membrane becomes one general granulating surface, secreting pus in great quantities.

The capsule may burst from distention and softening, and the pus pour into the periarticular tissues, where it reaches the surface as an abscess; but these and the other more destructive changes will be considered in the following section.

At any stage of the process resolution may occur, and the amount of limitation of the joint motion will be determined by the amount of granulation tissue which has occurred in the synovial membrane. It must of course retrograde to fibrous tissue, and, if this is present to any large extent, a certain cicatricial contraction of the capsule will result, which means necessarily impaired motion. In the simple catarrhal variety, however, perfect restoration of motion is not unlikely to occur. If the cartilages should be destroyed and eroded, however, it is a more serious matter.

*Hydrops articulorum tuberculosus*, as described by König,* should be described here, although, perhaps, partaking as much of the character of a chronic as of acute inflammation.

It is found as a diffuse inflammation of the synovial membrane, which is found to be studded with tubercles, and the membrane in which they lie imbedded is succulent and boggy. The effusion may be serous, sero-purulent, or purulent; and it may be fibrinous in character, perhaps even leading to the formation of foreign bodies.

This form of synovial tuberculosis, generally, although not

* Die Tuberculosis der Knochen u. Gelenke. Berlin, 1884.

necessarily, coexists with tuberculosis of the neighboring bone.

### *Etiology.*

Acute synovitis is due to many and differing causes.

(1) Traumatism is one of the most frequent and definite causes. It is ordinarily a serous synovitis which is caused in this way, unless the joint be opened by a penetrating wound, in which case the synovitis will probably be purulent. In the hip joint, of course, penetrating wounds are very rare, and traumatic synovitis here is generally a simple serous one. It is likely to be caused by falls and wrenches of the leg, by blows or falls upon the trochanter and the like; but it is much less likely to occur than synovitis of the other leg joints,—the ankle and the knee. The hip is such a deep-seated and firmly protected joint, and so thoroughly controlled by the strongest muscles and ligaments in the body, that any moderate grade of injury is much more likely, for obvious mechanical reasons, to take effect upon either of the more exposed and less protected joints of the leg, so that sprained knees and ankles are vastly more common than sprained hips. It should be remembered that synovitis of the hip follows all forms of dislocation of that joint.

(2) Over-exertion is sometimes followed by synovitis, but, here again, much more commonly by synovitis of the knee than of the hip.

(3) Exposure to cold or wet, although a frequent cause of synovitis of the knee, can hardly be classed as more than a possible cause of hip synovitis.

(4) Acute articular rheumatism is at times a cause, and one of the most frequent causes of synovitis of the hip. In a series of cases of joint affections occurring in acute rheumatism (compiled from series of cases by Haygarth,* Hersch,† Monneret,‡ and St. Bartholomew's Hospital), the relative

* Clin. Hist. of Acute Rheumatism. 1805.

† Mittheilungen aus der Med. Klin. zu Würzburg, 1886, ii. p. 277.

‡ La Goutte et la Rhumatisme. Thèse de Concours. Paris, 1851.

frequency of hip synovitis is shown by comparison with the other articulations.

| | |
|---|---|
| The knee was affected | 357 times |
| The ankle was affected | 284 times |
| The wrist was affected | 249 times |
| The shoulder was affected | 229 times |
| The elbow was affected | 148 times |
| The hip was affected | 103 times |
| The fingers were affected | 81 times |
| The feet were affected | 45 times |
| The hands were affected | 44 times |
| The toes were affected | 29 times |
| The spine was affected | 16 times |
| Miscellaneous joints | 8 times |
| Total joints affected | 1,593 times |

Senator * has found the fluid from joints affected by acute articular rheumatism to be alkaline in reaction and rich in albumen and fibrine; but Bouchard † reported cases where it was acid, so that nothing definite can be stated in this regard.

In this form of synovitis the development is very rapid, and there is no tendency to pus formation. It is essentially a multiple form of synovitis, and spreads with much rapidity from joint to joint. It is suggested by Monneret that the arthritis is a phenomenon much like the cutaneous erythemata of the disease; but beyond this, little is known about it beside the fact that the great majority of all patients affected by rheumatism suffer from joint symptoms.

(5) *Gout* is the cause of a certain very small number of attacks of acute synovitis of the hip. The joint is attacked by an acute synovitis of the ordinary type, which tends to pass on into a chronic form, characterized by the deposit of urate of soda in the synovial membrane, the capsule, and the periarticular structures.

* Ziemssen, Hdbch., 1879; 2d ed., vol. xiii.

† Bouchard, Mal. par Ralentissement de la Nutrition, 1882, p. 318.

The attacks are, in the great majority of all cases, located in the great toe, and the hip is but rarely affected. In 198 cases reported by Scudamore, 140 had the disease in the great toe joint.

(6) *Syphilis* is an uncommon, but still a recognized cause of acute synovitis. As a cause of chronic inflammation, it is more frequently met. Acute synovitis occurs at times (*a*) in connection with the secondary symptoms, such as the iritis, the eruption, and the pharyngitis. No *post-mortem* reports of this condition have been reported, and the hip is not commonly affected. (*b*) A simple serous joint inflammation, with rather a chronic tendency, occurs in connection with some cases of hereditary syphilis.

The joints are affected in syphilitic disease in the order named below, from which it will be seen that the hip is not often diseased from this cause. The knee, the elbow, the fingers, the toes, the metacarpo- and metatarso-phalangeal joints, the wrist, the hip, and the ankle are affected in the order named.

(7) *Infectious diseases* as a cause of acute synovitis are well recognized; and, although no very satisfactory explanation of their action can be given, they must be regarded as a comparatively frequent cause of acute serous or purulent synovitis of the hip,—unfortunately, most often the latter. In general, it may be said that the affection most closely resembles a pyæmic process; such infection of the joints being, in fact, a classical symptom of pyæmia.

The diseases in which such joint inflammations occur are as follows; diphtheria, dysentery, erysipelas, malaria, measles, meningitis, pneumonia, pertussis, parotitis, pyæmia, puerperal fever, scarlet fever, septicæmia, small-pox, typhus and typhoid fevers, and varicella. Gonorrhœa and the use of catheters are probably to be grouped with these diseases as possible causes of synovitis.

The joint complication in gonorrhœa most often occurs during or after the convalescence from the acute attack,

generally after the second week. These attacks may be serous or purulent. If the former, they tend easily to suppuration.

The joint infection in these diseases is attributed to the presence of micro-organisms in the circulation, and in the fluid from such joints micro-organisms are to be found. In the purulent and more severe cases one finds staphylococcus and streptococcus pyogenes in enormous numbers, and in the serous cases, milder forms, so that it seems as if whether the synovitis were serous or purulent were determined by the character of the micro-organisms reaching the joint rather than by any other factor.*

In most cases, the organisms reach the joint without doubt through the circulation; but they may at times, as in puerperal fever or erysipelas, reach the hip by the lymphatics or by direct extension.†

The character of gonorrhœal synovitis has been much disputed, but its proper place seems to the writer to be here. The theory of William Ord that it is the result of a reflex nervous disturbance does not seem tenable. Gonococci have been found in the joint fluid,‡ and the clinical character of the affection tends to make it seem like the synovitis of the other infectious diseases.

Gonorrhœal synovitis affects the knee most often and the hip infrequently. The joints are affected as follows in the order named: Of 308 cases,§ 86 attacked the knee, 52 the foot, 29 the shoulder, 26 the hand, 17 the fingers and toes, 16 the metatarso-phalangeal joints, 15 the hip.

Many of these infectious diseases also are the cause of tuberculous ostitis of the hip in children and of the acute arthritis of the hip in infants. In some instances, this is undoubtedly at first a synovitis; but in most cases, it will be

*Arch. f. Klin. Chir., xxxi., Heft 2; Ziemssen's Hdbch., 2 Auflage, ii. p. 546; Cent. f. Chir., Sitzberichte d. Cong. f. Chir., 1884.

† Bradford and Lovett, Treat. on Orth. Surgery. 1890.

‡ Petrone, Revista Clinica, 1883, No. 2; Cent. f. Chir., 1884, No. 4.

§ Nolen, Archiv f. Klin. Med., 1882, xxxii. p. 120.

seen, there is reason to believe that the original lesion is an osteomyelitis.

Acute purulent synovitis, when secondary to a lesion of the bone, will be considered under the heading of diseases primarily osseous.

### *Treatment.*

Simple acute synovitis of the hip is to be treated by rest and counter-irritation. Rest to the joint is most readily to be obtained in bed, with the hip controlled by a long outside splint or a plaster of Paris spica bandage. If there is much pain and muscular irritability, traction will add much comfort, exerted by means of a weight and pulley drawing down upon the leg by means of adhesive plaster straps. Rest to the joint should be insisted upon until motion is free and painless.

The hip joint is so deeply seated that it is not accessible to compression, so useful in the synovitis of other joints, and counter-irritation must take its place. This is most readily obtained by a fly blister back of the trochanter or by hot stimulating applications to the flank.

If an abscess forms, it must be opened freely, most conveniently by the conventional cut for hip excision. In the more rapid forms of acute infectious purulent synovitis, a free incision is to be made so soon as fluctuation is detected. Ordinarily, it will be better to wait until the collection of pus reaches the surface.

### *The Treatment of Acute Synovitis of the Hip in Children.*

To the writer's mind this section of the subject is worthy of the most careful consideration. Children are not prone to suffer from simple acute synovitis: it is not the way in which their joints commonly react to an irritant or an injury. The tendency is to ostitis and to chronic degenerative synovitis. Nowhere is this more true than at the hip. Practical experi-

ence shows that simple acute synovitis of the hip which clears up and leaves a healthy joint in children is very rare. The fact is not altogether to be explained, but it must rest on the basis of experience. On the other hand, let it be remembered that hip disease very often is noted as beginning acutely. In a large numerical proportion of all cases it is attributed directly to some injury, as is well known; and in most cases the symptoms after the injury are those of acute synovitis. Now, the practical outcome of the matter is that these cases of apparent acute synovitis are really beginning hip disease, which may have been excited by the injury or may not. The fact remains the same, that the surgeon who makes the diagnosis of simple acute synovitis in these cases lays himself open to a very great chance of error, as must be manifest. How common such cases are must be a matter of experience to every surgeon who sees much of children.

Remissions in hip disease, in which the symptoms practically disappear and the signs improve radically, are so common that they require no comment. This simply adds to the obscurity in making the resemblance of early hip disease and acute synovitis the more close, in their clinical history as well as their symptoms. Therefore, not only should the diagnosis of simple hip synovitis be made with much reserve in young children, but also the treatment should be conducted with great care, and not be discontinued so long as any suspicion of hip disease remains.

If the writer may allude once more to his own experience, it has led him never to make a diagnosis of acute synovitis of the hip in a child until some time after its complete and speedy recovery from all symptoms. This is, perhaps, a matter which belongs more to the diagnosis than to the treatment; but its extreme practical importance makes it justifiable to allude to it here.

The treatment should, of course, be the same as that de-

scribed above, except that, if at the end of a week the condition is not decidedly improved, traction should always be added, and *the child should not be allowed to walk on the affected leg until some time after all symptoms have disappeared.* If the symptoms persist, the child should be treated for hip disease without delay.

## Chapter IV.

# CHRONIC SEROUS SYNOVITIS OF THE HIP JOINT.

Forms of chronic serous synovitis of the hip which are not associated with the occurrence of tubercles or included in the manifestations of that affection known as arthritis deformans or rheumatoid arthritis, are so uncommon that they need not receive extended consideration. Tuberculous synovitis and arthritis deformans will be considered under their own divisions.

### Pathology.

Chronic synovitis of the hip may, however, succeed an acute synovitis. It may start *de novo* as a dropsy of the joint, so called, or it may appear as a low-grade inflammation with a scanty effusion, and associated with a strong tendency toward connective-tissue degeneration of the cartilage and obliteration of the joint by fibrous anchylosis.

Succeeding an attack of acute synovitis, one finds that an increased vascularity of the synovial membrane is followed by a thickening and bogginess of it, which is increased by its contact with the joint effusion. The capsule becomes thickened and softened, and the ligamentum teres swollen and soft. The subsynovial tissues become swollen and the ligaments thickened and less firm. In a joint less protected structurally it would lead to abnormal mobility. The slight synovial fringes which exist in the hip become hypertrophied, and appear papillomatous, but not to such an extent as occurs in the knee.

On the other hand, considerable effusion may rarely be found in the hip joint, as is so much more frequently the case in the knee, where the pathological changes are but slight. It is to such cases that the names dropsy of the joint, hydrarthron, etc., are given. Although it was originally considered to be an affection which was non-inflammatory, the weight of modern opinion inclines to class it as a low-grade inflammatory affection, accompanied by a copious effusion,* with slight structural changes in the synovial membrane.

Finally, there may be found in the hip joint the third affection spoken of above, which was formerly classed as a "dry synovitis," but which is now spoken of more commonly as *arthrite plastique ankylosante*, or *arthritis chronica ankylopoetica*.

The former idea was that a scanty effusion rich in fibrine was poured out, which led to a gluing together of the joint surfaces. This may occur in acute cases; but in the chronic form of the affection modern pathology has gone on to the observation of more extended and significant changes, and allows but little importance to the plastic power of the effusion in itself.

These changes differ from those found in arthritis deformans only in a slight degree, but chiefly in the cartilaginous part of the joint. In arthritis ankylopoetica, or ankylosing arthritis, proliferation of the cartilage exists only in a slight degree; and the changes on the cartilaginous surface partake less of the nature of a disintegration, being rather a change to connective tissue.

In the earlier stages of the affection the synovial membrane appears thickened and more injected than it should be normally, while the slight fringes tend to hypertrophy. In addition to these changes, however, and more significant, one finds that the cartilaginous surface is roughened, with

* Dict. de Méd. et Chir. Prat., viii. 89; Bonnet, Malad. des Artic., Paris, 1845; Billroth, Surg. Path., Am. Ed., 1883, p. 578; Billroth, Arch. f. Klin. Chir., ii. 408; Cornil and Ranvier, Histology; H. Marsh, Dis. of Jts.

a tendency toward fibrillary degeneration, and that certain parts have hypertrophied or have been made thicker by the deposition of layers of fibrine on the surface. In the deeper layers of the cartilage, next to the articular end of the bone, there is a tendency toward increased vascularity and change to osteoid tissue.

A very important factor in the joint obliteration is now to be noticed; namely, a vascularization of the cartilage. Blood-vessels are to be seen here and there in the stage subsequent to the one just described, which play an important rôle. In part they are derived from the synovial membrane and in part from the subsynovial tissue, as well as from the synovial fringes. In proportion to the number and size of these is to be estimated the rapidity of the joint change, which is essentially a fibrinous gluing together of the surfaces along with a fibrillary degeneration of the cartilage. The first adhesions form in the neighborhood of these vessels, and these bands grow larger and firmer and shut off more and more of the joint.

This condition of fibrous anchylosis is, in most cases, succeeded by a deposition of bone in the fibrous tissue, resulting in a bony anchylosis and complete obliteration of the affected joint.

It may seem a distinction of unnecessary accuracy to describe this affection separately from arthritis deformans, but in doing so the writer only follows the example of Ziegler and the best modern pathologists.

## Etiology.

Aside from the forms of hip synovitis associated with tuberculosis and arthritis deformans there is little to be said in considering the etiology of this affection.

Certain cases are the outcome of attacks of acute synovitis, the result either of traumatism or rheumatism, or in those instances where no cause can reasonably be assigned

for the attack. Cases which begin *de novo* as chronic serous synovitis are rare. For the most part, this form occurs in young adults, and is apt to be associated with rheumatism, in which case it is most often polyarticular.

*Gonorrhœa* should also be mentioned as a possible cause of chronic serous synovitis, although occurring most often in connection with an acute or chronic purulent form.

*Gout*, by a succession of acute attacks, induces a condition of practically chronic synovitis, in which the synovial membrane is the seat of urate of soda deposit, and stiffness of the joint ensues.

*Syphilis* affects the hip joint sometimes during the secondary stage of the disease, occurring as a subacute serous synovitis, accompanied by much swelling. It appears as a cause of joint inflammation more often at a later period, when the disease is well advanced into its tertiary stage, and appears generally in a chronic monarticular type. It is characterized by marked effusion, accompanied by much thickening of the capsule and papillary hypertrophy of the synovial fringes.

Gummata often appear in the synovial membrane, the capsule or the ligaments; and there is but slight tendency toward the formation of pus. Where resolution takes place, it is generally accompanied by contraction of the thickened capsule.

Chronic ankylosing arthritis is also spoken of as *arthritis pauperum*, which explains very succinctly the chief class affected by it. Associated in most instances with chronic rheumatic changes in the other joints, it is to be accounted the outcome of unfavorable conditions, such as damp dwellings, poor and insufficient food, exposure, and the like. It affects old persons, and mostly those in poor general condition otherwise.

Practically, it is not always to be differentiated from the similar condition of arthritis deformans.

### Treatment.

The treatment of chronic serous synovitis of the hip, apart from the two varieties which are not under consideration here, is a question which comes up but rarely in practice.

A long continuance of symptoms of chronic hip synovitis would lead to the suspicion of the existence of tubercular disease, and to the adoption of the treatment for that affection. Before that the measures most likely to be of use would be the administration of anti-rheumatic remedies and a building up of the general health. Locally, compression is not available; and one must depend upon counter-irritation by blisters or the Pacquelin cautery, with protection and rest to the affected limb, most easily to be obtained by the use of a high shoe on the well leg, with crutches, so that the affected leg would swing in walking. Massage should be tried to assist in the absorption of the fluid. The treatment of chronic ankylosing arthritis is identical with that of arthritis deformans, and will be discussed under that heading.

## *Chronic Purulent Synovitis of the Hip Joint.*

The changes here are so inextricably associated with the osseous changes that a consideration of the synovial changes by themselves would involve much repetition and lead to obscurity. It seems best, therefore, to consider the changes in chronic purulent synovitis in the next chapter.

## Chapter V.

# TUBERCULOUS OSTITIS OF THE HIP (*Hip Disease*).

### INCLUDING CHRONIC PURULENT SYNOVITIS.

There are two well-recognized forms of degenerative ostitis, the one characterized by the formation of tubercles, the other by the presence of gummata in the diseased tissue.

The bone changes occurring in arthritis deformans will be discussed separately.

The divisions of the subject are:—

(*a*) Tuberculous ostitis.

(*b*) Gummatous ostitis.

(*a*) *Tuberculous Ostitis* (including chronic purulent synovitis).

The great bulk of all cases of disease of the hip joint is made up by a chronic degenerative process, characterized by the formation of tubercles, a process which sometimes begins in the bone and sometimes in the synovial membrane. The result is the same, and practically the diagnosis cannot be made between the two conditions. It seems best, therefore, to speak of the whole affection by its accepted name of hip disease, and to discuss in one place the synovial, cartilaginous, and osseous changes, which go hand in hand in chronic tuberculous ostitis of the hip, commonly called "hip disease."

## Hip Disease: Pathology.

The affection is known more exactly as hip joint disease. Also it is called Coxalgia, Morbus Coxæ, Morbus Coxarius, Caries of the Hip, Coxotuberculose, Coxalgie, Huftgelenkkrankheit, etc.

Chronic articular ostitis of the hip is a more exact pathological name sometimes used.

It belongs to the class of joint disease spoken of in other joints (as well as in the hip) as fungous joint disease, strumous arthritis, scrofulous joint disease, etc.

In German similar names are fungöse Gelenkentzündung, die granulirend tuberculöse Gelenkentzündung, and Gliedschwamm; and, in French, Tuberculose articulaire, Osteite aiguë, etc.

The affection begins primarily either in the synovial membrane or in the spongy tissue of the bone, and, secondarily, affects the other in most cases. The cartilage plays only a passive rôle.

### *Synovial Changes.*

An affection of the synovial membrane has been described by König which he has called *Hydrops Articulorum Tuberculosus.* This form of disease is found most often in connection with the tuberculosis of neighboring bone, although not necessarily so.

The synovial membrane is thickened and succulent most often, and studded with tubercles which extend even into the subsynovial tissue. On the other hand, the tubercles may be present in a synovial membrane, almost unchanged by inflammation. The effusion is generally copious and serous or sero-purulent, and the synovial tissue tends to granulation, and the affection shades into the common form of fungous synovitis about to be described.

It exists, however, often enough alone to be described as an individual affection* pathologically. It should be mentioned, in connection with it, that the effusion in some cases is very fibrinous, and shows a strong tendency toward coagulation and the formation of loose bodies in the joints.† It is not, however, the usual form of tuberculosis of the synovial membrane. König finds an explanation for this particular form of joint disease in assuming that the irritation caused by the growth of the tubercles in these cases is not enough to cause the ordinary manifestation as fungous granulations.

The common form of tuberculosis of the synovial membrane results in changes in the membrane which lead to a purulent effusion.

The affection may be the outcome of an acute synovitis which has passed into the chronic state or it may begin merely as a chronic affection at the first.

If the affection was originally an acute purulent synovitis, a persistence of the condition described in speaking of that would lead to a chronic synovial disease. If it was originally an acute serous synovitis, certain transitional stages are to be noticed. The injection of the synovial membrane continues, and leads to its hypertrophy and thickening. The increased blood supply and contact with the effusion make the membrane succulent and boggy. At the edges of the cartilages it encroaches upon them and corrodes them. The increased activity leads to the formation of white blood corpuscles, and their accumulation as granulation tissue, which causes a change in the effusion from a serous to a sero-purulent or purulent one.

The first stage of inflammation in a synovial membrane infected by tubercle bacilli consists, then, in increased vascularity, thickening and succulency of the synovial membrane, accompanied by a serous or sero-purulent effusion.

* König, Die Tuberc. der Knochen und Gelenke, Berlin, 1884, p 22.

† Riedel, Deutsch. Zeitsch. f. Chir., Bd. xx.

This condition gradually merges into the formation of a low-grade granulation tissue, which occupies the surface of the membrane and which is best described by the term gelatinous. In the hip joint this gelatinous degeneration is not so common as in the knee, for instance, and more commonly one finds a swollen and reddened membrane with comparatively firm granulation tissue.

During this process the synovial membrane grows over on to the cartilage, and, where it covers it, it becomes adherent, and, if peeled off, it shows that the underlying cartilage has been eroded. Such synovial fringes as there are in the hip joint hypertrophy and take an active part in the process.

Imbedded in the granulation masses are small white specks, just visible to the naked eye, which are to be identified as tubercles. Later they appear in larger masses, and perhaps tend to cheesy degeneration in the larger nodules.

The secretion from these granulating synovial surfaces, as a rule, is small in the hip. When one considers how little effusion can be contained in this joint, and considers how comparatively uncommon hip abscess is in well-treated cases of hip disease, it must be evident that excessive secretion of pus is not the rule. In some instances, little or no effusion is present in the joint (Lannelongue), even when the disease is well advanced.

Microscopically, the granulations are seen to consist of typical granulation tissue, interspersed with the white specks already alluded to, which are of the greatest significance. For a long time their importance was overlooked, and they were first recognized as tubercles by Köster.* Their structure in the early stages is typical of that pathological condition known as tubercle. Later, as they become cheesy and disintegrated, the section shows less characteristic appearances; but even then the freshly forming tubercles can be identified. It would seem as if the identity of these structures would be admitted by common consent, supported as

* Köster, Virch. Archiv., Bd. xlviii.; Arch. de Phys., 1800, p. 325.

it is by the weightiest pathological authority; * but so high an authority as Barwell † finds cause to argue that these structures are the result of fatty and suppurative degeneration. His views, however, find no acceptance whatever. Similar masses of inspissated mucus may, however, be found imbedded in the granulations.

Tubercle bacilli are found in a certain proportion of these cases, and physiological evidence of their pathological identity is abundant. These matters will be discussed later, and for the present it must be accepted that the nature of these minute bodies occurring in the gelatinous granulations is abundantly proven to be tuberculous.

Synovial membrane which has reached such a degree of purulent inflammation as this pursues one of two courses. If matters go badly, the granulations melt down rapidly into pus and take on an erosive action. In their rapid career the synovial membrane is destroyed, and the capsule becomes thickened and softened, and probably bursts, letting out the pus into the periarticular structures, constituting the commonest form of joint abscess. The cartilage becomes degenerated and disintegrates, exposing the hyperæmic articular surfaces of the bones, which are at once attacked by the pus and take on a destructive activity themselves. Finally, what was formerly a joint is now a mass of granulating and degenerated tissue, in which the bare and eroded ends of the bone are loosely imbedded, while sinuses drain off the pus. It can be seen that it is not easy to set a limit to the destructive activity of such a process as this.

If, on the other hand, resolution is to take place in such a purulent synovitis as that described, the granulations become firmer and less pale, the tubercles cease to extend and become less frequent. In the granulation masses the connective tissue can be seen by the microscope to predomi-

*Brissaud, Rev. Mens. de Méd. et de Chir., 1879, June 10; König, Deutsch. Arch. f. Chir., xi. pp. 317 and 350.

† Dis. of Joints, 1881; and Lancet, Aug. 2, 1884.

nate over the cellular elements, and the secretion of pus diminishes in proportion to this change. This is merely the first stage in the change to fibrous tissue. This will, in cases where the change has been at all extensive, lead to fibrous contractions of the capsule, and to adhesions between the joint surfaces, impairing or obliterating the joint movement. Recovery from chronic purulent synovitis with perfect joint mobility is only likely to occur where the synovial membrane has been but slightly affected, because, if granulations have once formed, they can only be replaced by scar tissue, and contraction of the surrounding tissues follows necessarily.

Such, in brief, are the changes which occur in the synovial membrane in chronic joint tuberculosis. It matters very little whether the changes originated in the bone or the synovial membrane, the pathological appearances in the latter are much the same, and the results are similar.

### *Cartilaginous Changes.*

But no marked degree of change in the synovial membrane will have been reached without affecting the cartilage of the hip joint and the articular surfaces of the bones.

First, as to the changes in the cartilage. Primary inflammation of cartilage is not an affection which is believed to exist in tuberculous joint disease ; and, although cases have been reported of so-called primary disease of the intervertebral discs,* and of the cartilage of the knee † joint in one instance, there is not, so far as the writer has searched, a single authenticated instance of primary disease of the cartilages of the hip, except in the writings of twenty years ago recording changes which are now known to be secondary to inflammation elsewhere.

* Ogle, Path. Soc. Trans., xv., 1863; Broca, Gaz., Hebdom., 1864, p. 298; Chassaignac, Gaz. des Hôp., 1858, p. 156.

† Kocher, Cent. f. Chir., Nov. 5, 1881.

To the eye the appearances which occur in the cartilage in chronic purulent synovitis are manifested by a loss of the blue-white opalescent look which healthy hyaline cartilage possesses. It becomes yellowish, and looks softer and more succulent than it should normally. The synovial membrane has crept over on to it in places at the edges; and, if an attempt is made to detach it, it is found adherent, and, if pulled off, may leave a red and eroded surface of cartilage behind it. In some places it may tend to disintegrate, and to be replaced by granulations; while in others it is cast off in flakes or large masses loose into the joint. Sometimes the whole cartilage of the head of the femur may be thrown off, or it may hang in tags, or look worm-eaten, or be undermined by granulations. With the destruction of the cartilage, the ends of the bones are exposed to the destructive processes going on in the joint.

Microscopically, the cartilaginous changes are those by which cartilage always responds in inflammatory conditions. The nuclei and the cells both multiply very fast, and the hyaline substance tends to become fibrillated. Fatty degeneration of the cells ensues; and with it come softening and further fibrillation of the cartilage, which lead to its disintegration.

The casting off of large surfaces of cartilage occurs chiefly in cases where the disease is primarily osseous and shuts off the nourishment supply of the articular cartilage.

### *Osseous Changes.*

The changes which occur in the bones are the most important and the most significant. It will be shown later that the most frequent origin of hip disease is in the epiphysis of the head of the femur.

Specimens of beginning hip disease are very rare, so that the earliest changes are more a matter of inference than of observation. A hyperæmia takes place in the spongy tissue

about the epiphysis, which is followed by the appearance in the centre of this hyperæmic area of a small grayish, translucent spot, which increases in size and is surrounded by a zone of hyperæmia. Cases little more advanced than this have been reported by Lannelongue.*

It is probable that this stage of the disease is caused by an infection through the blood-vessels, that bacilli or micrococci become heaped up in the capillary of an Haversian canal and start up an endarteritis, which results in a tubercle. The irritation of this process causes and keeps up the hyperæmia which results in the processes described as rarefying ostitis. That is, the trabeculæ are absorbed in the hyperæmic area surrounding the tubercle, enlarged bone spaces are formed, and fatty degeneration of the bone cells occurs with the transformation of their contents to embryonal or granulation tissue.

The earliest stage, then, seems to consist of a tubercle situated in an area of hyperæmic, spongy bone tissue which is undergoing the absorption and degeneration which result from prolonged hyperæmia.

The gray spot continues to increase, and in its centre becomes yellowish, and around it appear other small gray spots, which merge into it and hasten its destructive career. Most often the centre softens and breaks down into pus; but before that it oftenest goes through a stage when it is filled with a semi-solid, cheesy mass, consisting of detritus, spicules of bone, amorphous matter, and fat.

The active destruction goes on at the periphery of this nodule, and its growth takes place in the direction of least resistance. Sequestra of varying size may be found in connection with these foci of disease. These are caused by the cutting off of the vascular supply from some area of bone, due to the growth of the tubercles. At the hip they are likely to be more extensive than elsewhere, owing to the fact that the whole upper epiphysis of the femur lies *within*

* Coxotuberculose. Paris, 1886.

the joint, and that the main vessels enter on the upper surface of the neck. It thus happens that the blood supply of a large area may be easily shut off, and this accounts for the comparative frequency of necrosis of whole or part of the femoral epiphysis. This cannot be spoken of as a common condition, but it occurs often enough to have attracted considerable attention.* Mr. Parker found this condition in 5 out of 8 cases, and Mr. Morrant Baker in 11 out of 24. Mr. Wright,† who quotes them, finds this too high a percentage, and reports only seventeen sequestra of the femur in 100 cases. Occasionally, the necrosis extends for a short distance into the diaphysis.

To return to the focus of disease, which exists as a purulent or cheesy mass in the epiphysis, it may at this stage be absorbed, it may grow toward the periosteum and be discharged outside of the joint, or lastly it may break into the joint (which is probably the commonest course), and infect that with a purulent inflammation.

If the conditions are favorable for its absorption, it becomes more cheesy and dry, and remains as a cheesy mass latent in the bone, still infected with the bacilli, but quiescent until some general or local cause calls it into activity; or, after becoming dry and cheesy, it is the seat of the deposit of lime salts, becoming calcified; or, lastly and most uncommonly, the pus may be absorbed, leaving a cavity filled with clear serum. It is not likely that absorption occurs where the focus contains sequestra of any size.

It can be seen from the anatomical conditions of the hip joint that a focus of disease in the neighborhood of the epiphysis of the femur is much more likely to invade the joint in its growth than to travel toward the surface of the bone outside of the capsule. It may be mentioned once more that the epiphysis lies wholly within the joint. Nevertheless, it does occur that the enlargement of the tuber-

*R. W. Parker, Clin. Soc. Trans. 1880. †G. A. Wright, Hip Disease, London, 1887, p. 30.

culous disease takes place at times away from the joint surface, and the contents of the diseased area are discharged externally, and the cavity heals. This is, of course, much more likely to happen where the origin of the trouble is in the diaphysis and in those uncommon cases where the epiphysis of the great trochanter is the one involved. When the disease travels toward the surface of the bone, the periosteum over it becomes thickened and soft, and a slight or severe cellulitis of the neighboring tissues occurs.

This termination of joint disease explains those cases where slight hip disease is followed by an abscess, after which the symptoms quickly subside.

Finally, the most common course of the three is when the tuberculous focus advances toward the joint cavity. The original tuberculous focus has broken down into pus, and is surrounded by smaller tubercles, which aid in its destructive work in melting down the bone. There is no joint disease at first. Volkmann says that "the danger to the joint begins with the softening of the cheesy mass." As the inflammation of the bone approaches the articular cartilage, inflammation of the joint begins before direct infection of the joint from the tuberculous pus has occurred.

From the early resections of Volkmann* and from the autopsies of Lannelongue, it would seem as if the joint inflammation originated by sympathy as well as by direct infection. Certainly, it has not been uncommon to find a degree of purulent synovitis accompanying an osseous focus which has not broken into the joint and which could only have caused it in some indirect way.

The synovial membrane becomes inflamed and undergoes the changes described above, especially in the neighborhood of the bone disease. The cartilage becomes secondarily inflamed and softened over the approaching focus, and the way is prepared for the entrance of the pus into the joint. Generally, a small hole exists at first, which becomes larger as the disease advances.

* Samml. Klin. Vort., No. 52.

When this stage is reached, it is evident that it matters little whether the disease began in the bone, the cartilage, or the synovial membrane, since all are involved in the destructive inflammation. The mechanism is at hand for an extensive and destructive inflammation. In cases of femoral disease the acetabulum becomes secondarily involved, and with that one finds a periosteal and fibrous thickening on the inner side of the pelvis under it, which is Nature's effort to prevent perforation.

Perforation of the acetabulum, however, occurs in a certain proportion of the more serious cases; and the head of the femur may be forced through the bottom of the socket into the pelvis, or, more commonly, the opening is only large enough to cause the formation of an intra-pelvic abscess, the pus from which may be found discharging into the rectum or involving the other pelvic viscera. More commonly it points in the buttock or under the adductor tendons. An important element to be taken into account is found in the constant muscular contraction accompanying hip disease, which crowds the head of the femur against the upper edge of the acetabulum, causing not only wearing away of the softened bone composing the head of the femur (spoken of as absorption of the head), but also wearing away the upper edge of the acetabulum and causing an upward elongation of that cavity (spoken of often as migration of the acetabulum).

This results in the malposition upward of the head of the femur, and the consequent shortening of the leg from the altered relation of the femur to the pelvis. Real shortening and atrophy, as well as retardation of growth, are to be found in the affected limb, which is another element in the production of the short leg of hip disease.

True dislocation of the hip is very uncommon in hip disease, occurring only when the changes affect the capsule very extensively.

Accompanying the changes in the spongy tissue of the epiphysis, the periosteum of the neck of the femur and the

trochanter becomes secondarily involved and thickened; and the capsule of the joint becomes softened and often distended by the purulent effusion. Finally, it gives way, and the pus finds its way into the periarticular tissues to form a hip abscess. Another source of hip abscess is to be found in the formation and degeneration of an independent focus of tubercle outside of the capsule.

Even in the milder cases of hip disease without abscess formation there are to be found a condensation and infiltration of the superficial tissues, which are rarely mentioned.

Even at the stage of joint inflammation just described, absorption may occur and a cure result. This comes about by the evacuation or absorption of the purulent effusion and the consolidation of the granulations, with their change to connective tissue, forming a fibrous anchylosis, which may later be the seat of a bony deposit.

On the other hand, the tuberculous process may continue to spread and invade the more superficial tissues until they have the consistency of pork. Many sinuses form, and the destruction of the joint goes on, until the patient dies of exhaustion or some intercurrent affection.

Tuberculosis of the other organs may be found in connection with hip disease, especially tuberculosis of the meninges and of the lungs. In cases where the suppuration has been long continued, amyloid changes may be found in the liver and intestines.

It should be said, in closing this section of the pathology, that the origin of the disease may be in single or multiple foci, beginning in the cancellous tissue.

There is, moreover, a second form of tuberculous disease of bone, which has been left to the end, to prevent confusion; namely, the infiltration of a whole or part of an epiphysis with a tuberculous deposit. A grayish substance, soft and semi-translucent, first appears in the tissue of the epiphysis, in appearance like the single focus of disease spoken of above. This degenerates in spots into yellowish, purulent material,

and soon pus forms everywhere, and the tissue is bathed in pus. This process is more rapid and more destructive than the focal form mentioned above. This latter form was first described by Nelaton under the name of "infiltrated tubercle," while the common form was called by him "encysted tubercle."

To return to the microscopical characteristics of the affection, and to ask what evidence we have that the process is a tuberculous one, the evidence is threefold,— (*a*) physiological (inoculation experiments), (*b*) histological, (*c*) bacteriological.

(*a*) Inoculation experiments will be discussed in speaking of the etiology.

(*b*) The microscopical appearances are those of a typical granulating tuberculosis. In the later stages the type of the characteristic structures is obscured by cheesy degeneration, but earlier one finds that typical tubercles with epithelioid and giant cells lie in the granulation tissue. Later they lie in an amorphous mass, composed of bone spicules, fat, and detritus of all sorts. Outside of this area is still a zone of hyperæmic bone, the pathological appearances of which have been already described.

In short, so far as structure can establish the identity of tubercles, they are present here.

(*c*) But a more accurate criterion is to be found in the presence of the bacillus of tubercle in the diseased structures. Unfortunately, the process of finding them is a difficult one, which prevents frequent search for them and which renders it easy to overlook them. Moreover, they are present in small numbers at that stage of bone tuberculosis which comes to examination, so that their absence in any given examination cannot count for very much unless the searcher is a person of much technical skill who has failed to find them on repeated examination. It has been customary to use a modification of Ehrlich's method.

To illustrate the difficulty of finding them, one may cite the experience of Schuchardt and Krause, who examined

some forty cases of scrofulous and fungous joint disease at Volkmann's clinic, in all of which they were able to find the bacilli; but in one instance it was necessary to make twenty sections to find two bacilli. Some other observers have not been able to find bacilli in so large a proportion of cases. Kanzler,* in 15 cases, found them present in only 8; and Müller,† in some 40 cases, in most of which he used the pus, found cases where he was unable to demonstrate the presence of the bacilli by any process to which he resorted. The latest observers ‡ have been able to find bacilli in nearly all cases, which is a contrast to the experience of the early investigators, such as Koch. §

König reported an analysis of 71 cases of hip disease, in 67 of which the tuberculous character of the process was unmistakable.

Having discussed at length the changes which occur in bone, cartilage, and synovial membrane in hip disease, it becomes a matter of interest to investigate the relative frequency of primary bone and synovial affections.

In a word, it may be said that modern pathology has established the fact that epiphyseal ostitis is the first change in the great majority of cases, especially in children; while synovitis is relatively more common in adults. This statement will be substantiated by a detailed analysis later.

The question of the seat of the primary disease in hip joint disease has been the subject of very warm discussion during the past fifty years, and it is to-day more a matter of historical than of practical interest. Mr. Wright, in his admirable book on Hip Disease, gives a complete summary of the phases and changes of opinion in the matter.‖ Originally, the disease was thought to be of synovial origin, and Billroth and Sayre still represent that opinion. Brodie,

* Berl. Kl. Wchsft., 1884, 2, January 14. † Cent. f. Chir., 1884.

‡ Park, Med. Press, W. N. York, January, 1887.

§ Koch, Fortsch. d. Med., 1883, 9, Bd. i. p. 277.

‖ G. A. Wright, on Hip Disease in Childhood. London, 1887.

although realizing the fact that many cases of the disease began in the bone or synovial membrane, was an advocate of the frequency of a primary affection of the cartilage as the real trouble, in which very few writers have followed him. Ashton Key originated the theory that the disease began in the ligamentum teres ; and Adams, Holmes, Owen, and Coulson are advocates of the ligamentous origin of the disease.

Among the surgeons who believe in the primarily osseous origin of hip disease in the great majority of all cases may be mentioned Barwell, Bryant, Gross, Parke, Annandale, Marsh, Gibney, König and Volkmann as representative of nearly all German writers, and Lannelongue. The evidence in favor of this view will show on what a strong basis it rests.

König found in 71 cases of hip disease 67 osseous in origin. Mr. G. A. Wright, as the outcome of his experience in 100 excisions, believes that "the disease begins almost invariably in the bone." Gibney states his belief that in children under eight years of age chronic articular ostitis is the common lesion. Müller, in 61 hip excisions, found in 47 cases that the disease clearly began in the bone, in 3 in the synovial membrane, while in 11 the changes were so far advanced that it was not possible to state accurately where it originated.*

Volkmann,† as the outcome of his enormous experience in the resection of joints, expresses the opinion that fungous joint begins usually (and always in children) as a localized ostitis. This is more the rule in hip disease than in the case of the other joints, as is shown by the table of Müller, analyzing 232 preparations of tuberculous joints : —

| | *Bony origin.* | *Synovial origin.* | *Indefinite.* |
|---|---|---|---|
| Hip, . . . . . | 69 | 33 | 16 |
| Knee, . . . . . | 47 | 3 | 11 |
| Elbow, . . . . . | 42 | 10 | 1 |

* Quoted by König, Die Tub. der Knochen u. Gelenk.

† Samml. Kl. Vtrge., Nos. 168 and 169.

The evidence for primary ostitis as the cause is strengthened by most of the early autopsies. The four early autopsies of Lannelongue have been already alluded to, and demonstrate this very clearly. Gibney,* in his book, has reported some early autopsies; and the case reported by Fricke † is a well-known one. The reports of early autopsies are so few that the above list represents all that are known to the writer.

One autopsy, however, made fairly early in the disease, should be mentioned as perhaps demonstrating the occasional occurrence of the disease primarily in the synovial membrane and the ligamentum teres. It was reported by Drs. Willard and Shakespeare, and had occurred in a child where the disease had existed a year, and who died of tubercular meningitis. Synovial changes were more marked than the osseous, but the case is open to the criticism made by Gibney,—that the patient had been under efficient treatment, and the osseous changes may have been retrograding.‡

Assuming, then, that the osseous origin of the disease is fairly demonstrated, it becomes of importance to inquire into the relative frequency of femoral and acetabular ostitis. This is not a distinction which, in the opinion of the writer, can be made in most cases during life, although the contrary is asserted by many authors, and the only reliable data must be obtained by *post-mortem* evidence and from excisions. Rectal examination may demonstrate a thickening of the inner side of the pelvis over the bottom of the acetabulum, but that does not prove primary disease of the acetabulum.

Mr. Wright, in his 100 cases of excision, found 10 where he thought that the acetabulum was primarily diseased. At operation, however, it was superficially diseased in 49 cases (and these were not particularly late cases), it was perforated in 16 instances, it contained sequestra twenty-two times,

* Gibney, Diseases of the Hip. New York, 1884.

† A. B. Judson, N. Y. Med. Jour. and Obst. Review, July, 1882.

‡ Boston Med. and Surg. Journal, 1880.

while in only ten was it noted as being healthy. Certainly, in the cases of excision coming under the writer's observation (all being late cases), the acetabulum has always been found seriously diseased along with the femur.

Habern has analyzed 132 of Volkmann's hip joint excisions. Of these he found a caseous focus of the acetabulum in 50, in 23 a focus of the head of the femur, in 7 there were such foci in both femur and acetabulum, and in 29 cases the changes were so far advanced that the original seat of the disease could not be stated.*

This is not in accord with the common opinion, although figures are not obtainable, and it must be noted that Habern is a partisan strongly in favor of the acetabular theory.

The general consensus of opinion locates the origin of most cases in the epiphysis of the femur.

## The Etiology of Hip Disease.

The knowledge of the pathology of bone tuberculosis may be in an unsatisfactory condition, but it far surpasses in accuracy and completeness the sum of all that can be said with regard to the etiology of the affection.

Formerly the writers on the etiology of hip disease could be classified into two schools,— those who believed in a constitutional cause for the affection and those who would find the cause in a local trauma. Late years have tended to bring forward those who believe that the disease is oftenest the result of both causes.

It would be hard to find a better introduction to this vexed question than the mention of the classical experiments of Schüller, which have done so much to furnish it with a firm scientific basis.

Guinea pigs and dogs were rendered tuberculous by the inhalation of solutions containing tuberculous detritus from

* Cent. f. Chir., 1881, April 2.

diseased lungs, etc., with occasional injection into their lungs of similar solutions. The knee joint of each animal was then wrenched or bruised, and in the great proportion of all the cases a typical chronic tuberculous synovitis of that joint occurred, while similar injuries to healthy animals caused no joint disease, and nothing beyond a temporary strain.* These experiments are accepted as conclusive by all writers except Barwell, who finds fault with them on very insufficient grounds.†

The recognition of hip disease as a tuberculous affection tended to weaken the cause of those who advocated traumatism as the chief cause of the disease, and of later years their number has diminished steadily. The advocates of traumatism are Sayre, Agnew, Bauer, Adams, and Petit ; and, at the time when these writers were most active, the true pathology of hip disease was but little known. Sayre's theory, that the traumatism caused a blood blister in the joint and a consequent joint inflammation, is not tenable in the light of the pathology of to-day.

The presence of the tubercle bacillus in the tissues, and the whole weight of modern opinion, then, are opposed to considering traumatism as more than an exciting cause of hip disease.

To consider somewhat in detail the influence of traumatism and heredity as causes of hip disease.

*Traumatism.*— All statements of the parents, to whatever class of society they may belong, tend to credit the disease to some accident. Not only does this seem to them more reasonable, but the supposition of an hereditary cause renders them in a measure responsible for the state of affairs, and the disposition is very strong to credit the disease to some post-natal cause rather than to allow the imputation to rest on them. Consequently, the figures in favor of traumatism are more likely to overstate than under state the truth.

*Cent. f. Chir., 1878, v. † Lancet, Aug. 2, 1884.

Certain cases of hip disease develop a few months or a few weeks after accidents, such as falls, wrenches, etc. The proportion of cases beginning in this way is variously stated. König has found a traumatic history in about 50 per cent. of his cases, which represents an average estimate. Gibney found 42 per cent. traumatic. Taylor attributed 53 per cent. to injury, while Albrecht presents the smallest estimate, one-sixth.

The effect of traumatism in healthy children has been investigated to a certain extent. Gibney observed 845 children affected with spinal paralysis (a class of children who are particularly liable to falls), and found only 4 cases of joint disease. And Roser,* observing 100 children at Marburg with fractured elbows, found no case of joint disease following the injury. A personal case of the writer's may be of interest in this connection. A boy of twelve, with tuberculous disease of the right shoulder, fell and fractured the left elbow. The fracture pursued the usual course for about six or eight weeks, when the signs of joint disease appeared, and have since progressed.

The general opinion is that in about half of the cases a traumatic history can be obtained. It is easy to see how this may result in joint disease. From a severe fall or injury there is likely to result an extravasation of blood in the cancellous tissue of the bone; and in certain instances, instead of being absorbed, this may become the seat of degenerative inflammation. König says, "There are cases where the swelling from the fall merges into the tuberculous swelling." †

The mechanism of the production of the local trouble is thus accounted for, and it is evident that in half the cases an accident is associated with the beginning of the disease. Let us inquire further in what class of children such accidents produce hip disease.

* Roser, Berl. Klin. Wchsft. † D. Zeitsch. f. Chir., 1879, xi.

*Heredity.*—In discussing the influence of hereditary tuberculosis on the occurrence of hip disease, the words scrofula and scrofulosis are much used, and rather indefinitely. Hip disease is, moreover, often classed as a scrofulous joint disease; and this may be as good a place as any to define the word as it is used now. Dr. Peters scarcely overstates the situation in saying that those who do not recognize the identity of tuberculosis and scrofulosis are "such surgeons at home and abroad who do not perhaps enjoy the privileges of closely following the rapid advance of pathological investigation."* The question is discussed at length by Mr. Treves,† and other references are given.‡ In this essay the word scrofulous will not be used, but in its place the term tuberculous.

It has been definitely settled that tuberculosis as such can be transmitted from the parents to the fœtus. Landouzy and Martin took an apparently healthy fœtus of six and one-half months born of a phthisical mother, and a bit of its lung caused general tuberculosis when put into a guinea pig's stomach, and inoculations from that animal were carried through five animals. Blood from a similar fœtus caused general tuberculosis in another guinea pig. One of the tuberculous guinea pigs gave birth to a litter, apparently healthy, but the inoculation of pieces of its liver and kidneys caused general tuberculosis in other guinea pigs; and semen from one of the tuberculous guinea pigs was taken by a carefully sterilized needle, and inoculated into other guinea pigs, infecting them with general tuberculosis.

Practically, one finds a history of inherited tuberculosis in a very large proportion of all cases; yet this is likely to fall short of the truth for much the same reasons that the traumatic histories are likely to exceed it. Hospital pa-

* Canad. Pract., 1890. † Manual of Surgery.

‡ Howard Marsh, Diseases of Joints, p. 7; Hueter, Gelenkrankheiten, and D. Arch. f. Chir., 1879, xi.; Modigliano, Deutsch. Med. Ztung., Sept. 19, 1890.

tients, from whom most statistics are necessarily obtained, are notoriously unreliable as to the life history of their relatives and their progenitors; and, moreover, they are strongly inclined to throw their influence in favor of traumatism. Consequently, such statistics cannot be regarded as more than approximate.

Gibney* has been the most active investigator on the side of heredity; and he is a believer in heredity, or an "acquired diathesis," as a well-nigh indispensable cause. In 596 cases of chronic joint disease affecting various joints, he was only able to find one case where there was not "an hereditary or acquired diathesis." He found tubercular disease of one or both parents in 68+ per cent., and an acquired diathesis in 30+ per cent. more.

In 401 cases of hip disease from the Alexandra Hospital reports, 35 per cent. were classed as traumatic, and 24 per cent. had a history of tuberculous disease in one or both parents.† C. Fayette Taylor‡ analyzed 845 cases of Pott's disease in this regard. He found 34 per cent. where there was scrofulous or tuberculous disease in the parents.

Bone tuberculosis is not often transmitted from parent to child, as Dollinger§ recently found in an investigation of 250 patients with bone tubercle. In these he found a family history of phthisis very common, however.

It must be evident from these figures that a history of tuberculosis in one or both parents exists in a large proportion of all cases of hip disease. Gibney seems to take extreme ground in assuming that an hereditary or acquired diathesis can always be established. It comes into the experience of most surgeons from time to time to see the robust children of healthy parents where hip disease follows some slight injury, and where the bone disease is the only evidence of tuberculosis which is demonstrable.

*Gibney, Strumous Element in Joint Dis., N. Y. M. J., 1877, July.

†Croft, Trans. Clin. Soc., London, xiii.

‡German Trans. of "The Mechan. Treat. of Pott's Dis."

§Cent. f. Chir., 1889, 35, p. 609.

Since the fall or the wrench is not capable of introducing into the circulation the bacilli which are found after it. There is strong presumptive evidence in favor of the theory that trauma only causes hip disease in cases predisposed to tuberculosis or infected by it. Shaffer states the question very fairly in saying "experience proves that traumatism excites only acute disease, as a rule. In those constitutions strong enough to resist and repair the injury these acute troubles soon subside. Under reverse circumstances they are apt to be followed by a chronic form of inflammation, which may perhaps end in suppuration." * The weightiest German authority may be quoted to the same effect: "Individuals with fungous joint disease spring, practically without exception, from families in which scrofula and tubercle are hereditary." †

Bad surroundings, insufficient food, exhausting illnesses, and the like seem to work in the same direction as heredity in rendering children less resistant, and predisposing them to tubercular disease. It is to such cases that Gibney applies the term of "acquired diathesis."

*The Influence of the Exanthemata.*— Certain of the acute diseases of childhood are to be recognized as important factors in the causation of hip disease,— notably, measles, scarlet fever, and diphtheria, more rarely pneumonia and typhoid fever. Croft estimates that 7 per cent. of chronic joint disease in children is due to these causes. Certainly, it is very common to find the beginning of the joint disease associated with the convalescence from one of these affections. Nothing but conjecture can be presented to account for this state of affairs.

These are the chief factors in the causation of tuberculous joint disease: an inherited or acquired tendency to tuberculosis in most cases as the predisposing cause, with a history of local injury in about half of the cases. In some cases, one of the exanthemata seems to be accountable.

* American Clinical Lectures, vol. iii. p. 141.

† Volkmann, Samml. Kl. Vrtrge., p. 52.

*Phimosis as a Cause of Hip Disease.*— Some mention should be made of this condition, which was at one time much advocated as a cause of hip disease. Dr. Parke demonstrated the very common occurrence of phimosis in healthy boys by the examination of 150. In 25.5 per cent. of these retraction of the foreskin was not possible, in 23.5 per cent. adhesions were present all around the glans, in 31.4 per cent. partial adhesions were present, while in only 19.5 per cent. was complete retraction of the prepuce possible.*

Barwell, finding 83 per cent. of children with hip disease affected with some phimosis, concluded that it was a cause of hip disease; but comparison with Parke's figures shows that this proportion was about normal. Wright examined 63 cases, and found that in hip disease 67 per cent. had phimosis, while of the others only 50 per cent. had it; but the figures are too few for generalizations.

In short, there is as yet very little evidence to point to phimosis as a cause. It is a very bad state of affairs, and causes much peripheral irritation, and perhaps incontinence, with often deterioration of the general health; but much more evidence is needed to connect it with hip disease.

*Age.*— Tubercular joint disease is pre-eminently an affection of early childhood. The rich vascular supply of the juxta-epiphyseal regions during ossification, the instability of the tissues, and the constantly occurring slight traumatism, all unite in rendering children the most frequent victims of this form of disease. As one might decide *a priori*, the time of greatest susceptibility would naturally be between the ages of three and nine. Where disease has begun, as Mr. Marsh has pointed out, there ensues an active period of disease, extending from two to five or six years, so that in a sense tuberculosis of bone is to be regarded as a self-limited disease.

* Chicago Medical J. and Examiner, 1880.

Wright tabulated 619 cases of hip disease, as follows: —

| | | |
|---|---|---|
| Under 6 years, | 40 | |
| From 6 to 10 years, | 110 | |
| From 10 to 15 years, | 129 | |
| From 15 to 20 years, | 66 | |
| From 20 to 25 years, | 39 | |
| From 25 to 30 years, | 17 | |
| Over 30 years, | 17 | 418 |

And in another group were classed the others

| | | |
|---|---|---|
| Under 2 years, | 28 | |
| From 2 to 5 years, | 62 | |
| From 5 to 10 years, | 81 | |
| From 10 to 14 years, | 30 | 201 |
| | | 619 |

Bryant tabulated 360 cases, as follows: —

| | |
|---|---|
| Under 4 years, | 126 |
| From 5 to 10 years, | 97 |
| From 10 to 20 years, | 86 |
| From 20 to 30 years, | 27 |
| From 30 to 40 years, | 13 |
| Over 40 years, | 11 |
| | 360 |

At the New York Orthopedic Dispensary from 1884–86 were treated 1,178 cases of hip disease, the ages of which were as follows: —

| | |
|---|---|
| Under 3 years, | 115 |
| From 3 to 5 years, | 316 |
| From 5 to 10 years, | 509 |
| From 10 to 15 years, | 140 |
| From 15 to 20 years, | 47 |
| Over 20 years, | 51 |
| | 1,178 |

If to these groups are added Gibney's 860 cases and 365 reported by Sayre, there are 3,382 cases of hip disease, 2,806 of which occurred before the age of fifteen.

*Sex.*—Boys are slightly more liable to have hip disease than girls are, from which the advocates of phimosis have drawn many conclusions. It seems easily enough accounted for, however, by the fact that boys lead a much more active life and are more liable to rough use and all sorts of traumatism. Of Wright's 619 cases, 371 were boys; and Holt collected for Gibney 2,307 cases of hip disease, and found 1,178 boys and 1,129 girls.

*Inoculation Experiments.*— Certain facts with regard to the etiology of tuberculous joint disease have been established by experiment, which have a bearing more or less practical upon the subject under discussion.

(*a*) It has been proved that cultures of the tubercle bacillus or detritus containing tubercular material (whether from scrofulous glands, phthisical lungs, or fungous joint cavities) are capable of producing general tuberculosis if introduced into the system, or tuberculous joint disease if introduced into the joints.* The most careful and most recent experiments are those of Parllovski,† who made pure cultures of the tubercle bacilli in peptonized glycerine, and injected these into the knee joints of guinea pigs. The animals were killed at intervals of from 12 hours to 8 weeks, and the changes noted. In 12 hours the bacilli would have found their way into the connective tissue and white blood corpuscles, and their progress along the lymphatics could be observed.

(*b*) The injection of inorganic material not containing tuberculous matter in either the joints or the general circulation‡ does not cause tuberculosis.

* Hueter, D. Arch. f. Chir., 1879, xi. 317; Triconi, Baumgarten's Jahresberich., ii. p. 229, 1886; N.Y. Med. Ass'n Report, ii. p. 331; Cent. f. Chir., 1878, v. p. 43.

† Wratsch., St. Petersburg, v. 10, p. 635, and London Lancet, Nov. 2, 1890.

‡ Sternberg, N.Y. Med. Journal, 1884, p. 325.

(*c*) It is, however, probable that the bacilli most often reach the joint through the circulation. Müller injected into the femoral artery of 16 rabbits tubercular material, with negative results. Where such material was injected into the crural artery from which the nutrient arteries arise, in some of the animals tuberculous bone disease occurred. Finally, the material was injected directly into the nutrient arteries; and in the case of goats most of those injected showed signs of typical tuberculous joint disease beginning from a focus deposited in the epiphysis.* Triconi, injecting tuberculous material directly into the diaphyses and epiphyses of bones, started up bone disease in type like hip disease, with occasional synovitis.†

To the writer's mind the only tenable supposition in the matter is that, where trauma causes joint disease of a tuberculous type, it *must* be assumed that tubercle bacilli were present in the circulation, and were merely localized by the injury.

That nearly all hip disease is tubercular in type is shown by all the pathological knowledge at our command. Hence the writer would advocate the opinion that hip disease occurs, as a rule, only in those who have an hereditary or acquired tendency to tuberculosis, and that in a large proportion of these cases an accident is the exciting cause of the disease, but that hip disease apparently of a tubercular type occurs at times in children who present every appearance of perfect health.

* Cent. f. Chir., 1886, xiv. † Triconi, *loc. cit.*

## Chapter VI.

# THE TREATMENT OF HIP DISEASE.

The treatment of hip disease is necessarily either (I.) *mechanical* or (II.) *operative.*

(I.) *Mechanical treatment* can be subdivided for practical purposes into three well-marked methods, although combinations of these methods exist : —

(*a*) Protection methods.

(*b*) Fixation methods.

(*c*) Traction methods.

(II.) *Operative treatment* can be discussed as a whole, and will be considered after the discussion of the various mechanical methods.

## I. The Mechanical Treatment of Hip Disease.

### (*a*) *By Protection.*

The treatment of hip disease by protecting the diseased joint from the jar and weight in walking without the use of apparatus is but little different from the treatment by expectancy. In its simplest form the latter was practised by the late Dr. James Knight, of New York, surgeon to the Hospital for the Ruptured and Crippled : and his views are set forth in his book, " Orthopædia." Counter-irritants were applied to the skin over the hip, the children were kept rather more quiet than before coming under treatment, and, if walking became excessively painful, they were allowed crutches. This treatment was followed out in a very large clinic ; and the large number of active cases of the disease to be seen there, who were not uncomfortable to any degree,

demonstrated the fact that hip disease, left to itself, is not always painful. With Dr. Knight's death, the only believer in the expectant treatment of hip disease passed away.

The method known as the physiological method, or Hutchinson's treatment, is still pursued in certain parts of the country where apparatus is not attainable. In the cities no one of experience uses it, nor is it in any degree trustworthy. It was proposed some years ago by the late Dr. James Hutchison, of Brooklyn,* and consists simply in putting a high sole on the well foot and having the patient go about on crutches, allowing the diseased leg to swing. In sitting down or getting up, the diseased joint is unprotected and subject to jar and strain ; and the weight of the leg is in no way to be considered as a traction force to counteract the muscular irritability. Subluxation and elevation of the trochanter are very likely to occur, as well as malpositions of the diseased limb. These are the obvious objections to the treatment, as borne out by practical experience. The method is of benefit in so far as it protects the joint from the jar of walking, and in mild cases is somewhat better than no treatment at all.

Methods of treatment which combine protection with fixation or traction will be considered under these headings. The treatment of convalescent hip disease is a treatment by protection, which will be considered later.

## I. Mechanical Treatment.

### (*b*) *By Fixation.*

Of all the methods which aim at curing hip disease by fixation of the diseased joint, the most efficient is that associated with the name of the late Mr. H. O. Thomas, of Liverpool.† It is, as a rule, the apparatus used by English

* American Journal of Medical Sciences, July, 1877.

† New York Medical Record, Sept. 15, 1888.

orthopedic surgeons; and in Dr. Ridlon, of New York, it has found an ardent advocate. It is, however, but little used in America.*

*The Thomas Splint.*

This splint consists in a bar of soft iron reaching posteriorly in the middle line of the leg from the angle of the scapula to the lower third of the leg. It is shaped to fit the curve of the buttock by being bent at an angle, as shown in the illustration. Above it terminates in a chest band, which should encircle three-fourths of the chest and be riveted at right angles to the upright. There is also a semicircular thigh band, which should be placed an inch or two below the perineum, to encircle two-thirds of the thigh posteriorly. A leg band should terminate the splint at the bottom, which should in the same way encircle two-thirds of the calf.

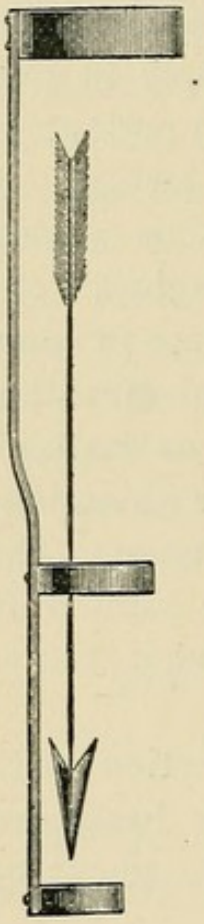

Fig. 2.—DIAGRAMMATIC OUTLINE OF SPLINT, SHOWING THE PARALLELISM BETWEEN THE BODY PORTION AND LEG PORTION (RIDLON).

These bands should be made of hoop iron, and should be so placed on the upright that two-thirds of each band should be to the well side of the stem and one-third to the diseased side.

The upright should be made of iron $\frac{3}{4} \times \frac{3}{16}$ of an inch. The chest band should be $1\frac{1}{4}$ inches wide, and the other bands $\frac{3}{4}$ of an inch.

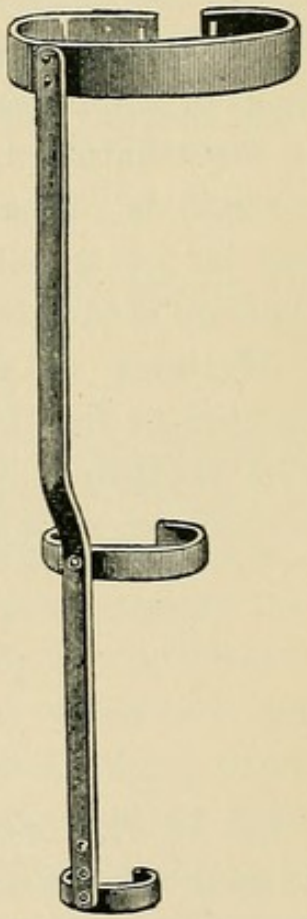

Fig. 3.—SHOWING THE SPLINT IN ITS SIMPLEST FORM, NOT YET PADDED OR COVERED (RIDLON).

Before the splint is applied, in addition to the bend for the buttock, as shown in

*H. O. Thomas, Diseases of the Hip, Knee, and Ankle.

the diagram, a twist should be made in the upright's longitudinal axis between the thigh and body bands, so that the thigh and leg part of the splint shall lie somewhat nearer the median part of the body than the body part.

If flexion of the thigh is present, the leg piece is bent at such an angle to the body piece that it fits the angle of flexion.

The splint is now applied, as shown in the figure, and secured to the body by means of a bandage connecting the ends of the chest piece and running over the shoulders. The leg is secured by leather straps or by a common bandage to the leg piece of the splint.

Fig. 4.— THOMAS SPLINT APPLIED WITH PATTEN AND CRUTCHES (RIDLON).

If it is to be used as a walking splint, a patten is put on the well leg, and the patient allowed to use crutches. If muscular spasm is present to any degree, the patient is kept in bed with the splint on till it improves or subsides. If flexion is present, the splint is made a little straighter than the angle of flexion, and the deformity corrected at small stages by this forcible means.

There are two points in the use of the splint upon which Mr. Thomas laid much stress. The patient must not go about while acute muscular spasm and joint irritability are present. The limb must not be disturbed even for purposes

of examination unless absolutely necessary, and then only at intervals of weeks or months. Consequently, all rebending of the splint should be done without removing it. By means of wrenches this is easily accomplished.

*Advantages of the Splint.*

It furnishes fairly good fixation; better, probably, than any other apparatus. It is cheap and simple, and can be made by any blacksmith or by the surgeon himself. In general, English experience in the use of the splint is favorable, and extremely good results have been reported by Mr. Marsh.

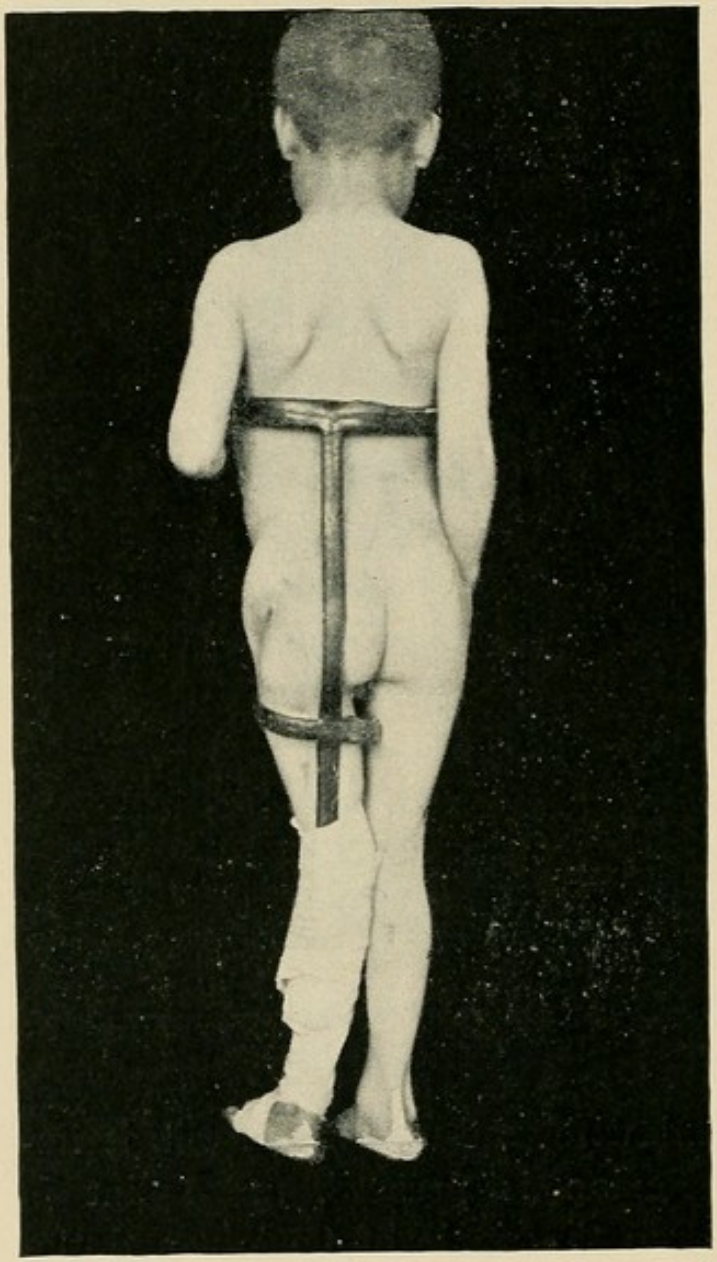

Fig. 5.—A CASE OF HIP DISEASE, WHICH HAD BEEN UNDER THE CARE OF MR. THOMAS, SHOWING A SPLINT WHICH HAD BEEN OUTGROWN AND NEGLECTED BY THE PATIENTS, THE RESULT BEING CONSEQUENTLY POOR. (The preceding figure shows the splint properly applied.)

*Objections to the Splint.*

Theoretically, the worst objection to the splint is that there is no provision for making traction; and traction is recognized by most surgeons who are familiar with the phenomena of hip disease as an essential in a certain large proportion of cases. Again, from a mechanical point of view there is a serious practical objection to the Thomas splint.

The leg is bandaged firmly to the splint, and is held to it much more firmly than the body can possibly be held by the chest piece. Consequently, in walking or being moved, the body piece moves on the body and twists and jars the leg, causing irritation of the joint. This is an important matter on account of the long leverage which the body piece possesses over the leg piece.

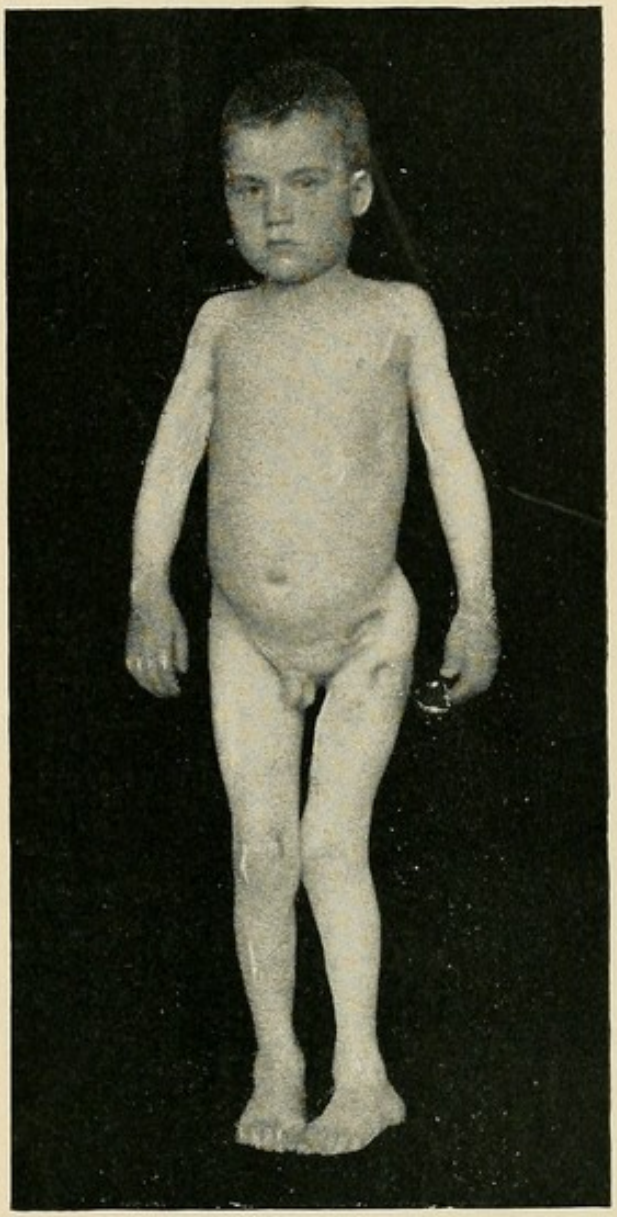

Fig. 6.— THE SAME CASE AS FIG. 5, SHOWING ABSCESSES AND MALPOSITION OF THE LIMB.

Again, inasmuch as nothing is done to counteract muscular spasm, the head of the bone is continually crowded against the acetabulum's upper rim, and both are worn away, causing unnecessary shortening. And, if an attempt is made to remedy flexion by forcing the leg straight, it is obvious that it must be done by using the surfaces of the hip joint as a fulcrum, thereby increasing the interarticular pressure, and with it the osseous destruction. This objection has been urged against the splint by American writers, and was resented by Mr. Thomas.

In general, American experience has not been favorable with the use of this splint. A series of cases in which it was used were reported in the Transactions of the American Orthopedic Association, Vol. II. In nearly every case of the

twenty-one the splint proved unsatisfactory. The writer's personal experience with the splint has shown that it is hard to adjust, difficult to keep in place, that in his hands it does not allay pain in any degree as traction does, and that it does not counteract muscular spasm, in consequence of which, elevation of the trochanter and much shortening ensue. In certain mild cases, where there is little pain or tendency to deformity, it answers admirably; but in cases of average severity it does not yield as good results as other methods.

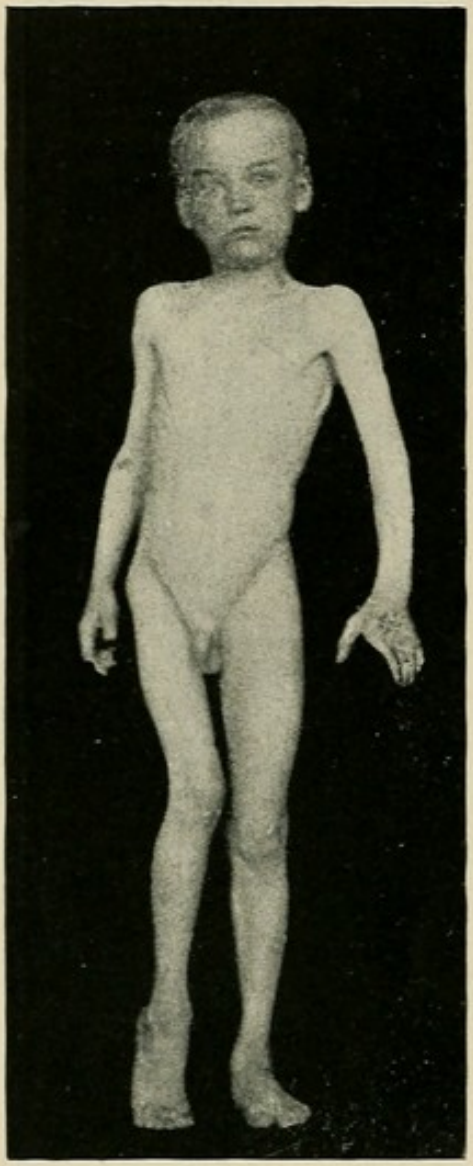

Fig. 7.— MARKED ATROPHY AND SHORTENING OCCURRING IN THE USE OF THE THOMAS SPLINT IN AN AVERAGE CASE OF HIP DISEASE.

*Phelps's Fixation Appliance.*

Dr. Phelps * has described a fixation appliance made of a wooden frame re-enforced by plaster of Paris, which should furnish complete fixation; but such elaborate appliances seem cumbersome, when compared with the simple bed-frame to be described later, which furnishes practically complete fixation.

Other methods of fixation are found in the use of plaster of Paris, leather, and metal splints.

The plaster of Paris spica splint is easily applied. It affords good fixation and is inexpensive. The leg and thorax should be wrapped in sheet wadding, and rollers of washed crinoline gauze impregnated with plaster should be applied. The bandage should reach from the lower part of the thorax to the lower

* N.Y. Med. Rec., March 4, 1889.

third of the calf. It is not possible to obtain firm fixation without encircling the thorax; and, if absolute fixation is required, the spica should include the well leg also. It is wise to incorporate a strip of iron in the front of the bandage, as the splint tends to crack in the groin unless made very strong there.

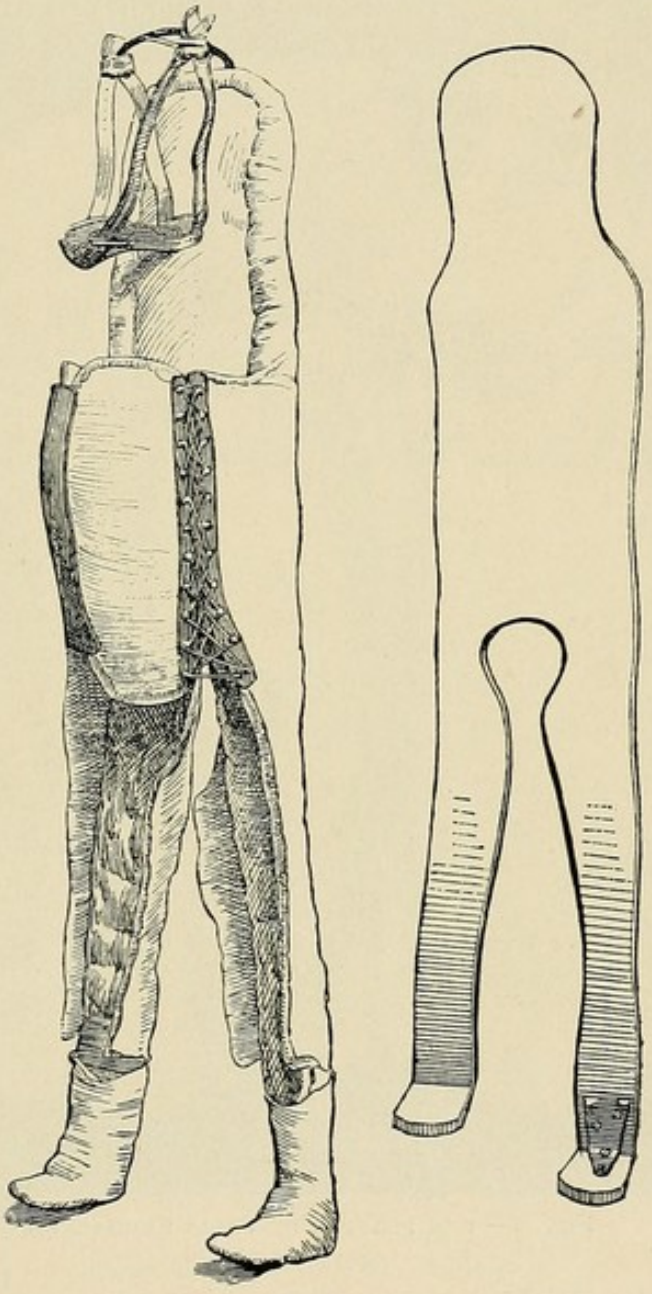

Fig. 8.— PHELPS'S FIXATION SPLINT (PHELPS).

The objections to the plaster splint are that it becomes loose very easily, allowing motion at the hip and chafing over the bony prominences, and that it is at best a dirty dressing,

as it is not possible to keep it from getting urine-soaked; and in dirty children it becomes extremely filthy in a very short time, so that frequent reapplication becomes necessary.

Its best use is found in patients who cannot afford any appliance or who are hopelessly careless and ignorant. It

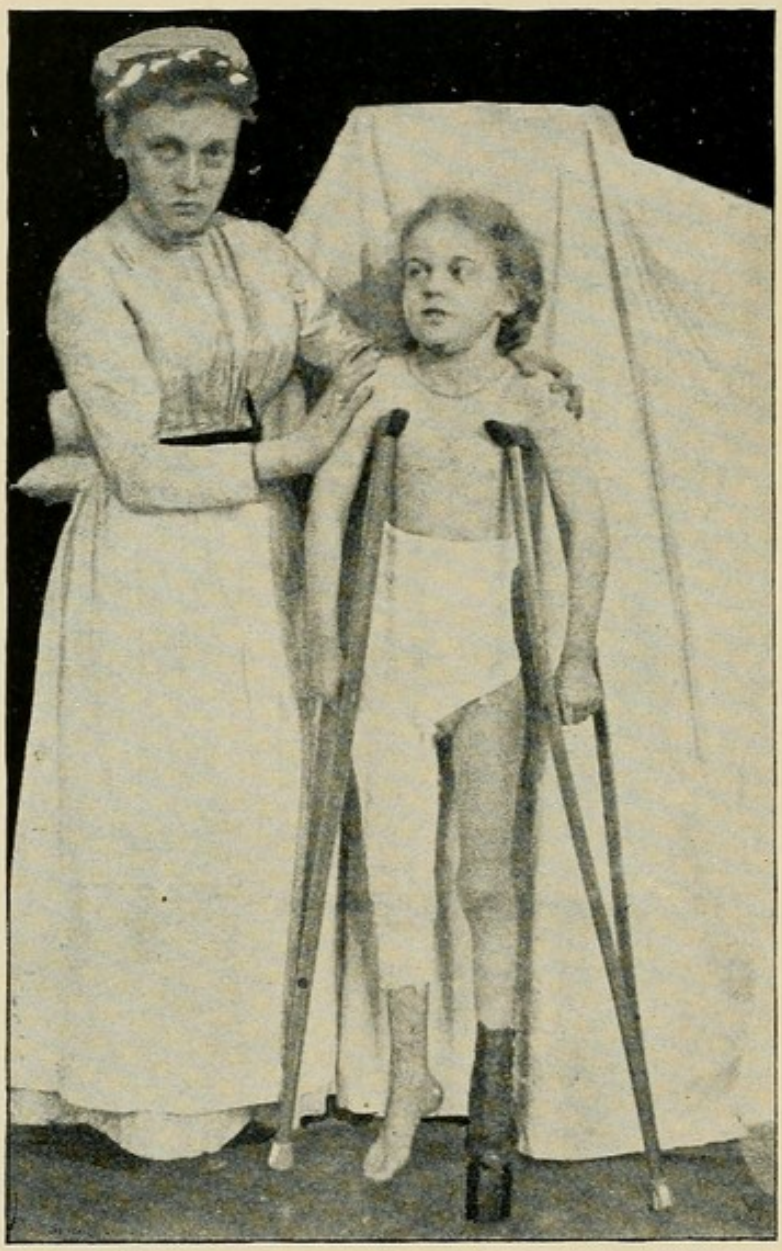

Fig. 9.— THE PLASTER OF PARIS BANDAGE.

is also of much use in cases where malposition of the hip has been corrected under ether, and where it is desired to keep the hip from returning to the position of deformity.

Moulded leather splints are cleaner, and are much used in the West. They are made of stout sole leather, and are re-

inforced by steel strips, lacing in front. It is obvious that they cannot afford as complete fixation as the methods just mentioned. Those who use the splints, however, obtain very good results; and the writer, being perhaps prejudiced in favor of traction methods, has not had any personal experience in their use.

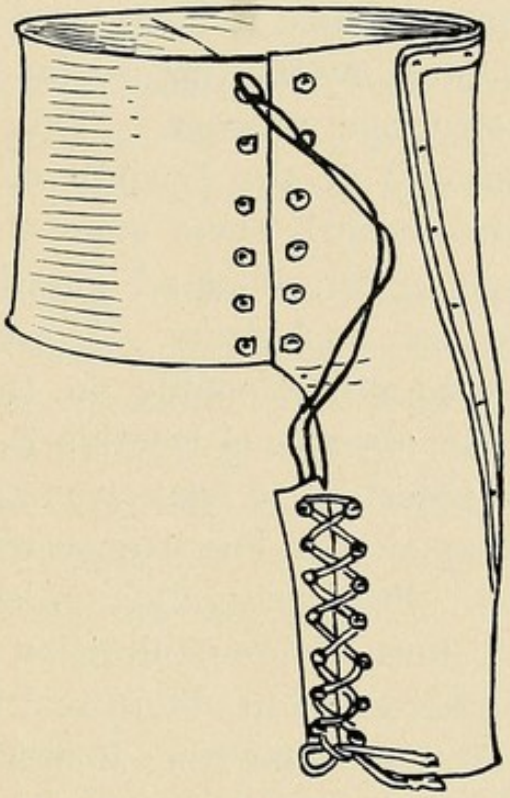

Fig. 10.—VANCE'S MOULDED LEATHER SPLINT.

Fixation splints may also be made of silicate, metal, copper gauze, or any similar material. They are made of the same pattern as those described and are open to the same criticisms.

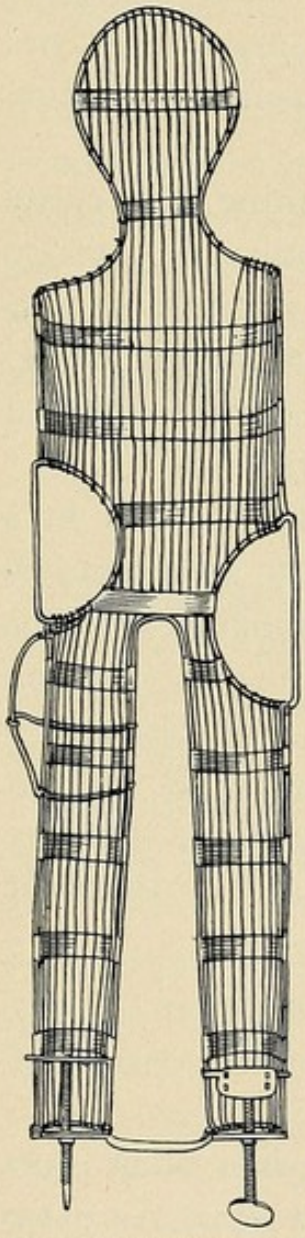

Fig. 11.—GOUTTIERE DE BONNET.

The Gouttière de Bonnet is a wire frame to hold the body and legs. It was formerly used after excisions, and is now but little known. It of course furnishes complete fixation.

The Cabot splint discussed at length under acute arthritis * affords fair fixation of the hip, and is useful in the case of young children, especially where flexion deformity is present.

* See Fig. 1, p. 25

*Objections to Treatment by Fixation.*

It is not to be feared that fixation of a diseased joint will lead to anchylosis if carried on through the acute inflammation. Rather it is to be regarded as a means of preserving mobility, by limiting so far as may be the inflammatory or destructive process. This matter has been discussed by Verneuil at the Society of Surgery in Paris in 1879, and more recently some admirable experimental work has been done by Dr. Phelps,* showing that fixation *per se* does not produce anchylosis. Fixation cannot, therefore, be considered objectionable on that ground.

The absence of traction is, to the writer's mind, the cardinal objection to fixation methods. The reasons why traction seems of such importance will be considered in the next section. Practically, fixation is at fault in not being complete; for, short of immobilization of the whole body, it is almost impracticable to obtain real fixation of the hip joint.

At the same time it must be remembered that it is in a degree a question of personal opinion and of geographical location,—that English surgeons claim excellent results, and that French surgeons incline much to the fixation method; but, on the other hand, in America, where modern orthopedic surgery had its birth, and has reached its highest development, methods of treatment by fixation alone are almost wholly discountenanced by the leading orthopedic surgeons.

## I. Mechanical Treatment.

### (*c*) *By Traction.*

The treatment of hip disease by traction has been practised certainly from the early part of this century. As early as 1835 Le Sauvage† was using it; and Dessault‡ was using extension with counter-extension in the perineum, in

* N.Y. Med. Journal, May 17, 1890. † Arch. Gén., November, 1835, p. 280.
‡ Treatise on Tract., Philadelphia, p. 243.

the last century, for thigh fractures. The use of traction in hip disease while the patient was going about was introduced by Dr. Henry G. Davis in 1855. It was the idea of Dr. Davis * that traction separated the head of the femur from the acetabulum and permitted "motion without friction."

With some slight modifications the splint of Davis is the one in use to-day under the names of the Davis, Taylor, or Sayre splint. It is more correctly called at times the long traction splint.

It would seem useless to enter upon the discussion relative to the original ideas of Davis as modified by his followers. The subject has been discussed at much length by Thomas,† Ridlon,‡ Shaffer,§ and Judson,‖ and references are given to the controversial articles. It seems better to pass at once to modern ideas regarding traction and its application to the treatment of hip disease.

### *The Theory of the Use of Traction in Hip Disease.*

The evil effects of the muscular spasm in causing bone destruction and shortening have been several times alluded to. Any measure which will tend to diminish this feature of the disease will be rational.

Moreover, traction is exerted instinctively by children with hip disease, when one leg is pulled down by the other, as shown in the picture,— an attitude very common in acute hip disease. Thus, by theory and by an indication from nature, traction would seem to be of use. Practically, it is a matter of general information that traction is a sedative to muscular irritability (as in fractures of the thigh), and that in hip disease it quiets pain more quickly than any other measure when applied simply by the surgeon's hand.

* American Medical Monthly, 1859, p. 361.

† An Argument with the Censor at St. Luke's Hospital, New York. London, 1889.

‡ Medical Record, Sept. 15, 1888. § Trans. Am. Orth. Ass'n, vol. ii.

‖ N.Y. Medical Record, July 7, 1883; Lancet, Dec. 2, 1888.

It has been a matter of much discussion whether or not traction separates the articular surfaces at the hip.

If traction is made upon a healthy adult joint, the head of the femur impinges upon the lower edge of the acetabulum, and a straight downward pull is hardly sufficient to separate it from the socket; but abduction of the limb, while traction is being made, renders distraction of the joint surfaces possible. In children the cotyloid ligament is less developed, and distraction can be obtained in the *cadaver* by a downward pull, on account of the shallow acetabulum. In a diseased hip joint, where the tissues are softened and in part disintegrated, distraction would seem to be more easily obtainable.

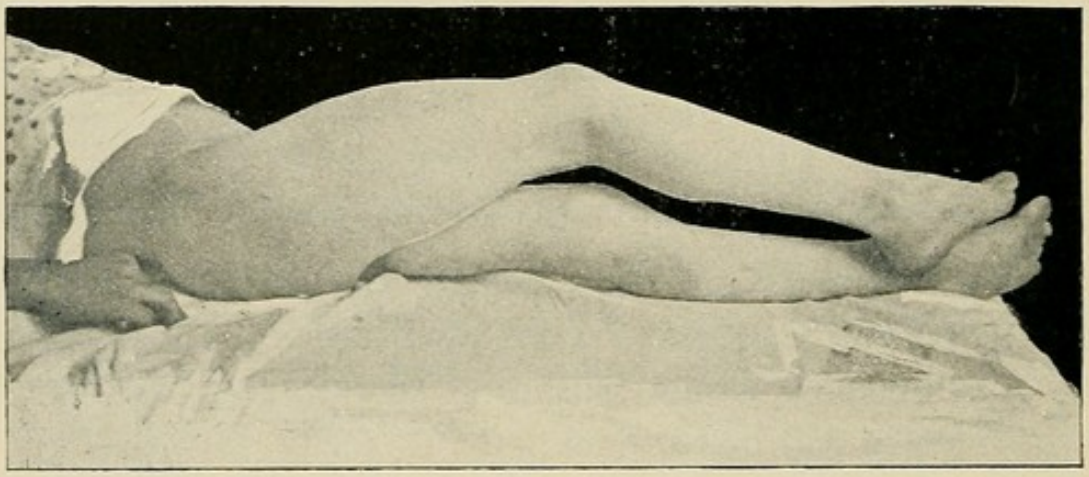

Fig. 12.— INSTINCTIVE EFFORT AT TRACTION.

Experiments upon the *cadaver* and under ether are not conclusive, because they do not reproduce the most important condition of all,—the muscular spasm. König made frozen sections of hips, both with and without traction, and concluded that traction of 8 pounds caused separation of .5 to 2.5 millimetres. These results were confirmed by Paschen, but Morosoff * reached diametrically opposed conclusions. Unlike König, he found that, under normal conditions, the two joint surfaces were in intimate contact, and that it required 40 to 60 pounds of traction to cause diastasis. Lannelongue, however, found results in accord with

* Quoted by Lannelongue, Coxotuberculose. Paris, 1886.

those of König. He used for the experiment the *cadaver* of a boy four years old afflicted with hip disease for five months. After death from croup, a weight of 4 kilogrammes was applied, as it had been in life, and the body was frozen. Section of the diseased hip showed a separation of 2 millimetres between the diseased joint surfaces.

The most careful and most practical experiments in this very important matter have been made and recorded by Dr. E. G. Brackett.* In a series of experiments upon the *cadaver*, steel pins were driven into the os pubis, trochanter, and femur of 6 adult subjects, and 4 showed evidence of joint separation of from 2 to 8 millimetres, when traction of 25 pounds was used. One of the failures was caused by a rheumatic change in the joint, and in the other case stiffness of the joint was present. In the *cadaver* of a girl three years old a traction hip splint was applied, and a separation of the joint surfaces of from 2 to 6 millimetres was obtained.

It was found that, owing to the obliquity of the acetabulum, the first change to occur when diastasis is being produced is an outward displacement of the trochanter, caused by the slipping of the head of the femur on the oblique surface of the acetabulum. Consequently, any separation of the joint surfaces will show first as an increase in the distance between the trochanters. This can be measured in the living subject, and showed in a series of experiments on living children with hip disease that *distraction of the joint was produced by mild traction* to the degree of 2 to 2.5 millimetres. In two cases, it was possible to measure the increase in length directly, as the bony landmarks were peculiarly definite and showed a separation of 3 and 8 millimetres between the joint surfaces. These experiments of Brackett serve, therefore, in connection with the others,† to establish the probability that traction produces very decided modification of intra-articular pressure, and in some instances un-

* Trans. Am. Orth. Ass'n, vol. ii. p. 207.

† Bull. et Mém. de la Soc. de Chir., 1886, xii. 31; Deutsch. Z. f. Chir., 1873, iii. 256; Boston M. and S. Journal, 1880, ciii. 465, and Aug. 30, 1888; Trans. Am. Orth. Ass'n, vol. i. p. 193.

doubtedly results in distraction of the joint surfaces. This furnishes a rational and scientific explanation for the use of traction.

It is not likely, however, that traction necessarily produces separation of the joint surfaces before it affords relief. On the other hand, even mild traction made with the hand is very often enough to control muscular irritability and relieve much discomfort. In these cases, it seems to act as a sedative to the muscles, probably by slightly stretching them, and to have its beneficial effect on that account rather than because any notable joint separation has occurred.

Traction is used in two ways in hip disease,—during recumbency and by means of portative appliances.

### *Traction during Recumbency.*

This older method of treatment is exerted by means of the weight and pulley, and, to be of use, must be rationally applied. It is of use where malposition of the limb or a sensitive condition of the joint is present, and in cases where apparatus is not to be obtained. On general principles prolonged recumbency is to be avoided during hip disease. Exercise within certain restricted limits and fresh air are all therapeutic measures which are of the greatest value in controlling the disease and keeping the general condition as good as possible. During certain complications recumbency is indicated ; but, as a rule, it should only be resorted to when ambulatory treatment proves impracticable.

It should be added that this is not in accord with the ideas of many eminent English surgeons, notably Mr. Howard Marsh.

During recumbency the patient's body should be secured and kept quiet. Without this, one loses half of the efficiency of the method. The best means of securing the patient is by means of a light bed-frame, to which the patient is

strapped. An oblong frame, a little wider and a little longer than the patient, is made of ¼-inch gas-pipe, being joined at the four corners by common gas-pipe "shoulders." It can

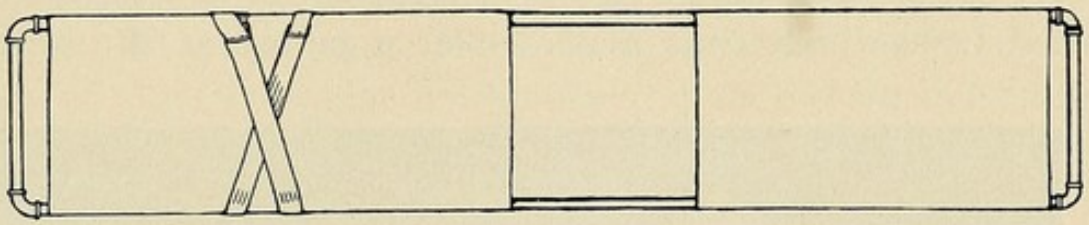

Fig. 13.—BRADFORD BED-FRAME.

be covered with stout cloth, which should be tightly stretched over the bars, and over the buttocks it should be omitted, to allow for the use of the bed-pan.

The patient is secured to this by straps passing over the chest and by a band around the pelvis. This makes it impossible for the patient to sit up or roll over, which he is sure to do if left free in bed; and it insures quiet to the joint.

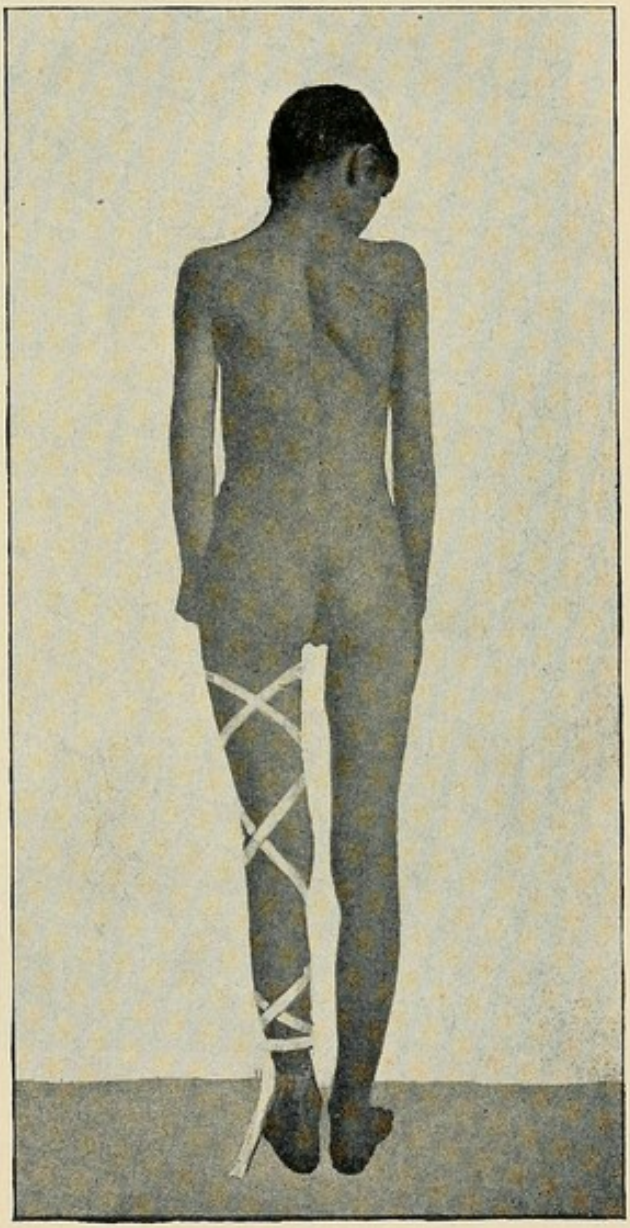

Fig. 14.—A PLASTER HIP EXTENSION APPLIED.

Traction is applied by means of a weight pulling upon adhesive plaster attached to the leg. Two strips of surgical adhesive plaster are sewed to webbing, which should project below the foot. These plaster strips run upward from the malleoli inside and outside of the leg and thigh; and they are further secured in

place by a basket-work made by two other strips of plaster running around the leg and thigh. This gives a firm hold upon the skin of the leg to the webbing which projects below the foot. This is buckled to a crosspiece of wood from which runs a cord over a pulley at the bottom

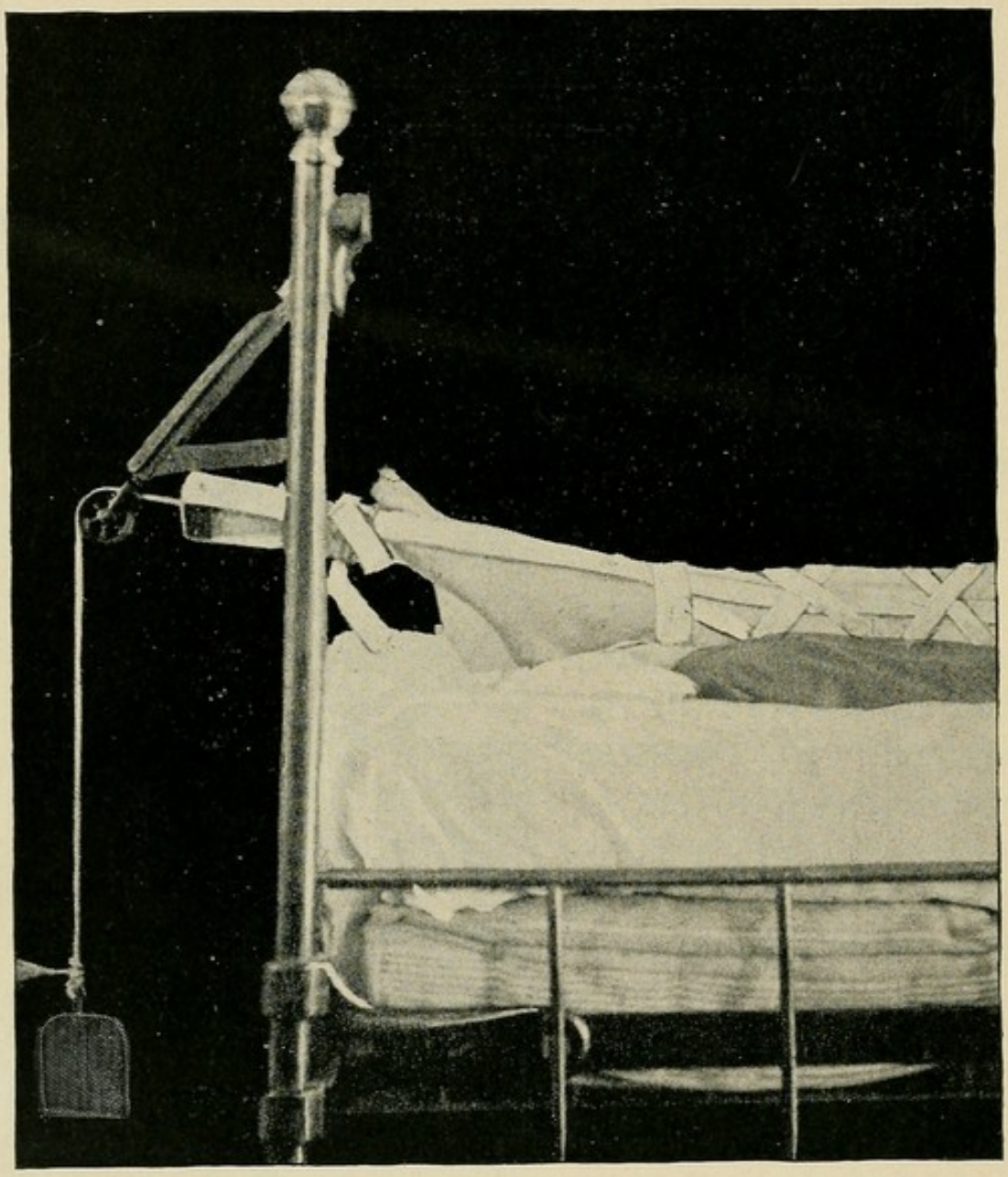

Fig. 15.— WEIGHT AND PULLEY APPARATUS FOR BED TRACTION.

of the bed. To this cord a weight of from 3 to 5 pounds is attached. In acutely painful cases a heavier weight may be temporarily required.

The foot of the bed should be elevated to provide for

counter-traction, else the child will be continually pulled down by the weight.

*Traction should always be made in the line taken by the leg when the pelvis is made square*, otherwise it is likely to prove painful. Traction thus made is a sedative measure, and tends to quiet muscular irritability and to reduce deformity.

The use of a long outside splint or any other appliance, except in cases of deformity (when it may be necessary to elevate the leg on an inclined plane), is wholly unnecessary.

Traction may, however, be made in bed, when deformity is present, without the use of the weight and pulley, by applying a long traction splint to the limb, and then placing the limb in the deformed position.

Traction in bed is only indicated in acutely painful cases, in cases where deformity is present, and where apparatus is not to be obtained.

### *Traction by Means of Splints.*

Any traction splint consists of an upright furnished below with some appliance to pull down upon the leg straps, while above it terminates in an arm or band to take a hold upon the pelvis and furnish a point of counter-extension by means of straps passing under the perineum.

The conventional long traction splint consists of a steel pelvic band, made either straight, or curved in the manner shown which enables it to fit more closely to the crest of the ilium and take a firmer hold on the pelvis. This arm may be long or short, curved or straight.

The pelvic band should be riveted to the upright at an angle with the anterior arm lower. The upright should reach from the pelvic band (which should be at a level with the anterior superior iliac spines) to two inches below the sole of the foot, and should be curved out a little at the top to avoid the fulness of the thigh. This, however, is not essential. Below, it should terminate in an arm with a

windlass provided with pins, upon which the extension straps can be wound up. This is the cheapest form of apparatus.

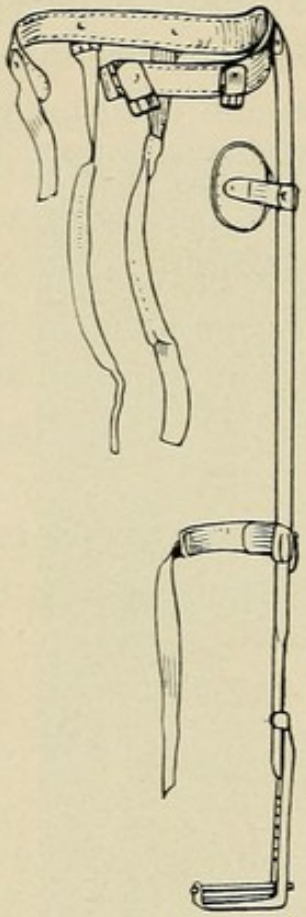

Fig. 16.

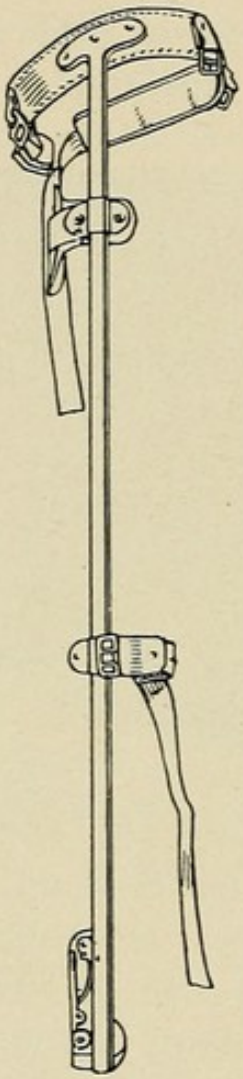

Fig. 17.

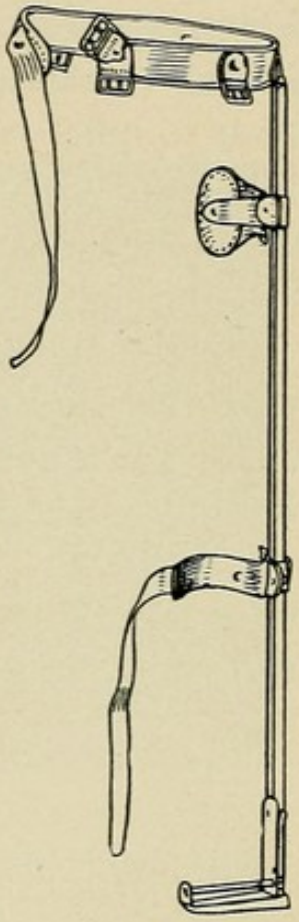

Fig. 18.

Fig. 16.—SPLINT WITH CURVED BAND. Figs. 17 and 18.—SPLINT WITH STRAIGHT BAND FOR LEFT LEG.

A more expensive and more convenient one can be made by having the lower part of the splint slip inside of the upper part, at a point one-third of the way up the leg, where the inner piece is controlled by a ratchet cut into it, and the whole upright can be lengthened or shortened by means of a cogged key. In this way no windlass is needed on the foot piece, which requires only buckles; and the traction is obtained by lengthening the upright by means of the ratchet and key.

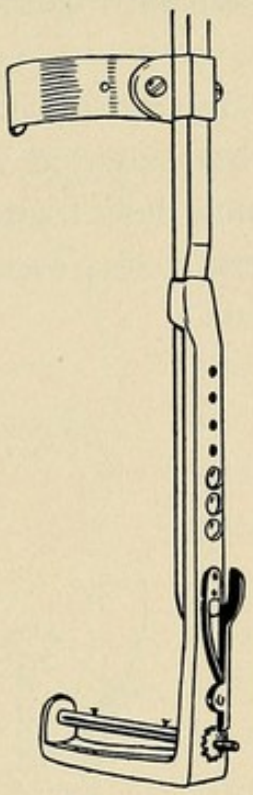

Fig. 19 — WINDLASS AND EXTENSION AS USED IN THE LONG TRACTION SPLINT.

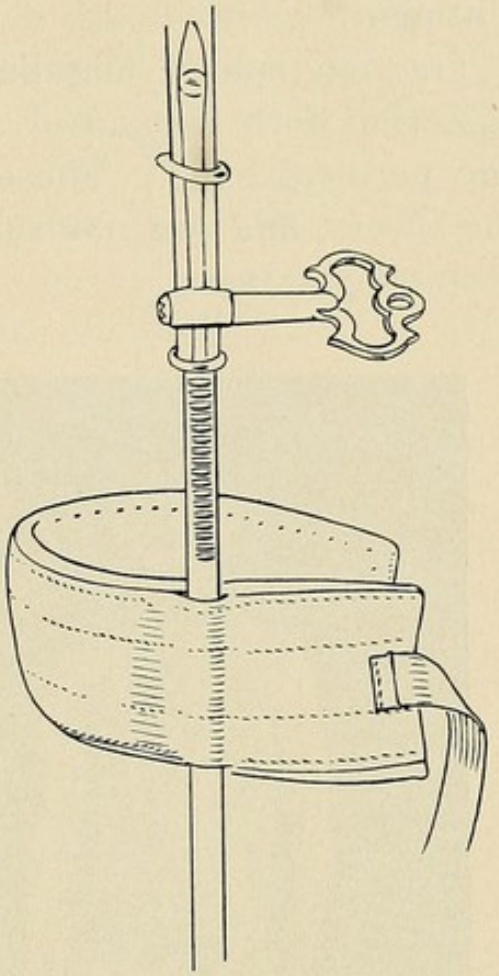

Fig. 20.— RATCHET AND KEY EXTENSION.

The splint is provided with an anterior pad over the thigh and a posterior arm behind the calf.

If the windlass pattern is used, some provision should be made for increasing the length of the splint as the child grows. This is done by having the two pieces overlap and screwed together. The pelvic band should buckle around the waist and be padded with leather, as should also be done to the plate and arm. The splint should be made as light as is consistent with strength.

Perineal bands are attached to the pelvic band, so as to pass under the tuberosity of the ischium as nearly as may be. They can be made of webbing, covered with Canton flannel, or of leather moulded over a leather strap.

The care of the perineum is an important matter in hip disease, and it should be hardened by alcohol and kept dry by some dusting powder. If sloughs form, the splint should

be removed, and they should be dressed with some simple ointment.

Traction splints may be made with one anterior and one posterior horn instead of a band, and be provided with only one perineal band. These furnish much less fixation than the others, and are not suited to severe cases, especially in hospital practice.

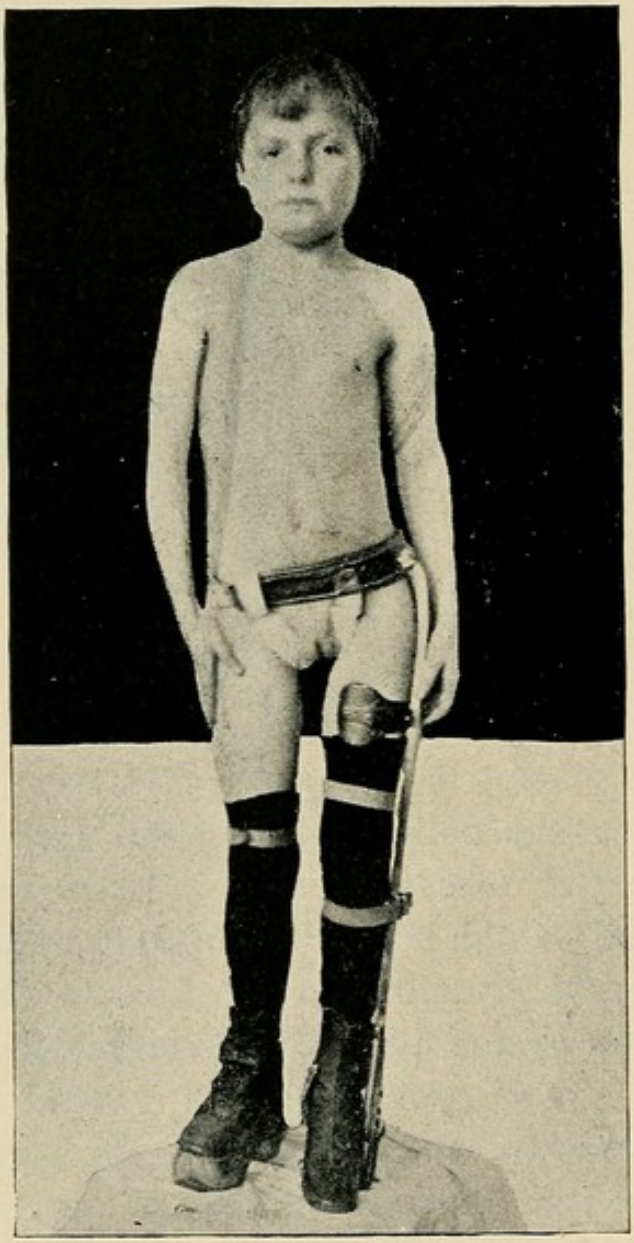

Fig. 21.— STRAIGHT TWO-BAND HIP SPLINT APPLIED.

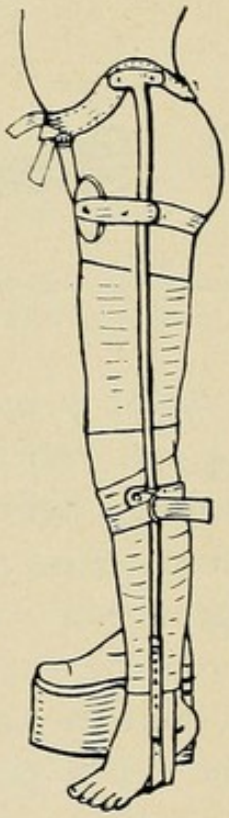

Fig. 22.— CURVED TWO-BAND HIP SPLINT APPLIED (which follows more closely the outline of the crest of the ilium).

If there is a sinus over the trochanter or tenderness there, it is often a matter of much convenience to split the upright

over the outer surface of the thigh, as shown. In other cases, the splint may be applied over the dressing.

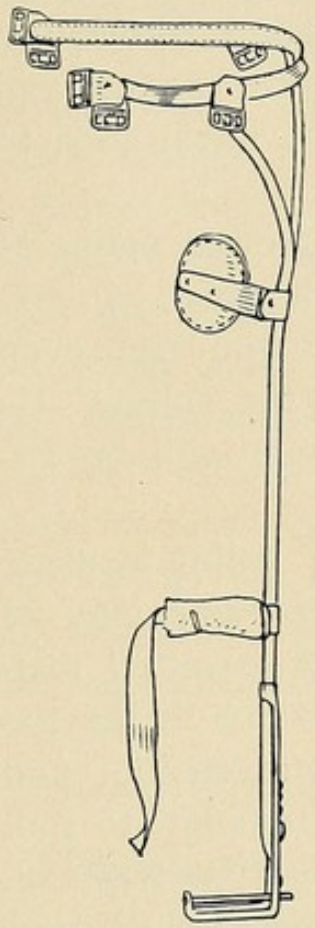

Fig. 23.— SPLINT WITH OPEN SPACE OVER THE TROCHANTER.

A cheap hip splint, made of gas-pipe, has been described by the writer,* where traction is to be made by means of leather straps attached to the foot piece instead of by a windlass. The splint should cost only one or two dollars, and is fairly efficient.

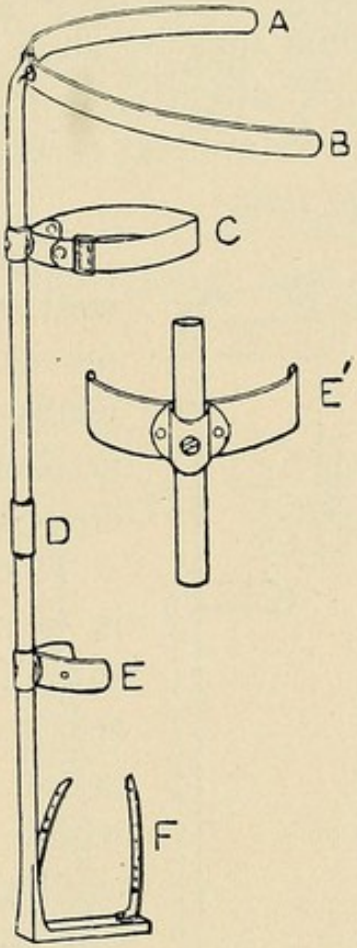


Fig. 24.— DIAGRAM OF CHEAP GAS-PIPE HIP SPLINT.

Judson's splint, or ischiatic crutch, differs somewhat from the others. It is intended to exert only slight traction, and the splint is made heavier above than below, so that the centre of gravity is higher and makes walking with it easier. The pelvic band is covered with hard rubber, which is a cleanly but expensive method. The splint, in a modified form, can be made very cheaply, however, and is much used in New York clinics. It is open to the same objection as are all traction splints not supplied with some better appliance than straps for obtaining traction. It does not pull evenly or strongly enough.

Such a splint as one of these should be worn through the acute stage of the disease, until muscular spasm on manipulation has been absent for some months, as well as pain.

* R. W. Lovett, Boston Med. and Surg. Journal, March 12, 1891.

It is safer to begin with the use of crutches, and building up the well foot by so high a patten that the splint swings clear of the ground in walking. Later the bottom of the splint may be shod with leather, and the patient allowed to walk directly on it. In children under careful control, and in the mildest cases, this may be done at first, but it adds to the risk.

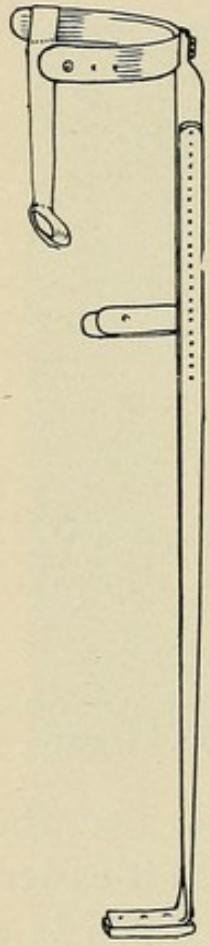

Fig. 25.—JUDSON'S PERINEAL CRUTCH.

The splint serves as a protection splint as well as a traction appliance, inasmuch as it removes the body weight from the leg, even where the patient walks upon the splint. Its attributes as a fixation appliance will be discussed in a subsequent section.

The material of which the splint is made is a matter of detail, and the same may be said of the pattern used. The essential matter is to have an appliance which holds the pelvis as a basis for counter-extension, and which projects below the foot enough to pull the leg down. When this is once understood, the construction of an appliance is comparatively an easy matter.

These splints should be worn night and day, and the limb disturbed as little as possible when they have to be removed. When the splint is not in place and exerting traction, the leg should be gently pulled down by the hand until the traction straps are fastened in place.

In all probability the splint will have to be worn from two to five years. Most cases under control recover from their acute symptoms in two or three years; but a longer course of disease is common, and is not inconsistent with a favorable issue.

*Faulty Appliances.*

Traction splints which are jointed at the junction of the upright and pelvic band, although, perhaps, in accord with the ideas of the originator of the splint, are not regarded to-day as desirable. The problem is not to facilitate, but to restrict, motion at the hip lip.

Sayre's short splint is almost worthless. It is too short to obtain any pull upon the hip worth mentioning, and it does not grasp the pelvis. It is but little used, although sold by the instrument-makers. Elastic perineal straps are faulty, and cause constant relaxation of traction and jarring to the hip. They are almost never seen outside of the instrument-makers' shops.

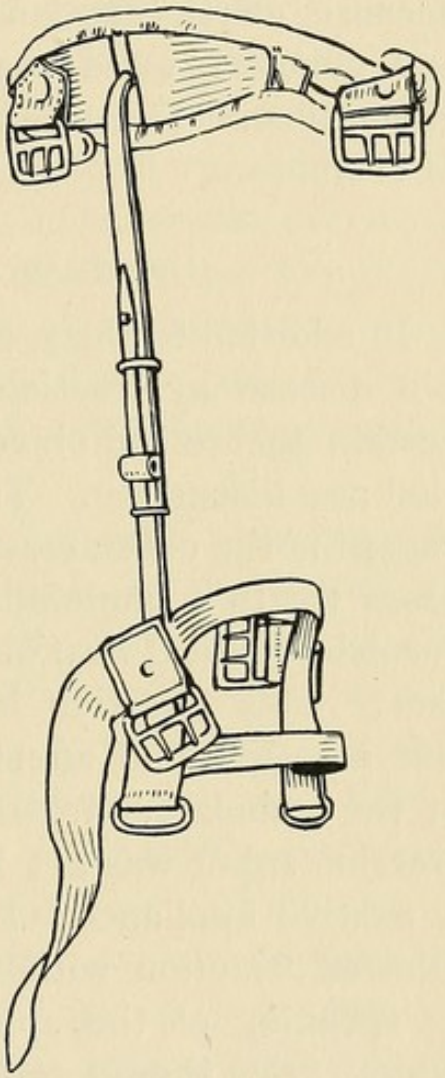

Fig. 26.—SAYRE'S SHORT SPLINT.

*The Practical Objections to Traction.*

Theoretically, traction as a treatment of hip disease rests upon a scientific basis. Practically, it has some disadvantages.

The skin is frequently made sore by the constant irritation from the plaster, and frequent changes of plaster are necessary. If the plaster is applied below the knee, and does not have a hold upon the thigh, the knee ligaments will be weakened and the knee hyper-extended.

In some rare instances, traction causes pain, as in two cases recently reported by Ridlon; but such cases are so rare that they may be left out of account.

A serious objection to the long traction splint, and one which, in the writer's mind, makes the routine use of crutches almost advisable, is that, when the patient steps upon the splint, the traction is lessened; and often the traction straps can be seen to hang loosely as the body sags down in the perineal bands. This leads to a series of jerks to the diseased joint. Attempts have been made to remedy this by the insertion of a spring in the shaft of the splint; but such an arrangement is expensive and complicated.

The use of elastic traction straps is not to be advocated, because elastic appliances are always uncertain quantities, and generally exert too much or too little traction at any given time. The problem is very easily solved by the use of crutches.

*The Theoretical Objections to Traction.*

In addition to the practical objections to the treatment of hip disease by traction, there are, in the writer's opinion, certain theoretical objections also, which demand consideration and discussion. The most important question in this regard is the consideration of the fixative power of traction. Does traction immobilize a diseased joint, or, if not, does it furnish practical fixation enough to protect it from traumatism? This question is one which is not only theoretical, but practical, and affects very strongly the whole question of the ambulatory treatment of hip disease. The American traction splint was not introduced with the idea that it was a fixative appliance. Dr. Henry G. Davis believed that it allowed "motion without friction"; and Dr. C. F. Taylor, in speaking of the appliance, spoke of it as an apparatus which, first, should relieve pressure from the joint due to the muscular contraction by temporarily destroying the muscular irritability and contractibility, and, secondly, should protect the joint from weight and concussion. He made no mention of the splint as a fixative appliance, and evidently did not consider it as such.

Later, however, traction seems to have come to be regarded as a means of fixation, notably by Dr. A. B. Judson, who has written an article dealing with the question of the fixative power of traction (Medical Record, July 7, 1883, May 13, 1883). Dr. Judson quotes Bauer, Yale, Wyeth, and Shaffer as the authorities believing that fixation furnishes traction.

Dr. Judson believes "that, when the hip splint is applied to a patient, traction is made in such a manner that fixation is rendered more complete by the part of the apparatus which acts as a brake. As applied to the patient, the hip splint, when traction is exerted, makes friction on the tuberosities of the ischia and rami of the ischia and pubes, these parts representing the periphery of a wheel revolving at the upper end of the femur, through a considerable arc in the plane of flexion and extension. In practice it is found that, when traction is made in the case of a patient to whom the hip splint is applied, motion in flexion and extension is prevented, although it may not as yet have been arrested by the disease."

These theoretical considerations, however, have not stood the test of actual experiments, as made by the writer, who reported to the American Orthopedic Association in 1888 some experiments which seem to show that in practice the traction splint does not furnish any considerable degree of fixation to the hip joint (N.Y. Medical Journal, Feb. 8, 1889). A long traction splint was fitted with a registering appliance to record motion at the hip joint. The shaft of the splint was simply carried up until it was opposite the skin over the crest of the ilium. This upper extremity of the shaft was provided with a pencil perpendicular to the skin, which recorded on the skin motion occurring at the hip joint, if any such took place.

The splint was applied to a boy with anchylosis at the hip joint; and, after walking with the splint, no motion was recorded on the skin over the ilium.

The splint was next applied to a boy with normal hip joints; and a moderate degree of traction was applied, some three and one-half pounds as registered by a spring balance inserted in the extension straps. In walking and in sitting, the boy's hip described an arc of 35 degrees of joint motion, as recorded by the register of the apparatus. When traction was increased so much that it was almost unendurable, the hip described an arc of 15 degrees of motion; and in a second experiment, made with a boy with healthy hip joints, the hip described an arc of 40 degrees of joint motion with moderate traction.

If these experiments show anything, it is that "one may conclude from this that a long traction splint with one perineal band furnishes very incomplete fixation to a healthy hip joint with any comfortable degree of traction, and consequently to a diseased hip joint it must furnish equally poor fixation." There is no doubt that, within the limits set by nature, motion in hip disease is not harmful. But it must be evident that from a mechanical standpoint it is very difficult to restrain motion by an apparatus which allows 35 or 40 degrees of motion in flexion. If the joint is one which does allow so large an arc of motion, the long traction splint is a perfectly efficient apparatus under these circumstances.

If, however, the joint motion is limited by nature to an arc of 15 or 20 degrees, it must be obvious that with rough usage the long traction splint must become an inefficient appliance, and must allow motion beyond the proper limits. This, then, seems to the writer a theoretical objection to traction: *that traction is not fixation, and does not of itself produce fixation*, and that in practice the traction splints in common use are not fixation appliances, and are liable to allow motion beyond the proper limits.

In view of this the question arises, Is the matter one of any importance practically? and is not the fixation furnished by the traction splint sufficient for all practical purposes? The answer to this is found in the fact which must appeal

to any surgeon, who sees much of this class of cases, that a certain proportion of children do not progress well under treatment by the long traction splint. In the writer's experience it has seemed to him to be because these children have been allowed too much joint motion. The cause of most of the complications is to be found in the ceaseless activity of such children, which causes constant traumatism to the joint. They are allowed by their parents in most cases as much activity as healthy children. They climb fences, and jump rope continually. They run about all day, and indulge in all sorts of violent exercise. It stands to reason that in a joint which is at all sensitive, this cannot be indulged in without the risk of exciting joint irritability and increasing the muscular spasm, and such is practically the outcome.

In hospital practice it is a very common experience to find that the patient is doing badly, that the joint is becoming sensitive and less movable, and that pain is becoming marked. In these cases, it is generally possible to find the explanation of the symptoms in the patient's constant activity. In certain cases, the severity of the disease is enough to account for it, without further exciting causes; but in the majority of cases the explanation of it is to be found in a constantly repeated traumatism of the joint.

It does seem, then, that the lack of fixation afforded by the traction splint is an important element to be considered in the treatment of the disease; and the question arises, In what way can this matter be remedied, and in what way can greater quiet be secured to the diseased joint?

In the first place, the use of crutches accomplishes a certain amount in this direction. If the children wear so high a sole on the well foot that the splint swings clear of the ground in walking, and are thus obliged to use the crutches continually, much is gained. Again, a traction splint with two perineal bands, and a steel pelvic band fitting accurately to the pelvis, is much to be preferred to a long traction splint,

which is provided with only one perineal band, inasmuch as it obtains a better hold of the pelvis, and affords better fixation to the hip. Yet even this in children who are under poor control is unsatisfactory, and likely to yield poor results. In such cases, the splint described by the writer may be of use.

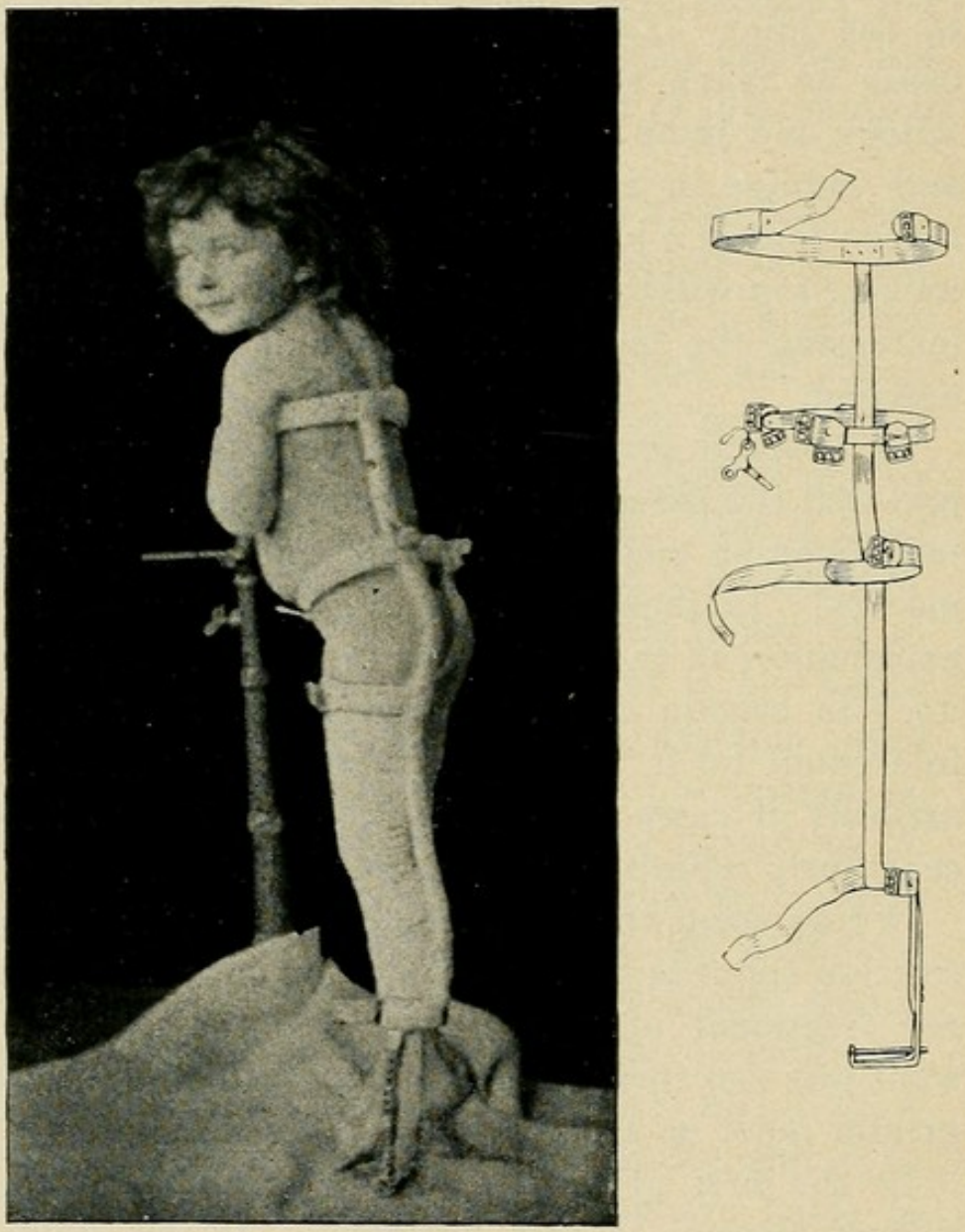

Fig. 27.—COMBINED FIXATION AND TRACTION SPLINT.

It is practically a combination of the Thomas and Taylor splints. Embracing the thorax by a steel band, the splint follows the line of the Thomas splint as far as the calf of the leg, with the exception that it is provided at the pelvis with

an arm to encircle the pelvis and support the perineal band. Below the calf of the leg it terminates in a traction appliance similar to that of the traction splint described above.

The advantages of the splint were stated as follows:* "It is not presented as a splint for the routine treatment of hip disease, but as a means of furnishing fixation and traction in bad cases, while the patient goes about on crutches. It has these advantages: it necessitates the use of crutches, it makes it impossible for the patient to climb fences and knock about in the way so many children do with such disastrous results, and it makes it possible for the child to go comfortably about, even with the joint exquisitely sensitive to every jar."

Although this is in general true, it is not possible to find any appliance which it is safe to use in these extremely sensitive cases without decided risk. Cases where sensitiveness is a marked feature demand, from the first, fixation in bed until the sensitiveness has improved.

In concluding, it may be said that in most cases, and in all cases which are under good control, the long traction splint affords a perfectly efficient means of treatment, but that in unruly children, and in exceptional cases, certain more stringent measures are necessary; and these will be more fully discussed.

## The Treatment of Convalescence.

When muscular rigidity and pain have subsided and have been absent some months, the question arises as to abandoning traction, and making the first step toward regaining the use of the leg in applying a simple protection splint. This is a step which should be taken with much care and deliberation. Any precipitancy is likely to be regretted, and it is often very hard to wait what seems so unreasonably long a time before changing the splint. But the many relapses

* Trans. American Orthopedic Ass'n, vol. i.

which occur, even when every care has been taken in making the change, should serve as a warning. It must be remembered that the process is a slow one, and that cure most often takes place by the caseation of the tubercular foci. These remain latent, but ready to be awakened by any irritation in their neighborhood. It is for this reason that it seems wise to keep on for the longest time possible the most efficient splint.

The case shown in the figure is one of a series which have made the writer very cautious about recommending a change to the convalescent splint.

Fig. 28.— CONVALESCENT SPLINT APPLIED.

The boy, twelve years old, had been under treatment with the long traction splint for three years, and had done well. As he had been for some months without pain or muscular spasm and was in excellent condition, the traction splint was removed and a simple protection splint applied. His good general condition at that time is shown by the photograph. In about three months an old abscess cicatrix broke down, pain began to be complained of, and in the last year the progress of the case has been downward until now, when it seems likely that excision will be necessary. It seemed as if a quiescent focus had been roused to activity by the change in splints.

Reduced to its simplest terms, the protection splint is merely the traction splint cut off and attached to the sole of the boot instead of projecting below it. The illustrations

will show more plainly than any description can do how simply this is accomplished. The foot piece is cut off and the end of the upright slotted to fit into the arm from a steel sole plate screwed to the sole of the shoe, as shown in the photographs. This supplies a perineal crutch, which transfers the weight from the hip joint to the perineum when the leg is used in walking.

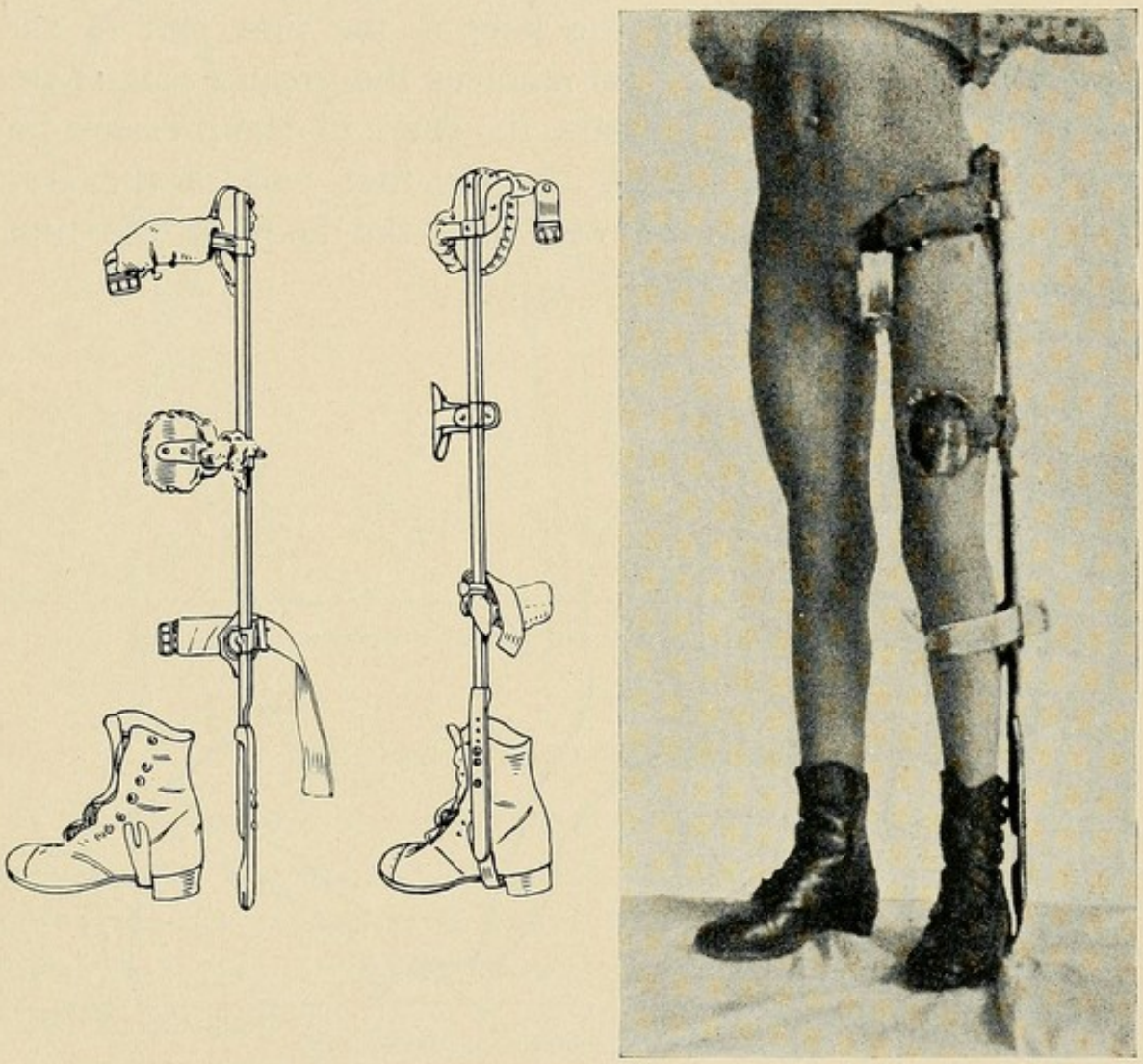

Fig. 29.—CONVALESCENT SPLINT FOR THE LEFT LEG UNAPPLIED AND APPLIED.

In this splint the patient is suspended by the perineal strap, so that the heel does not touch the ground on the affected side; and, if the heel touches, the splint is of course inefficient, and the patient might as well be without any apparatus at all.

In adults and in older children, where expense is not an object, the splint may be jointed at the knee, which in no way impairs its efficiency, but which adds to its weight, although the ability to bend the knee makes the splint much less cumbersome.

The theory of the splint has been very carefully worked out by Dr. Brackett,* who has demonstrated very clearly the reason for its usefulness in protecting the hip from traumatism. In normal walking the heel is the first part of the foot to strike the ground and receives the greater part of the shock, and the toe only bears its share of the pressure for one-sixth of the whole time. In the first part of the step the heel sustains all the weight of the body at the time when the leg is extended.

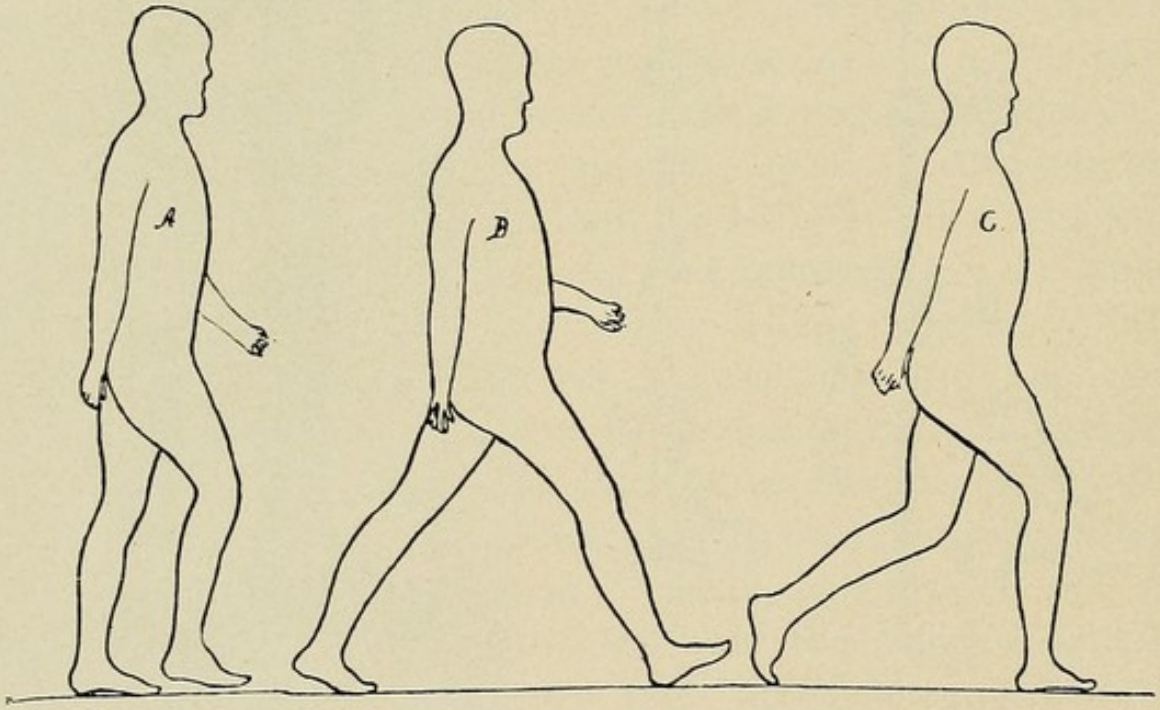


Fig. 30.— NORMAL PROGRESSION (BRACKETT)

By substituting the protection splint for the unaided leg, the first impact of the foot in touching the ground is borne by the splint and transmitted to the perineum without coming at all upon the hip joint. By means of this the foot (and consequently the hip) are protected from pressure except at

* Bost. Med. and Surg. Journal, Oct. 6, 1887.

the last part of the step, when the foot is in the act of leaving the ground and the least protection is required. The difference in the mechanism of locomotion will be appreciated by comparison of this diagram (made from photographs by Dr. Brackett) with the one preceding.

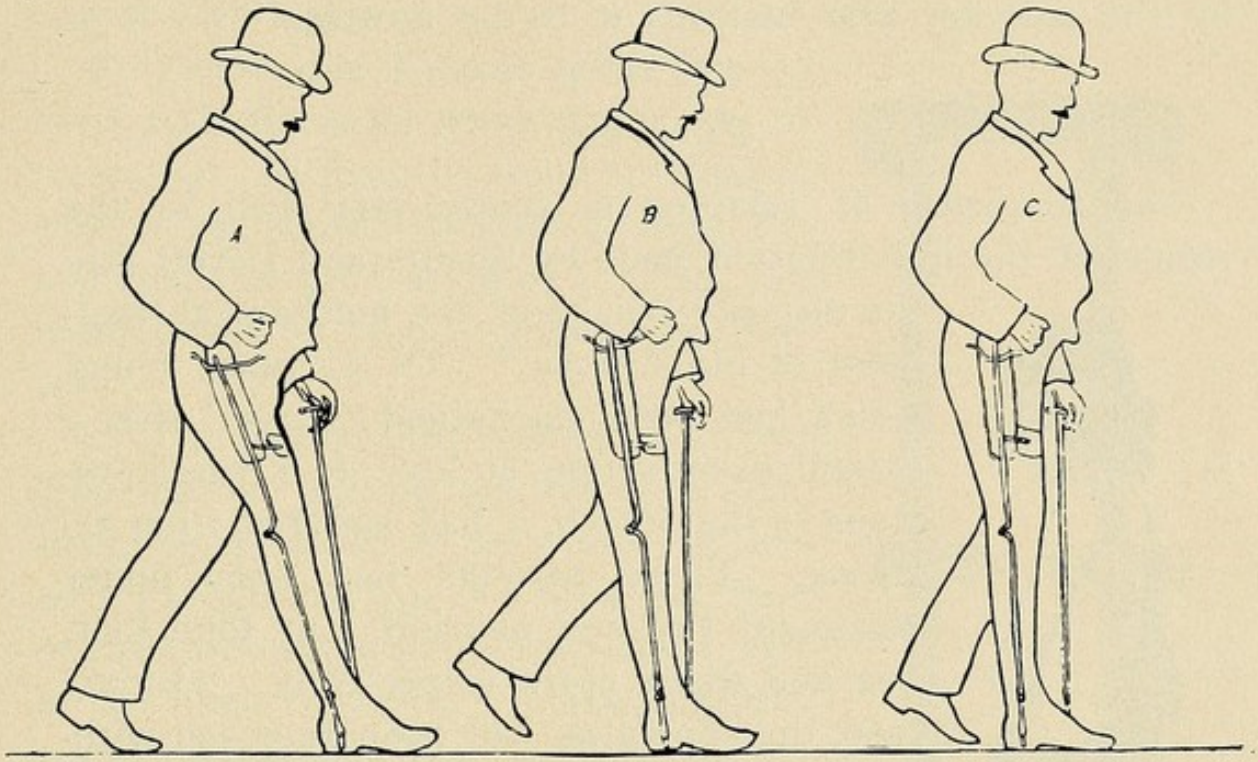


Fig. 31.— PROGRESSION WITH THE PROTECTION SPLINT (BRACKETT).

*The Termination of Treatment.*

It is impossible to state in general terms how long the convalescent hip should be protected. Certainly for some years after the cessation of active treatment; perhaps to the time of puberty. The question of removal is a matter which must be decided for each case, and there is always the risk of removing the splint too soon. The active period of the disease is, in general, from two or three to five or six years; and, after that is over, it must be remembered that latent foci of tuberculosis may still be present, and that all risk of so serious a matter as a relapse should be avoided. The pathology teaches no lesson more clearly than that the process is in the milder cases a very slow one.

It is not, of course, possible to carry out such a careful routine in hospital practice nor always among the more intelligent classes; but, if risk is to be run by an early discontinuance of treatment, it would seem as if the responsibility should be taken by the parents who desire it rather than by the surgeon who believes it to be unwise.

## Relapses.

The frequency of relapses is shown very well by the results of the investigation made by Shaffer and Lovett into the ultimate results of the mechanical treatment of hip disease.* Of 51 cases found which had been discharged "cured" after a careful examination, at least four years previous to the search, 6 had suffered from relapses. These patients had been under treatment two and one-half, four, four, four, five, and seven years respectively. "In one case, the apparatus had been removed without the knowledge of the surgeon; but in the five others treatment was discontinued only after the joint symptoms had ceased for some months, and the patient could hop, run, and perform other active movements with the affected leg."

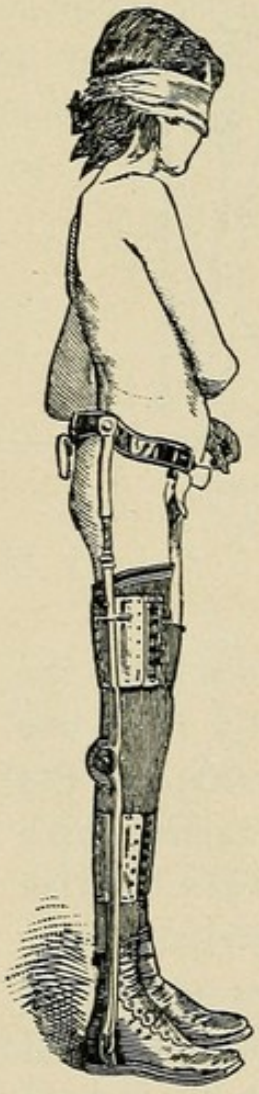

Fig. 32.—THE CONVALESCENT SPLINT WITH CURVED PELVIC BAND APPLIED (RIDLON).

## The Treatment of Double Hip Disease.

Fortunately, double hip disease is an uncommon affection; for the treatment in any event is confining and distressing, and the results apt to be unsatisfactory. The disease may be treated in one of three ways.

(*a*) Patients may be treated by rest in bed on a bed-frame with double traction. The

* N.Y. Med. Journal, May 21, 1887.

only objection to this method is the prolonged confinement, but in the early stages of the disease it is to be advised as being more efficient than any portative appliance could be in the treatment of two acutely inflamed hip joints. It is however often necessitated by the presence of malposition of one or both legs.

(*b*) The double Thomas splint may be used, and affords an admirable means of treatment. It fixes the trunk and limbs; and, unless sensitiveness be present, demanding the application of traction, the method will be found perfectly satisfactory.

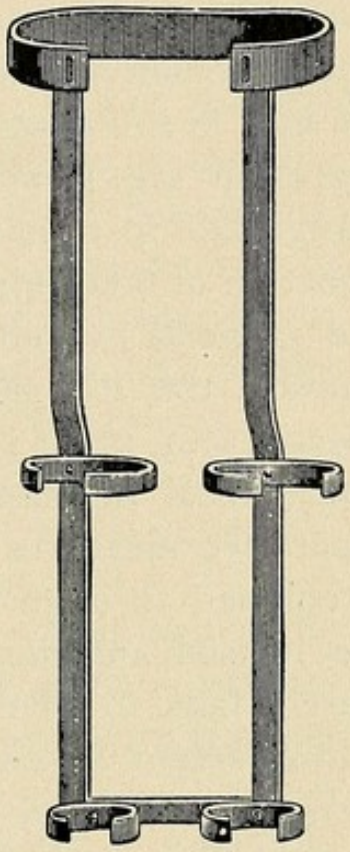

Fig. 33.— THE DOUBLE HIP SPLINT (RIDLON).

(*c*) The patient may be treated by two long traction splints, one on each side, buckling together at the waist. In the writer's opinion, this is a little the best of the three ways where practicable, as it seems likely to secure a better ultimate result than simple fixation.

In any event, it will be possible for the child to get about very little indeed, as it is almost impossible to walk comfortably or easily with either of the portative appliances described; but they allow riding and out-of-door air, and in that they have the advantage over simple recumbency.

## THE TREATMENT OF THE COMPLICATIONS OF HIP DISEASE.

The common complications are: —

(*g*) Night cries.
(*h*) Acute sensitiveness.
(*i*) Malpositions of the limb.
(*j*) Abscesses.

### (*g*) *Night Cries.*

Ordinarily, night cries subside when traction is applied. If they persist, it will be found, as a rule, that the splint is improperly worn or that the child is going about too much. These causes are easily remedied.

At other times, in spite of every care in patients under control, night cries will persist, generally in connection with much sensitiveness of the joint. In these cases salicylate of soda in full doses is of much use.* Antipyrine and phenacetine are sometimes temporarily of benefit. If these drugs fail to relieve the cries, and if the leg is fixed in the position of deformity and the mechanical treatment seems to be properly carried out in every way, it may be useful to elevate the leg slightly. In a case recently reported by Goldthwait, night cries were controlled in this way.† When mechanical measures fail after faithful trial, nothing but operative measures remain. The head of the femur may be trephined through the trochanter or the joint capsule may be incised anteriorly or posteriorly. The latter measure rarely fails to give relief for a while; but *cases which are characterized by excessive sensitiveness in the beginning belong, as a rule, to the worst type of the disease,* and often resist all measures of treatment.

### (*h*) *Acute Sensitiveness of the Joint.*

This condition, again, is commonly the result of a fall or of too much activity, although often occurring without assignable cause. Rest in bed is essential, and heavy traction should temporarily be applied; and all traction should be made in the line of the leg's position.

Salicylate of soda is often of use; and, if cases persist in

* Boston Med. and Surg. Journal, April, 1889.

† J. E. Goldthwait, Boston Med. and Surg. Journal, 1890, vol. ii.

spite of thorough mechanical treatment, the joint should be opened

Acute attacks of sensitiveness, especially if spontaneous, are in most cases the precursors of abscess formation. Certain cases, however, continue acutely sensitive in spite of every care and in spite of thorough mechanical treatment.

### (*i*) *Malpositions of the Limb.*

At the beginning of treatment, in the majority of hospital cases at least, abduction or adduction or flexion of the diseased limb is present to some degree. Later in the disease these malpositions come on spontaneously, or as a result of inefficiency of treatment, or from too much traumatism to the joint. At other times they come on as sequelæ to the exanthemata occurring during the course of treatment.

As a rule, malpositions of the limb are associated with an acutely sensitive condition of the joint, and point, generally, to some imperfection in the mechanical treatment.

As soon as malposition reaches a degree which makes the splint fit awkwardly, or before that if the joint is acutely sensitive, rest in bed should be insisted upon, with traction made in the line of deformity, either by the ordinary traction splint or by a weight and pulley. The latter is generally preferable, and the pelvis should be made square, and traction made upon the leg in whatever line it takes. It is obvious that an inclined plane will be necessary for this if flexion is present. The child should be secured to a bed-frame in every case, as a measure necessary to secure proper fixation.

The figure (34) shows the application of this method in a case of flexion with abduction. Traction was applied to the well leg merely to steady the patient, and is not ordinarily necessary.

It will be found in the pursuance of this method that at very short intervals it will be possible to bring the leg nearer

to a correct position, until the normal line is reached. The reduction of a moderate degree of deformity is generally only a matter of two or three weeks. There is a more forcible and a quicker method of reduction by etherization and forcible reposition. This is, firstly, a rough shock to an acutely sensitive joint, and often causes much pain afterward; and, secondly, it is occasionally followed by abscess formation, which, it will be seen in the next section, is in many cases avoided by the milder method of deformity correction. If

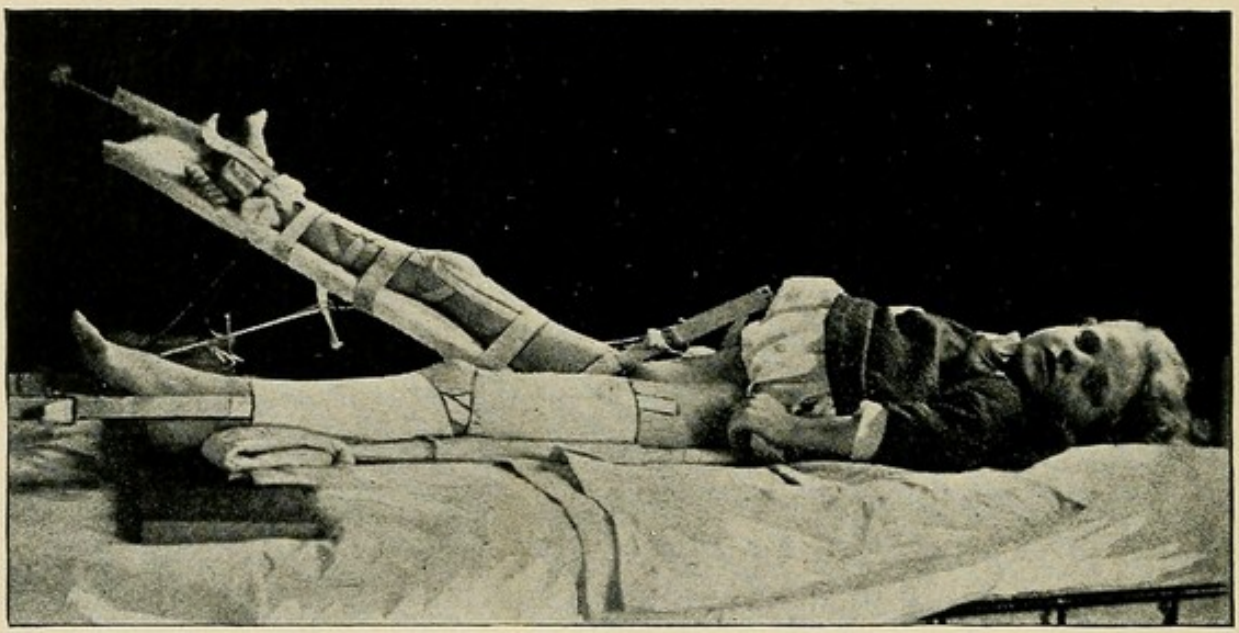

Fig. 34.— BED TRACTION IN A CASE OF FLEXION AND ABDUCTION.

the leg is forcibly straightened, a plaster spica should be applied, while the patient is unconscious, to hold what has been gained in the position of the diseased leg.

The method of Dr. Taylor for the correction of adduction is exemplified in the cut. It consists in a hip splint applied in a reversed position, so that the perineal band presses in the groin of the healthy side. In this way forcible leverage is obtained, which tends to straighten the leg. The splint is applied during recumbency only.

In many cases the choice of a method will have to be dictated by the circumstances of the patient; and forcible reposition is a perfectly legitimate proceeding where it is

desirable to save time or where good home or hospital care is not obtainable.

If anchylosis occur in a deformed position, operative measures must be resorted to.

When an anchylosis of the hip has occurred in a position of much deformity, several operative measures are to be considered which have been of use in the rectification of the deformity. If the anchylosis is bony, anything short of a cutting operation is not likely to be of use; but the formation of a true bony anchylosis is a matter of some years probably, and many anchyloses apparently firm and osseous are in reality only fibrous. It is a question whether it is better to operate upon a recent anchylosis or to wait until the local condition has quieted down, and then to do one of the cutting operations to be described.

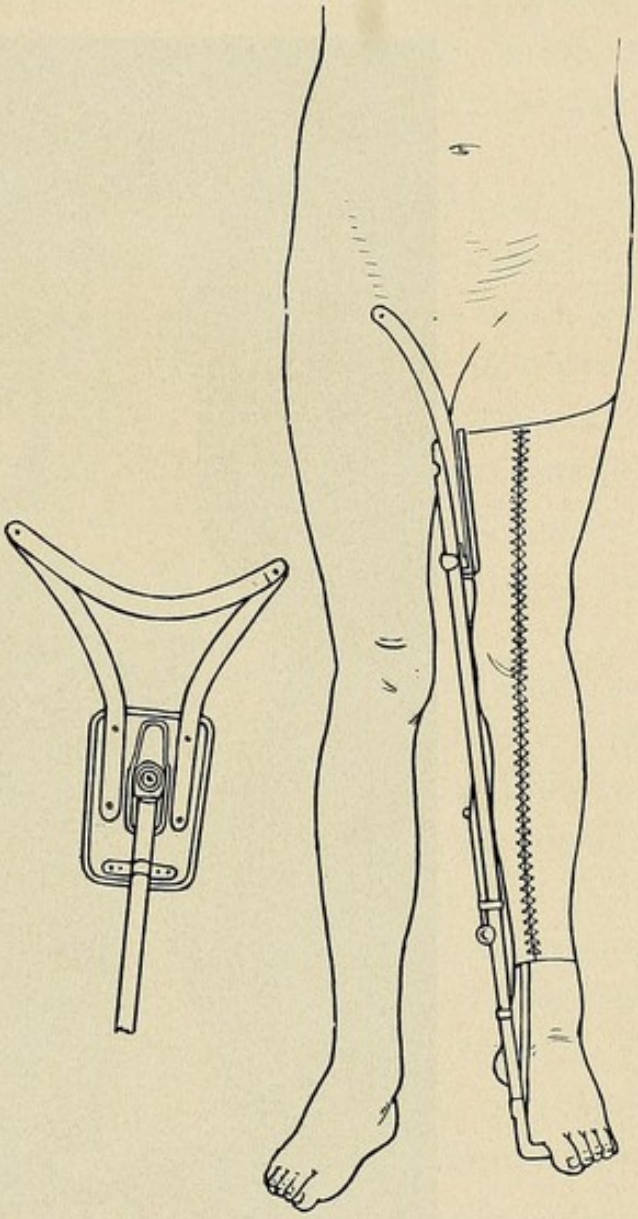

Fig. 35.— TAYLOR'S SPLINT FOR THE CORRECTION OF ADDUCTION.

If it is decided to operate upon a recent anchylosis, the most common method is that of *brisement forcé*. The patient is etherized, and the hip is forcibly extended over the edge of the table, or by laying the patient on the face and crowding the pelvis downward, so as to obliterate the

angle between the trunk and the femur. It is hardly necessary to call attention to the fact that a proceeding of this sort is likely to start up any latent focus of tuberculosis which may exist in the joint, and that, in a certain proportion of

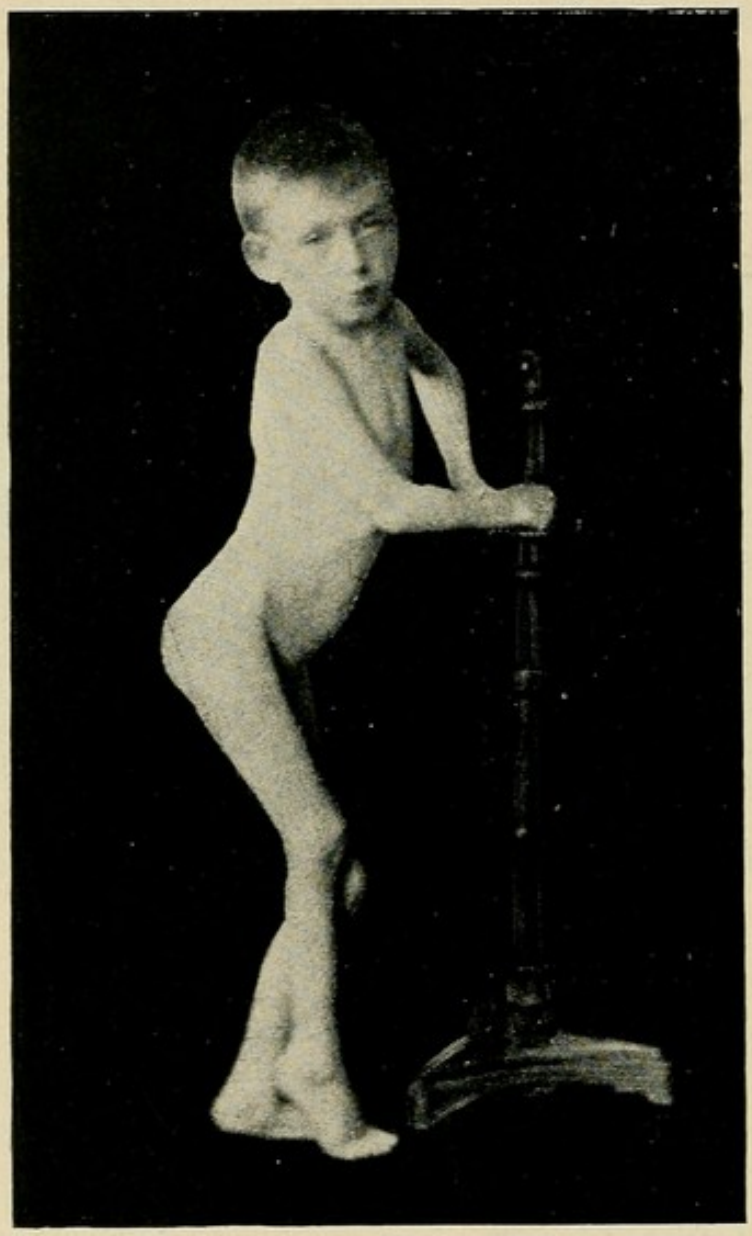

Fig. 36.— SEVERE FLEXION OF THE DISEASED LEG IN HIP DISEASE (AN UNTREATED CASE), NECESSITATING RECUMBENCY IN BED.

cases, it is followed by an active outbreak of the disease. In acute stages of hip disease this proceeding, or forcible extension of the hip, is not one of any great risk, although inferior to the method by recumbency; but, after the acute stage of the disease is over, it seems to the writer an unjustifiable

risk to run for the surgeon to adopt any proceeding which is at all likely to again start up the acute disease. Consequently, in the writer's opinion, it is wiser and safer, in cases where anchylosis has occurred in a deformed position, to wait until the local condition is quiet, probably a matter of months or years, before proceeding to any operation, and then to do a thorough, cutting operation about to be described.

One or two other proceedings should be mentioned before speaking of the common operation for the correction of anchylosis in deformity. In certain cases even when osteotomy has been performed, and in other cases where the anchylosis is only fibrous, there is so much contraction of the skin and fasciæ at the anterior part of the thigh that it is impossible to extend the leg without dividing the structures. Consequently, tenotomy and myotomy are occasional procedures, either alone or in connection with osteotomy.

Osteoclasis is occasionally, although very rarely in these days, used as a means of correction for hip deformity. The operation lacks precision, and its interest is chiefly historical. Very rarely it is done by manual force, and most often by one of the osteoclasts for the purpose.

*Subtrochanteric Osteotomy.*—The most common and the most useful operation for hip deformity is subtrochanteric osteotomy as performed by the method of Mr. Gant. The only other operation is that of Adams, which is a supratrochanteric osteotomy of the neck of the femur. The advantage of the operation below the trochanter minor is that relapse is less likely, on account of the division of the bone below the insertion of the psoas muscle. If, as in Mr. Adams's operation, it is done above the trochanter minor, the continued pull of the muscles inserted into it is a factor which is likely to reproduce the flexion. The reason for the preference of subtrochanteric osteotomy is given by Mr. Gant (British Medical Journal, Oct. 18, 1879) :—

"When, in consequence of continued disease of the hip

joint, the head of the femur has disappeared, leaving only a stunted nodule of bone representing the neck above the trochanter, in such a case the operation of section in the femoral neck cannot be performed, there being no neck to divide. Even when supratrochanteric section is practicable the state of the neck may render this operation abortive. The seat of the operation will be in an almost carious portion of bone, which is unfit to yield a fibrous union."

It is for these reasons, and on account of its simplicity, that Mr. Gant's operation is, in the writer's opinion, preferable to any other for the correction of hip deformity. The risk of the operation is very slight.

Poore analyzed 167 cases of osteotomy about the upper end of the femur. Of these, 138 were cured, 17 died, and 12 were failures. Of the 17 fatal cases, 12 occurred before the advent of antiseptic surgery. These figures are not in any way representative, and exaggerate very much the danger of the operation. So far as the writer's personal experience has gone, the operation has been always simple, and unattended by unpleasant symptoms; and he has never personally heard of any trouble occurring in the operation, as performed in the last few years.

The operation is done very simply, and every possible antiseptic precaution should be observed. The patient is etherized and turned upon the side, and the incision may be made exposing the trochanter if it is desired, although it seems entirely unnecessary, and the operation is less bloody if the chisel is driven directly into the bone through the sound skin. The place selected for section should be an inch or an inch and a half below the great trochanter, and the section should be made across the long axis of the bone. When it is evident that the bone is very nearly divided, and that only a shell is left, the femur should be fractured by gentle force, preferably bending the bone inward. The bone breaks with a loud snap, and in most cases the leg can be immediately placed in a correct position.

In some cases of long standing, division of the soft parts over the anterior surface of the thigh may be necessary, as has been said. An antiseptic dressing should be applied, and the patient is most easily cared for on a bed-frame, with traction applied to the leg which has been operated upon.

A plaster spica is dirty and uncomfortable, and the leg cannot be inspected without a good deal of disturbance of the patient. It should be remembered that the operation produces a compound fracture of the femur, and that confinement to bed is necessary for about six weeks, beginning with a gradual use of the leg. A too early use of the leg is likely to be attended by a relapse and by flexion of the leg. If abduction or adduction exist, they are easily rectified at the time of operation; and, in one or two instances coming under the writer's observation, the operation has been done chiefly to correct a lateral curvature which was beginning, and which seemed to be due to the obliquity of the pelvis caused by adduction of the diseased leg.

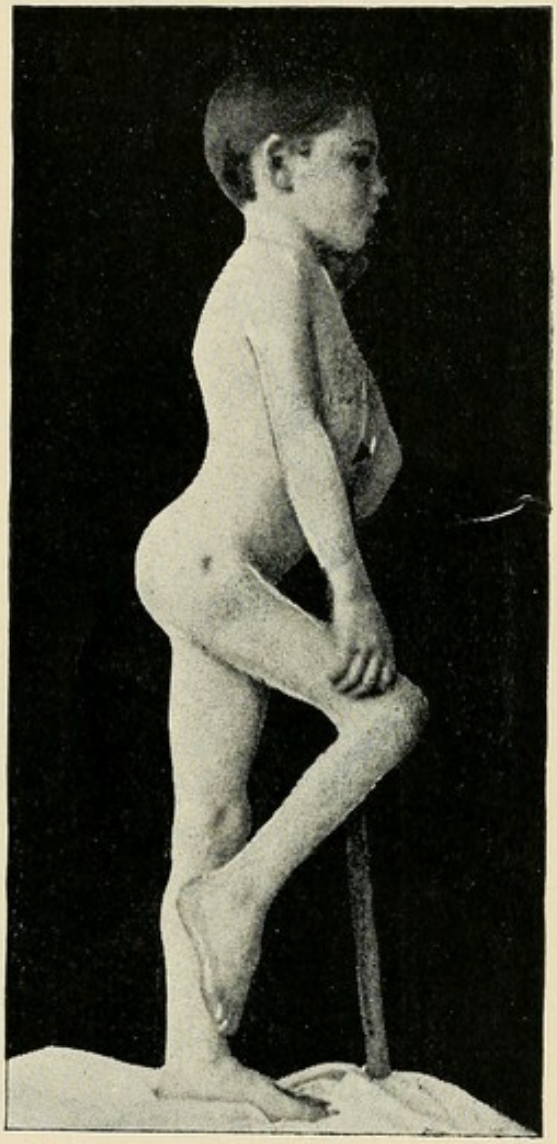

Fig. 37. — A BAD RESULT FROM HIP DISEASE DUE TO ANCHYLOSIS IN THE POSITION OF DEFORMITY.

The question of the advisability of the operation is one which must be, of course, settled in each case. As a rule, when the deformity is severe enough to cause a very conspicuous limp, or is enough to disable the patient by causing lateral curvature, or on account of its marked characteristics,

it is proper to recommend the operation. It is performed equally well upon children and adults, and is to-day done almost to the exclusion of all other similar operations.

### (*j*) *Abscesses.*

The occurrence of abscesses is in many cases due to the severity and destructive character of the disease in the individual case, but in most instances it is the result of ineffi-

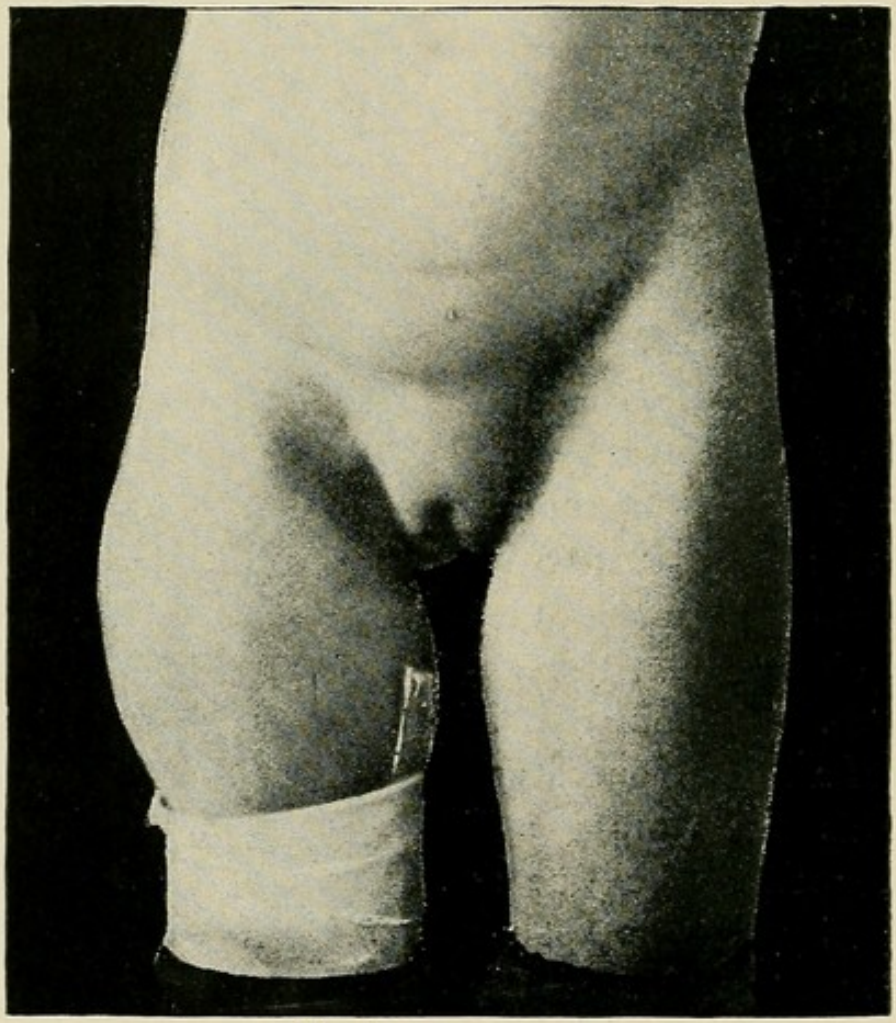

Fig. 38.— A HIP ABSCESS.

cient or incomplete treatment. The joint being imperfectly protected or fixed, irritation of the articular surfaces is induced by constant traumatism, which is expressed first by increased muscular spasm and malposition of the limb, and then by the formation of pus in large quantities, which bursts

through the weakened capsule and seeks the surface,—sometimes on the anterior surface of the thigh, at other times in the buttock, or still more uncommonly under the adductor tendons. Although no definite conclusions as to the seat and character of the disease can be drawn from the location of the abscess, those appearing at the inside of the leg under the adductor tendons are more likely to be associated with pelvic disease and to be more troublesome. The appearance of an ordinary hip abscess is well indicated in the figure.

Widely differing views are held in regard to the treatment of hip abscesses by American orthopedic surgeons. In Europe it is the universal practice to incise such collections of pus, and for that matter such is the practice of most American orthopedists. But the fact that Dr. N. M. Shaffer and Dr. Judson, of New York, stand as the representatives of a few men who advise against operation, makes a careful consideration of the question necessary.

Dr. Judson has formulated the objections to operation: "Incision is a tardy and fruitless procedure. The painful stage in the history of the abscess is long past. It was present when the pus was collecting under the periosteum and in the cells of the bone. . . . But, when the pus is in the cellular structures or the cavity of the joint, I do not see that the progress of the case can be materially affected by interference."

"If we operate, we substitute artificial for natural closure; and, with the best antisepsis, we gain nothing by operating unless we reach and scrape out the purulent deposit or the interior of the joint. . . . And, if we operate in the manner described, we do not avoid the necessity of bringing to bear the best mechanical treatment and hygienic control, which, if they are supplied, will bring about a recovery, whether we operate or not, by the slow but sure process of natural repair, with the better result the less we interfere with the soft parts, as a general rule." *

* New York Med. Journal, March 2, 1889.

Dr. Judson had expressed similar views in 1885, with regard to which Dr. L. A. Sayre said in the discussion that "it was a disgrace to the orthopedic surgery of America to allow such statements to go abroad uncontradicted." *

These views of Dr. Judson represent the best that can be said, presumably, of non-operative treatment; and the fact that he and Dr. Shaffer advocate such treatment should not be estimated too lightly. In favor of the non-operative treatment it may be said, further, that absorption of abscesses occasionally occurs at even an advanced stage, when fluctuation is plainly to be felt; that any operation is attended by the risk of accidents resulting in death; and that, although there should be no risk of septicæmia from operation, there is, as after excision of the joint, a slight risk of the generalization of tuberculosis, undoubtedly by infection at the site of the incision.

The conservative treatment of abscess in hip disease should be limited to cases under good control, where an abscess is not painful and shows no tendency to increase; where its spread can be limited by bandaging or the pressure of the anterior pad-plate of the splint, and its growth will be toward the surface instead of laterally between the layers of fascia. In such cases there is no impropriety in waiting almost indefinitely in the hope that the abscess may be absorbed.

In cases where perfect antisepsis is not obtainable, it is better to allow the abscess to burst, as also in the case of unusually delicate and nervous children, where the abscesses are not painful.

In short, the non-operative treatment of painless hip abscess is sanctioned by the best authority, but, in the minds of most surgeons, is inferior to the treatment about to be considered, and, so far as the writer's experience goes, should be limited to the class of cases just described.

* New York Med. Journal, Jan. 31, 1885, p. 116.

*The Prevention of Hip Abscess.*— It may, however, first be permissible to speak of the prevention of hip abscesses as a most important part of the discussion of their treatment.

The percentage of cases in which they occur varies very widely. In the cases reported by the London Clinical Society, in 1880, of 401 cases, 69 per cent. developed abscesses. Mr. Howard Marsh, in an analysis of cases since 1880 from the Alexandra Hospital, found abscesses in only 50 per cent., which diminution he attributed to improved methods of treatment. Gibney reported, in 1878, 80 cases of cured hip disease, 60 per cent. of which had developed abscesses. Mr. Marsh said, in speaking of his cases, "My own estimate, from what I have seen in the hospital and elsewhere, is that the formation of an abscess may be averted in at least 80 per cent. of the total number of cases."

In contrast to these percentages, the series of cases reported by Lovett and Goldthwait * is of much interest. In 320 cases under treatment at the Children's Hospital in Boston, only some 75 developed abscess, making a percentage of only 23, which is very strikingly less than any other series of cases, and seems to fulfil Marsh's prediction. More recently the writer has had the opportunity of investigating a still larger number of cases, including those just mentioned.

From 1884 to 1890, inclusive, there presented themselves at the Out-patient Department of the Children's Hospital 574 new cases of hip disease. In pursuance of the operative treatment of these abscesses which has been followed out for some years, practically all cases of abscesses were admitted to the hospital wards as soon as they appeared. In those years when 574 new cases appeared at the Out-patient Department, 107 abscesses were opened in the hospital, which means that 107 cases either had an abscess at the time of coming or developed it in the course of the disease. This gives a percentage of 18.7 per cent., which is very

* Trans. Am. Orth. Ass'n, vol. ii. p. 82.

much lower than in any other series of cases reported. There may be a slight error, amounting to 1 or 2 per cent., caused by exceptional cases of abscesses which were not operated upon ; but these were so few that they would make very little difference in the percentage.

The reason for this small percentage is believed by the writer to be due to the fact that cases under ambulatory treatment are at once admitted to the hospital whenever sensitiveness or deformity of the joint occurs, and are treated by recumbency.

In 1888, 42 cases of hip disease were admitted to the ward ; in 1889, 59 cases ; in 1890, 81 cases. In these years the percentage of cases admitted for deformity and sensitiveness has steadily increased, and the percentage of cases admitted for abscess has steadily diminished. Of the 182 patients admitted in these three years (which are all that it has been possible to analyze), 107 were admitted for deformity or sensitiveness, and stayed only a short time in the hospital, returning to the Out-patient Department for ambulatory treatment, while only 54 cases were admitted for abscess and 23 for application of apparatus.

It seems reasonable, therefore, to conclude that the confinement of the patient to bed during the occurrence of deformity or sensitiveness of the joint is a measure which renders the occurrence of abscess less likely, and is to be regarded as preventive treatment. When the abscesses occur, three courses are open,— the abscess may be let alone, it may be aspirated, or it may be incised. In general, as has been said, it may be let alone so long as it does not increase, or when the circumstances of the patient demand it. Personally, the writer is in favor of early and thorough operative-treatment, at least in hospital cases ; but it should be stated clearly that it is a personal preference, and that expectancy is admissible and to be considered good treatment.

*Treatment by Aspiration.*— Methods of treatment by aspi-

ration are, as a rule, unsatisfactory. These abscess cavities are lined by a pyogenic membrane, which will secrete more pus when the contents are drawn off; and attempts to check its activity by the injection of solutions of iodoform or carbolic acid are, to say the least, attended with danger. There is on record* the death of a child where 1-40 carbolic acid was used in this way. Very rarely aspiration is effective. The writer recalls a case of extensive abscess at the inner side of the leg where the parents and child were so excessively nervous that operation was not possible, and where the distention was so great that much deformity was caused. The abscess was aspirated over a year ago as a palliative measure, and refilled temporarily to a slight extent, after which it entirely disappeared. Such an experience as this seemed so rare that it deserved notice. Yet within the last few months, one year after aspiration, this abscess has refilled and has broken externally. This has been the invariable experience of the writer in the aspiration of abscesses.

*Treatment by Incision.*— In general, if operative measures are to be undertaken, free incision will be found the most satisfactory and thorough. The abscess should be opened throughout its whole extent and thoroughly irrigated. The pyogenic membrane should then be thoroughly scraped off of the abscess walls with a sharp spoon, and the cavity dried with sponges. The general plan is to insert a drainage tube and apply an antiseptic dressing, but this is practically sure to leave a sinus. The same may be said of packing the wound with gauze. The writer† has reported several cases of hip abscess where, after incision and drying of the wound, the line of incision was tightly sewed up without any drainage whatever. In these cases, union by first intention occurred, and much discomfort and inconvenience were avoided by having done away with a sinus.

* Bradford and Lovett, Orthopedic Surgery, 1890, p. 326.

† Bost. Med. and Surg. Journal, Sept. 18, 1890.

The writer has operated more recently upon several cases by this method, and has obtained a large proportion of successes. Sometimes the wound at once breaks down and a sinus forms, or the cicatrix may give way when the stitches are removed; but in most cases firm union is obtained by first intention, and in cases operated upon two years ago the cicatrix is still firm and normal. The experience with regard to drainage tubes at the Boston Children's Hospital is of interest: "Of 43 cases of abscess of the hip operated on at the Children's Hospital between 1884 and 1888, only one is

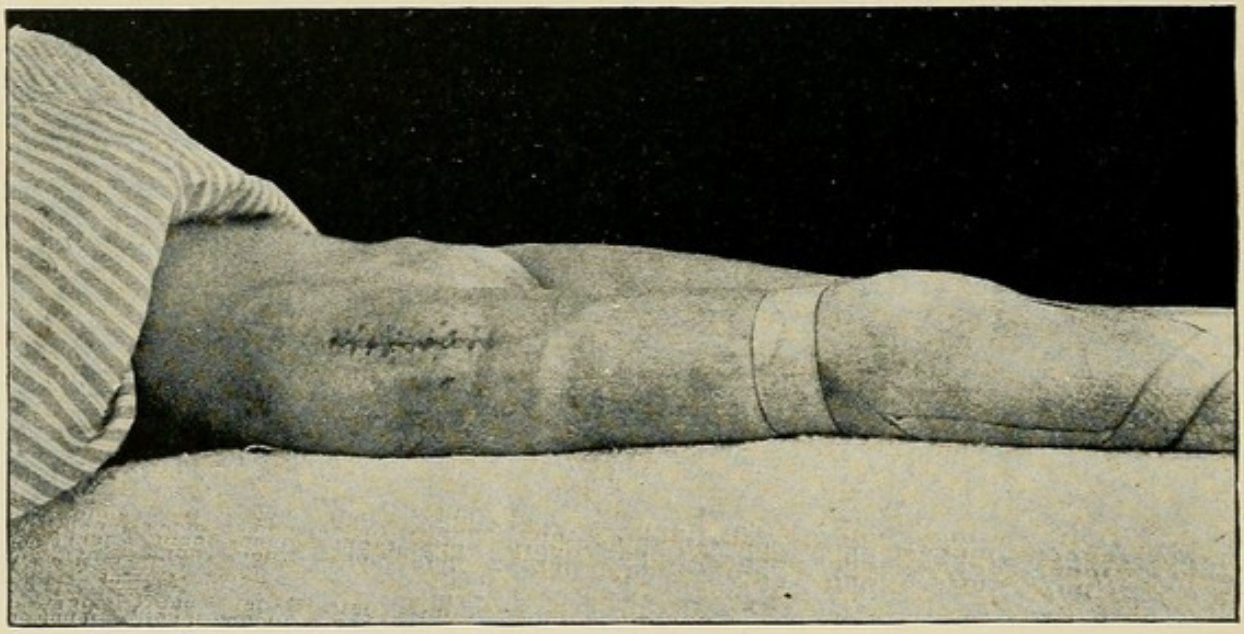

Fig. 39.—HIP ABSCESS INCISED AND SEWED UP. THERE IS NOW A FIRM, HARD CICATRIX.

recorded as having healed within six months, and about half of the sinuses healed within periods varying from one to two years, the rest remaining open almost indefinitely. These cases were all thoroughly cleaned out after a free incision, and were either packed with gauze or, more commonly, drainage tubes were inserted and an antiseptic dressing applied. . . . The site of the drainage tube was almost always the site of a sinus which persisted for a varying period of time." There is a similar advocacy of treating abscess without drainage in the Practitioner for February, 1890.

If this method is to be pursued, the strictest antisepsis and asepsis are essential; and, if there is reason to suspect the thoroughness of either of these, it is better not to operate, or at all events to leave the abscess cavity open. It is better to leave the incision open in cases where there is much inflammatory exudation into the tissues around the abscess, in cases which are particularly acute, and in very extensive abscess cavities. In many, in fact in most, of the writer's cases which healed by first intention, communication

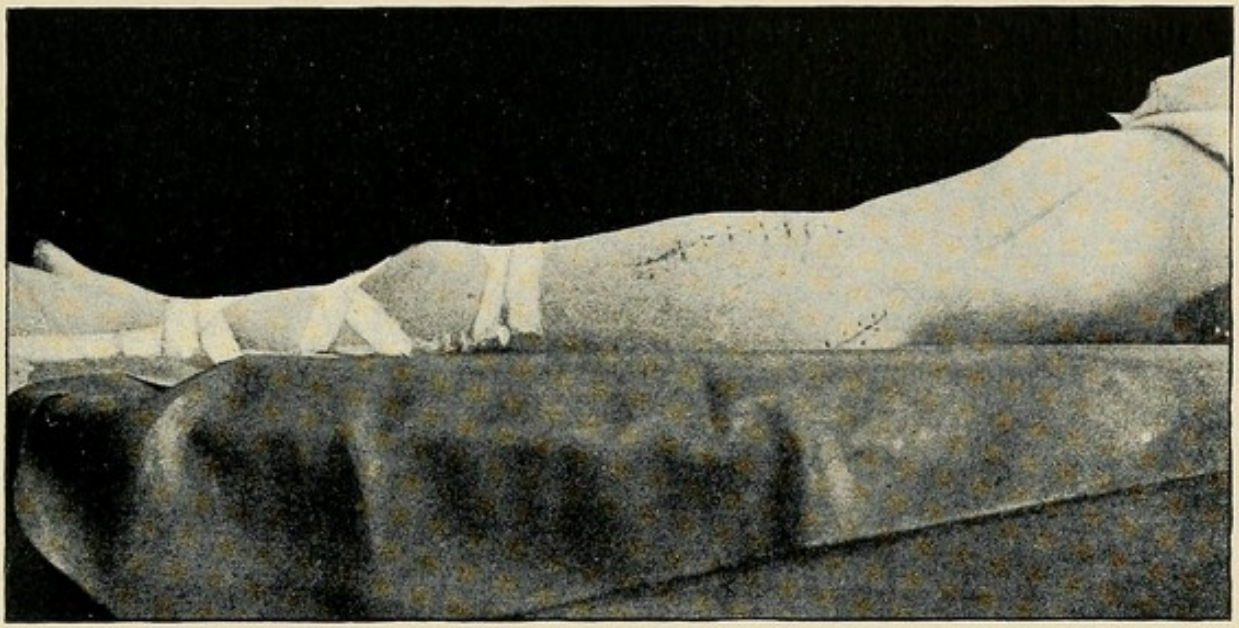

Fig. 40.— HIP ABSCESS OF GREAT EXTENT, INCISED AND SEWED UP THREE WEEKS PREVIOUS TO PHOTOGRAPH. CICATRIX IS FIRM, AND TISSUES ARE NOT INDURATED OR FLUCTUATING.

of the abscess with the joint cavity was demonstrated at the operation, so that this cannot be accepted as a contra-indication to suture.

A change in the mortality at the Alexandra Hospital in late years is attributed by Mr. Marsh to the fact that of late years the abscesses have been opened and drained, whereas in former years this was not the case. There are two series of cases from which this inference is drawn,—those prior to 1880 reported by the Clinical Society, where the mortality was 30.4% in the suppurating cases and 7% in the others,

while in a series of 614 cases since that time reported by Mr. Marsh the mortality was 6% only.

If suture is to be attempted, the abscess should be incised from top to bottom, no matter how long a cut is made. The pyogenic membrane should be scraped out with a curette, reaching to every corner of the wound. The cavity should then be scrubbed with dry sponges, and packed with them until bleeding is stopped. Then, after the wound is dusted with iodoform, it should be tightly sewed up, and a heavy antiseptic dressing applied, which should not be disturbed for ten days, unless there is discomfort or elevation of temperature.

The reasons that lead the writer to advocate the early operative treatment of abscess are these: If a careful and rigorous treatment is carried out, abscesses will only appear in a small proportion of cases, and these will be cases of exceptional severity. Under these circumstances, joint drainage will be of benefit, and waiting for the absorption of the abscess will in general prove futile.

In such cases, abscess formation is generally associated with pain in the joint and a condition of acute sensitiveness. This is generally at once relieved by incision of the abscess, just as in similar cases, without abscess formation, joint incision is sometimes necessary.

And, finally, the general surgical principles which demand the evacuation of pus influence the writer here, as in other parts of the body, to evacuate it, when present in more than a small amount; and not the least consideration should be the possibility in a certain proportion of cases of securing evacuation of the contents of the abscess with an almost immediate closure of the wound, avoiding the formation of sinuses.

After the incision of abscesses, rest in bed is temporarily indicated until the effects of the operation are recovered from. Generally, in two or three weeks the incision will have firmly healed up (if sewed up tightly) or a well-defined

sinus will have been formed where the drainage tube was inserted.

No treatment seems to be of much use in causing the closure of such sinuses. At times it has seemed to the writer that some benefit was derived from the insertion every two or three days of a urethral iodoform bougie, about $\frac{1}{16}$ of an inch in diameter, containing from three to five grains of iodoform in cocoa butter. In general, however, these sinuses run for some months, and their spontaneous closure is a most favorable prognostic sign.

### Résumé of the Treatment of Hip Disease.

It is very hard to summarize so extensive a subject as the treatment of hip disease; yet, after so extended a consideration of the subject, the writer is anxious once more to declare his belief that the best treatment for hip disease is to be found in the traction treatment, combined with measures which are calculated to secure a large degree of rest to the affected joint.

This plan would consist in the application of a long traction splint, and necessitates the use of crutches and a high shoe. This splint should be worn night and day until some months after the cessation of all muscular spasm. Sensitiveness of the joint and the occurrence of malposition are indications for rest in bed. The activity of children treated in this way should be restricted by recumbency for two hours or more a day and by most careful watching.

In short, the writer would be glad to advocate in every way the necessity of greater joint rest in connection with the ambulatory traction treatment.

## II. The Operative Treatment of Hip Disease.

### *Excision of the Hip.*

The operative treatment of hip disease is generally interpreted to mean treatment by excision of the joint. Cer-

tain minor operative procedures will be considered later. These are ignipuncture, incision of the joint, trephining the neck of the femur, etc.

Considering, then, the operative treatment of the disease as contrasted with the mechanical treatment, two questions arise. First, Does operation diminish the death-rate of the disease? Second, Are the results better after operation than after mechanical treatment?

It may be stated here that the advocates of excision as a treatment for hip disease are to be found among German and English writers; while American orthopedic surgeons unite in advocating excision only as a last resort, to be used when mechanical treatment has failed.

Excision of the hip joint is a serious operation, and should only be undertaken with (*a*) the hope of lowering the mortality of the disease, (*b*) in order to prevent systemic infection (a generalization of the local tuberculosis), and (*c*) to obtain better functional results than by mechanical means.

(*a*) *The Mortality after Excision.*— Mr. Wright, of Manchester,* has collected 2,461 cases of hip excision, new and old, done with and without antisepsis, and finds 1,566 recoveries and 841 deaths, which amounts to 34 per cent. of mortality. The older groups of cases give a higher death-rate, Leisrink's † being 63.6 per cent. and Culbertson's 41.6 in 418 cases. Caumont ‡ divided his cases into two groups; and he found that without antisepsis the mortality was 66 per. cent., while with antiseptic precautions it fell to 41 per cent.

The time at which the resection is done, of course, is an important factor in determining its gravity. Grosch § analyzed 166 cases, and he divided them into classes according to the stage of the disease at which they were done. In the first stage in children (where the suppuration has not reached the surface) the per cent. of mortality was zero, in

* G. A. Wright, Hip Disease in Childhood.

† Archiv f. Klin. Chir., xii. 177.

‡ Caumont, Deutsch. z. f. Chir., xx., 1884, p. 344.

§ Cent. f. Chir., 1882, xiv. 229.

the second class (those with extensive suppuration) it was 24.1 per cent., and in the third and last class of advanced disease it was 67.5 per cent.

As representative of the results obtained under modern conditions, Bradford and Lovett give the following table:—

| | *Cases.* | *Mortality per Cent.* |
|---|---|---|
| Volkmann, | 48 | 25.30 |
| Korff, | 33 | 48.5 |
| Grosch, | 166 | 36.7 |
| Alexander, | 36 | 30.5 |

It is not to be supposed that these writers, nearly all of whom are advocates of excision of the hip, have reported any cases as deaths besides those which are legitimately to be attributed to the operation. The later cases of death, in most instances, are not counted as due to the operation.

So that the outcome of the matter is that excision, as ordinarily performed, carries with it a mortality per cent. of 30 or more; and this seems a serious risk to assume, unless it becomes evident that decided benefit is to ensue over any other method. That matter will come up for discussion later.

(*b*) Excision has been advocated as a preventive of generalization of tuberculosis from the focus in the hip. That such a danger exists is well known.

In a series of cases at the Alexandra Hospital since 1880, analyzed recently by Mr. Marsh,* there were 35 deaths, and 17 of these were caused by meningitis or phthisis. From 1867 to 1879 at the same hospital there were 384 cases of hip disease, and only 23 deaths from tubercular meningitis. All these cases were treated conservatively.

In coming to the consideration of operative treatment, König † reports that, of 21 hip excisions, 47.6 per cent. died of tuberculosis inside of four years. Wartmann analyzed 837 resections, and found that 10 per cent. of all deaths were

* Br. Medical Journal, Aug. 3, 1889. † Archiv f. Klin. Chir., xxvi. 822.

the result of rapidly appearing miliary tuberculosis. Mr. Barker, in a lecture before the Royal College of Surgeons in 1888, stated that in 10 per cent. of all deaths following excision "rapid miliary tuberculosis came on in such a way as to suggest strongly, if not to prove, that the surgical interference was the cause of the generalization of the disease."

Caumont treated 26 cases of hip disease by conservative measures, and found that one-fifth died of tubercular disease; while, of 22 cases resected, one-third died of generalization of the tuberculosis.

These figures seem enough to establish the fact that resection of the hip does not prevent general tubercular infection.

(*c*) *Functional Results.*— It will be readily understood from the casual consideration of the matter that the results after excision are not likely to be so good from a mechanical standpoint as when a cure has been secured by other means. It is not as if it were possible to do a complete subperiosteal operation and shell out the bone, leaving its case. This, in most instances, is not practicable. On the contrary, very important muscular insertions are severed, the joint capsule is destroyed, the head of the femur is removed, and with it, perhaps, part or all of the neck, and possibly the trochanter major, and even part of the shaft. This leaves a headless femur in loose or uncertain contact with the acetabulum. As a matter of fact, the results are not so bad as one would expect; often they are almost perfect. There is, of course, always shortening; but a new joint may form of very good character, and be movable and serviceable. The dissection of such a case is figured in Sayre's Orthopedic Surgery as the frontispiece; and other cases have been reported by Kuster, Israel, and many others.

In the case of Sayre there had been the formation of a new fibrous capsule and of new cartilage, and of course in every operation an attempt should be made to save the

periosteum as much as possible; but in the later cases the periosteum is either so hopelessly diseased or so nearly wanting that it has not, in the writer's experience, been possible to save it to any extent.

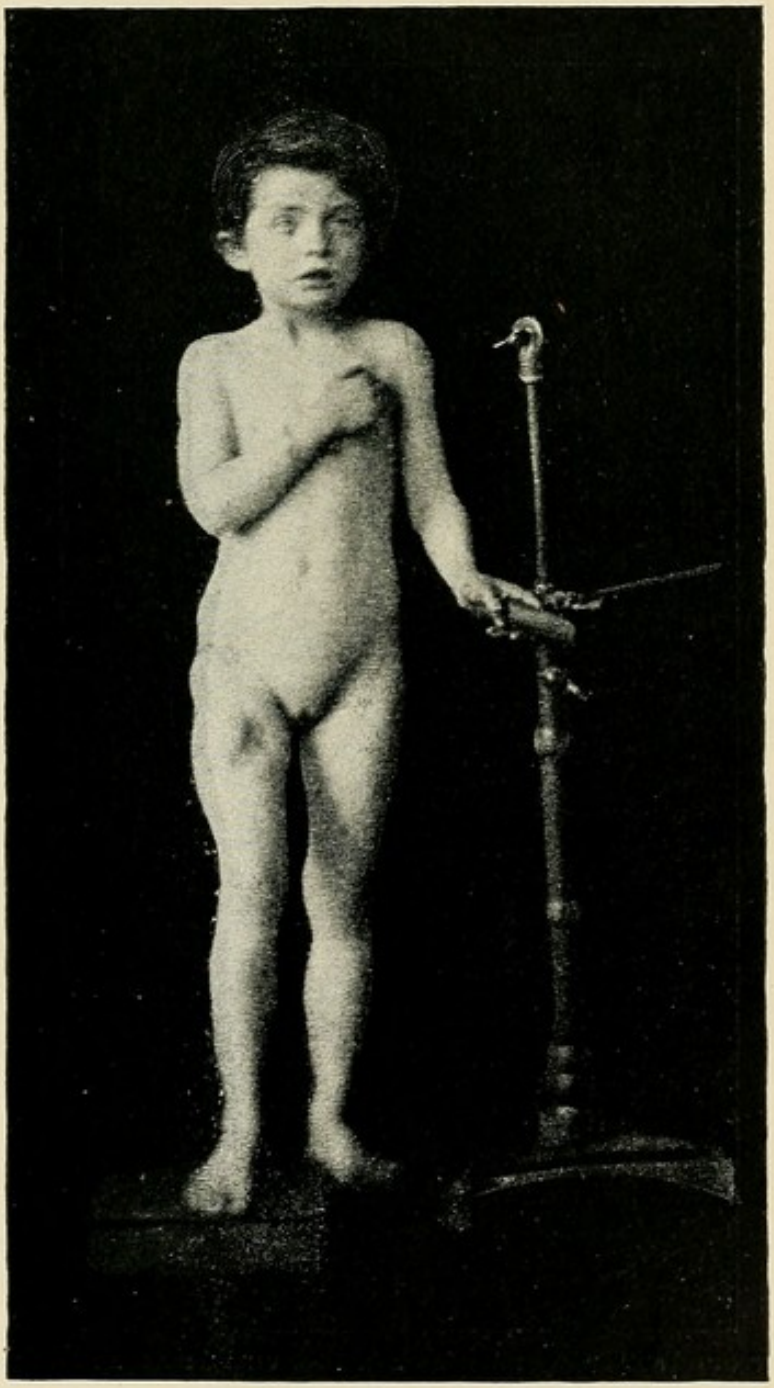

Fig. 41.— RESULT OF HIP EXCISION FOUR YEARS AFTER OPERATION. SINUSES DISCHARGING. LIMB PARTLY USELESS AND POSITION FAIR. CHILD CAN WALK WITH CRUTCH. TO BE CLASSED AS A FAIR RESULT.

Anchylosis may result after excision, which is a good and desirable result, and, perhaps, safer than a movable joint

would be; but firm anchylosis is not common after hip excision.

The results of late excision are not so good as the results of early operation; but, on the whole, they are satisfactory, as a rule. Very often the most wonderful improvement will

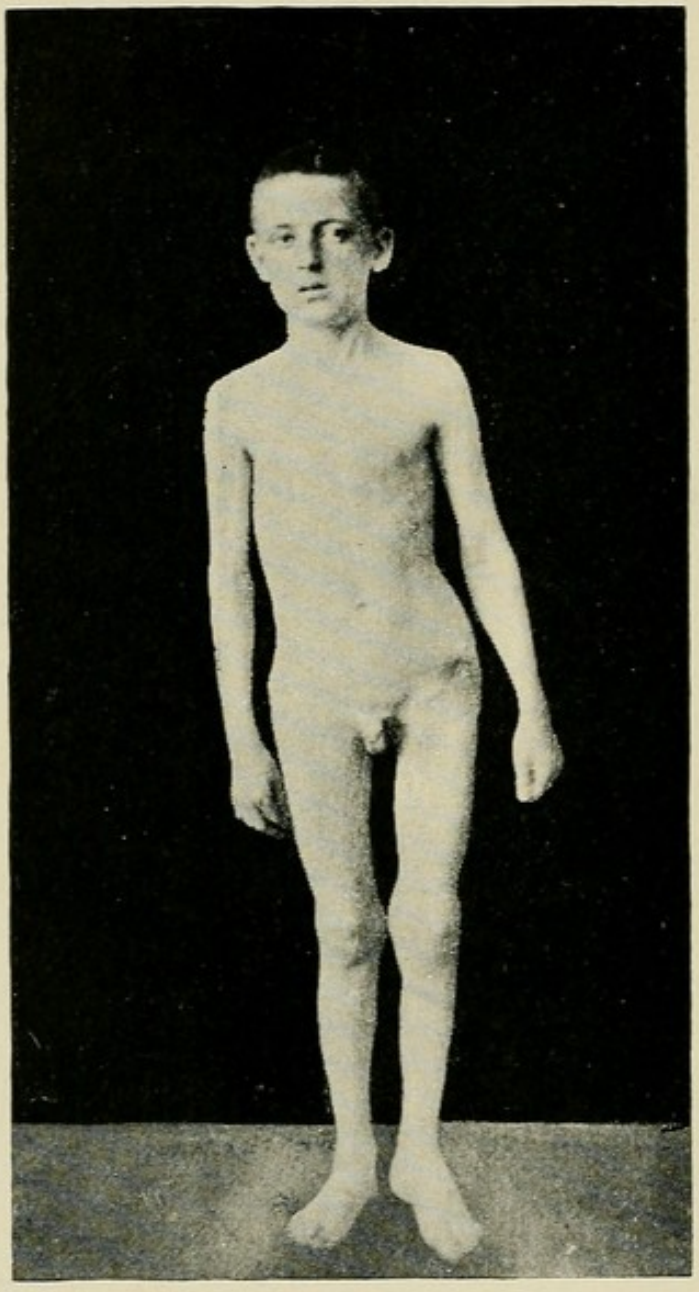

Fig. 42.— RESULT OF HIP EXCISION DONE AS A LIFE-SAVING MEASURE ONE YEAR PREVIOUS TO THE TIME OF THE PHOTOGRAPH.

follow almost immediately upon operation. The case photographed will serve as an example.

This boy was seen in a most deplorable condition. Mechanical treatment had been abandoned by the parents; and

he was emaciated and so feeble that he was helpless, while the hip was apparently rapidly disintegrating, and the whole thigh very much swollen and discharging profusely. Excision was at once undertaken by the writer, but had to be abandoned before throwing the head of the bone out of the socket on account of the boy's alarming condition. Three weeks later the operation was completed, and the boy's present condition at the end of nine months can be seen. The head of the femur was eroded and diseased as far as the shaft, the acetabulum necrosed, and all the parts about infiltrated; yet such a result as this has been in the writer's experience not at all exceptional.

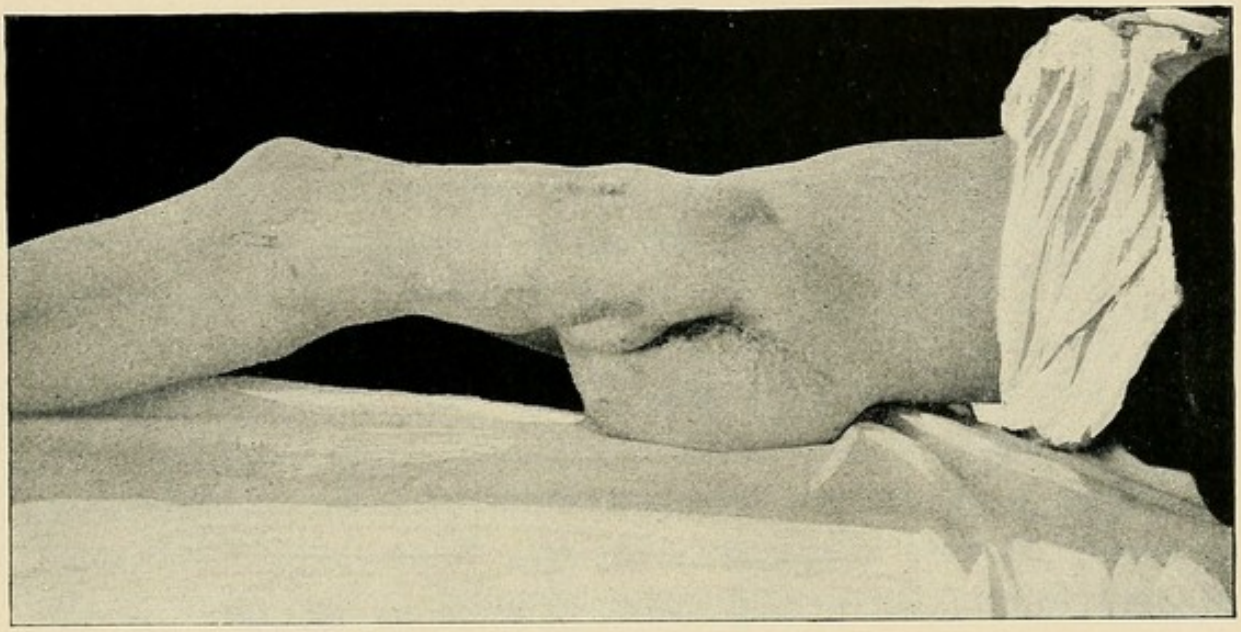

Fig. 43.— A BAD RESULT AFTER EXCISION OF THE HIP.

But there are many bad results after excision. Some cases do well for a while, and then relapse. Such may be counted as good results. Bradford and Lovett report a case which was one of these. This case was reported six months after excision, in Culbertson's Tables,* as "No. 464. Recovered in six and two-thirds months. One-half inch shortening. Almost perfect motion." Seen five years later,† the report was that he could only touch the floor

*Trans. Am. Med. Assoc., 1876, p. 142. † N.Y. Med. Journal, April, 1879.

with the toes of the affected limb, on which he could bear little or no weight; and he was unable to walk without a crutch or cane. This case may serve as an example of the later histories of many cases of excision reported as successes.

The case in the figure may serve as an example of a bad result and an almost useless leg following excision. The disease was originally extensive; but some years after operation the leg was as shown in the illustration, with the sinuses still discharging.

With regard to the results to be obtained by excision, the 100 cases of Mr. Wright are instructive. When these cases were last seen by Wright, the results were as follows:—

| | |
|---|---|
| Soundly healed, | 17 |
| Unhealed, | 57 |
| Dead or dying, | 18 |
| In bad condition, | 3 |
| Amputated, | 4 |
| Recent case, doing well, | 1 |
| | 100 |

In short, about 20 per cent. might be classed as satisfactory at that time.

Now, 30 of these cases had been in progress only nine months or less when excision was done, being the most favorable class of cases possible to judge of the value of the early operation; yet one is surprised to find that 4 died and 2 were amputated, 6 healed soundly, 7 were unhealed at the end of one year, 6 at the end of two years, while 5 were too recent for classification. The Clinical Society Committee investigated 12 cured cases after excision, and found that 2 could stand and hop on the excised limb, 4 could stand firmly, 4 others could stand, but not firmly, and 2 could not stand at all; and the committee reported, as a result of their whole investigation, "that movement is more frequently present, and is also more extensive, in the former class (excision), but that patients often walk insecurely and

with considerable limp, while the limb after treatment by rest and extension, though frequently more or less fixed, is more firm and useful for purposes of progression." *

Elben † traced 61 cases of hip excision, and found that 41 could walk without apparatus, 15 required some apparatus, while 5 were unable to walk at all.‡

Grosch § states, as the result of an extensive analysis of cases, that the functional results are no better than they were before the day of antisepsis.

Holmes ‖ speaks of the end results of excision as follows: "The limb is hardly ever so firm or powerful in walking as we constantly see that it is after the natural cure by anchylosis, nor is the patient so active or enduring."

These are not partisan views, but, so far as the writer knows, the most representative expressions of opinion on both sides.

Shortening of the leg must necessarily be a marked feature of cases treated by excision of the joint, not only on account of the amount of bone actually removed, but also because of the retarded growth due to the removal of part of the epiphysis. Mr. Croft believed that it was but little greater than after conservative treatment. The average shortening, however, in thirteen of his cases, reported by him, was 2¾ inches. In Wright's cases, the amount of shortening is only given in thirty cases, where it was 1½ inches.

The case for excision is not a strong one, as must be evident from the consideration of the figures given, although no one is more aware than the writer of the unreliability of statistics in general. But the mortality is evidently high. The operation does not prevent systemic infection. The proportion of unhealed and unsatisfactory cases is apparently larger than is supposed; and, finally, the end results are not satisfactory altogether, considering them by themselves and

* Trans. Clin. Society, xiv. p. 234.
† Cent. f. Chir., 1882, 2, 77.
‡ Cent. f. Chir., 1879, No. 2.
§ Cent. f. Chir., 1882, xiv.
‖ Med. Times and Gaz., Nov. 3, 1877.

not comparing them as yet with the results of conservative treatment.

*The End Results of Mechanical Treatment.*

There is scarcely more value to be attributed to the figures relating to the results of the mechanical treatment of hip disease than to those which deal with excision. They are comparatively few in number, they are brought forward by partisan writers, and they deal with different methods of treatment. Yet they offer enough information to make them worth careful consideration.

With regard to the worst class of suppurative cases, Cazin had charge of the hospital at Berck where cases were sent from the hospitals in Paris when they seemed hopeless; and these cases were treated by mechanical means in an atmosphere, of course, very favorable to improvement of the general condition. In 80 cases of such hip disease (all suppurative) treated in five years there, 12½ per cent. died, 55 per cent. were cured, 7½ per cent. were improved, 25 per cent. were not cured or improved.

C. Fayette Taylor, of New York, reported 94 cases of hip disease treated by the long traction splint under favorable conditions, with 91 recoveries and 3 deaths. 24 of these cases were suppurating ones.

Of 288 cases which Gibney collected, which were treated at an institution where the treatment was purely expectant, the mortality rate was only 12½ per cent.; and these figures are of interest in contrasting what is practically untreated hip disease with the results of excision.

But any mortality per cent. obtained from the analysis of recent cases must evidently be of little value, as the whole mortality of the disease must include many late cases, where death occurs after a lapse of years. It must on this ground be evident that most analyses are not of great value, inasmuch as they have to do with cases which remain under observation only a short time.

*Motion.*— With regard to the functional results to be obtained, the information is more definite. Shaffer and Lovett* analyzed 51 cases of cured hip disease discharged from the New York Orthopedic Dispensary from four to ten years previously. 4 of these had died, 6 had relapsed; but 41 were well, and were apparently permanently cured. These latter were all active working people or school children. They all walked without cane or crutch (with one exception, where Pott's disease was also present), and all were free from any serious inconvenience from their hip disease. These 51 cases were the only ones which could be found in some 75 cases selected for investigation. Those selected cases were merely all those living in or near New York, who had been discharged as cured (after being at least two years under treatment) between two dates.

Few parents are willing to persist in treatment until the children can be considered by the surgeon as cured, and take them from under treatment as soon as the patient is convalescent; and these cases, if investigated, would probably show nearly as good results as those investigated by Shaffer and Lovett. Of these 51 cases, however, there were 26 suppurative cases carefully examined; and they showed as good an average of joint motion as cases without abscess.

There were 2 recoveries among these with perfect motion in every direction, 3 with 90 degrees of motion, 5 with 10 to 45 degrees of motion, 4 with slight motion, and 12 with anchylosis. These cases were all treated by ambulatory traction throughout the disease.

Howard Marsh analyzed a similar class of hip cases one year after discharge; and of 37 suppurative cases he found perfect joint movement in 1 case, free joint movement in 10 cases, slight joint movement in 7 cases, anchylosis in 18 cases.

Among the 39 non-suppurative cases he found still better

* N.Y. Med. Journal, May 21, 1887.

results: 9 were classed as perfect recoveries, 9 were classed as excellent recoveries, 12 were classed as good recoveries, 9 were classed as moderate recoveries.

These cases were treated by traction in bed and fixation in the quiescent stages of the disease.

*Shortening* is less important than motion; but the results of mechanical treatment are excellent in this respect. In the cases of Shaffer and Lovett the shortening was from half an inch to two and a half inches, with 2 exceptions. 2 cases, on the other hand, had no shortening. Suppurative cases had a little more shortening than the others, but the table shows how slight is the difference: —

| *Shortening.* | *Supp. cases.* | *Non-supp. cases.* |
|---|---|---|
| None | 2 | |
| ½ inch | 1 | 1 |
| 1 inch | 5 | 5 |
| 1½ inches | 4 | 3 |
| 2 " | 8 | 1 |
| 2½ " | 5 | |
| 3 " | | 1 |
| 6 " | | 1 |

Of Marsh's 37 suppurating cases, 3 had no shortening, 17 had less than one inch, 12 had from one to two inches, 3 had two inches or more, while the average of non-suppurating cases was two-thirds of an inch.

### *The Results of Expectancy.*

Even expectancy or no treatment at all is not attended by such bad results as one would expect. Gibney* investigated 80 cases of hip disease from the Hospital for the Ruptured and Crippled, and found that 61 could walk well, while 12 had an arc of motion of 15 degrees or more. This is not intended to excuse such lack of treatment, but to show that the disease cannot certainly be considered so malignant as some English surgeons would have us believe.

* N.Y. Med. Record, March 2, 1878.

## *Excision* v. *Mechanical Treatment.*

The outcome of all this is the question as to which of these methods offers the best prospect in hip disease, a conclusion which the writer has endeavored to present only after a careful and separate consideration of the results to be expected from each method of treatment. Two questions proposed at the beginning of the section on excision can now be fairly answered on the evidence presented.

One was, Does operation diminish the mortality of hip disease? The answer is plainly, No. The other question was, Are the results better after operative than after mechanical treatment? And, again, the answer, as established by the evidence presented, would be, No.

Those surgeons who believe that early excision is the best treatment for hip disease (of whom the most prominent representatives are Mr. Barker, of London, and Mr. Wright, of Manchester) are inclined to advocate very radical views in this direction. It is difficult for American surgeons to appreciate the grounds on which Mr. Barker * advocates excision of the hip joint as "soon as it is suspected that caseation is advancing in it," until it is understood that Mr. Barker regards "tubercle in the light of a malignant growth," and would deal with it accordingly. Of course, if this view is accepted, the position of these extremists is not to be criticised. "It is impossible, however, to shut one's eyes to the fact that this is an estimate of tuberculosis which the great majority of surgeons would not for a minute entertain. The estimate formed by Brodie, indorsed by Paget and Hilton, and accepted by a very large proportion of those who have studied the subject from a clinical point of view, is that, though often intractable and destructive in its later stages, tuberculosis, on a general survey, wears the aspect of merely an obstinate inflammatory process, the

* Brit. Med. Journal, June 9, 1888.

whole course and progress of which are widely divergent from those of malignant disease."

This quotation from Mr. Howard Marsh * is a fair statement of the position in the matter as it appears to most surgeons. The justification of early excision of the hip cannot be found on these grounds, evidently. It must rest on diminished mortality or improved results, and these aspects of the question have just been considered.

Yet, from his experience with excision of the hip, Wright has reached no more temperate conclusion than that "treatment short of excision, where once suppuration occurs, is useful only as a palliative or means of temporizing."

Now, these statements of Mr. Wright and Mr. Barker are much more radical than those of the Clinical Society's Committee, who reported in 1880, among their conclusions, that "with respect to the general question of operative interference [in hip disease] the committee are of opinion that the effect of complete rest and weight, or other modes of extension, with the withdrawal of matter, should always be patiently tried in the first instance, and that operative interference should be resorted to only when these means have failed to secure the favorable progress of the case." Certainly, Mr. Wright's figures in no wise justify the position which he takes, as must have been especially seen when the consideration of the end results of mechanical treatment was taken up.

It seems unnecessary to dwell longer on the fact that excision of the hip cannot be accepted as the proper treatment of hip disease.

The writer can only state his views, which he believes to be representative of those of most American orthopedic surgeons. Excision of the hip is to be considered a proper and necessary measure under two circumstances,— where mechanical treatment is not obtainable, and where mechanical treatment, after careful and intelligent trial, has failed.

* Brit. Med. Journal, July 20, 1889, p. 121.

The children of the lower classes, in cities where hospital facilities are poor and where the parents are so circumstanced that they could not carry out simple bed traction, are to be considered fit subjects for excision, if it seems clear that the better treatment cannot be put within their reach. Where proper mechanical facilities are to be obtained, it would be the writer's feeling that excision should not be undertaken. Fortunately, this class of cases, where conservative treatment is not obtainable, is steadily growing smaller with the increase of hospital advantages.

With regard to the time when mechanical treatment should be abandoned in favor of operation the question is a more difficult one to decide; nor is it possible to lay down any definite rule which can be followed. The question in every case is one which should be settled by a delicate balancing of the different features of the case.

In suppurating cases, where there is a porky induration of the thigh and a profuse discharge from numerous sinuses, any pronounced failure of the general condition should lead the surgeon to consider the advisability of excision. Other cases show plainly that a rapid disintegration of bone and soft parts is taking place, and this goes on steadily in its destructive course in spite of mechanical measures until it becomes evident that a limit must be set to the process. This is not common in cases under control, but in exceptionally tuberculous children it occurs. Again, excision may be necessary, in exceptional cases, where excruciating pain is suffered, which cannot be relieved by mechanical treatment. In many cases, simple incision of the joint will relieve it; while, again, excision may be necessary as a further measure.

Such rules as were laid down for excision by the Committee of the Clinical Society are not of use to-day, because the methods of treatment have been changed and improved; and the presence of necrosis or pelvic disease is in no way to be considered an indication for excision.

Any extended discussion of the technique of the operation

of excision of the hip does not, in the writer's opinion, come within the scope of this essay.

The posterior incision is the one ordinarily used. The head of the bone should be thrown from the socket before being sawed off, and is thrown out most easily posteriorly. It is not generally possible to remove all diseased tissue from the acetabulum. The photographs of the various stages of the operation may serve better than a description to make the matter plain.

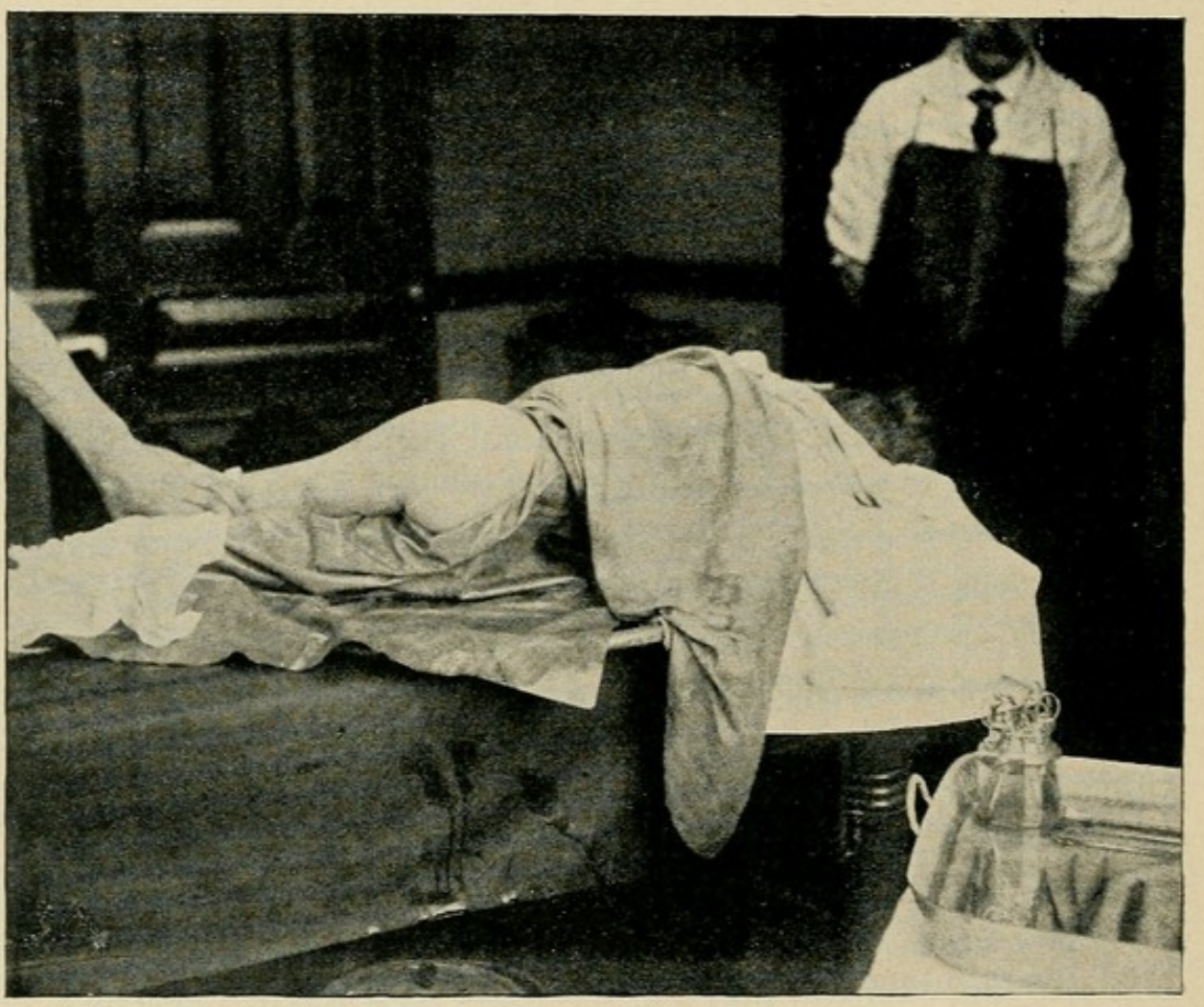

Fig. 44.— POSITION OF THE PATIENT FOR EXCISION OF THE HIP JOINT.

After excision the hip should be protected for a long time, preferably by some splint combining fixation and traction. Excision cannot be considered as a means of cutting short the disease, because a hip joint after excision demands very

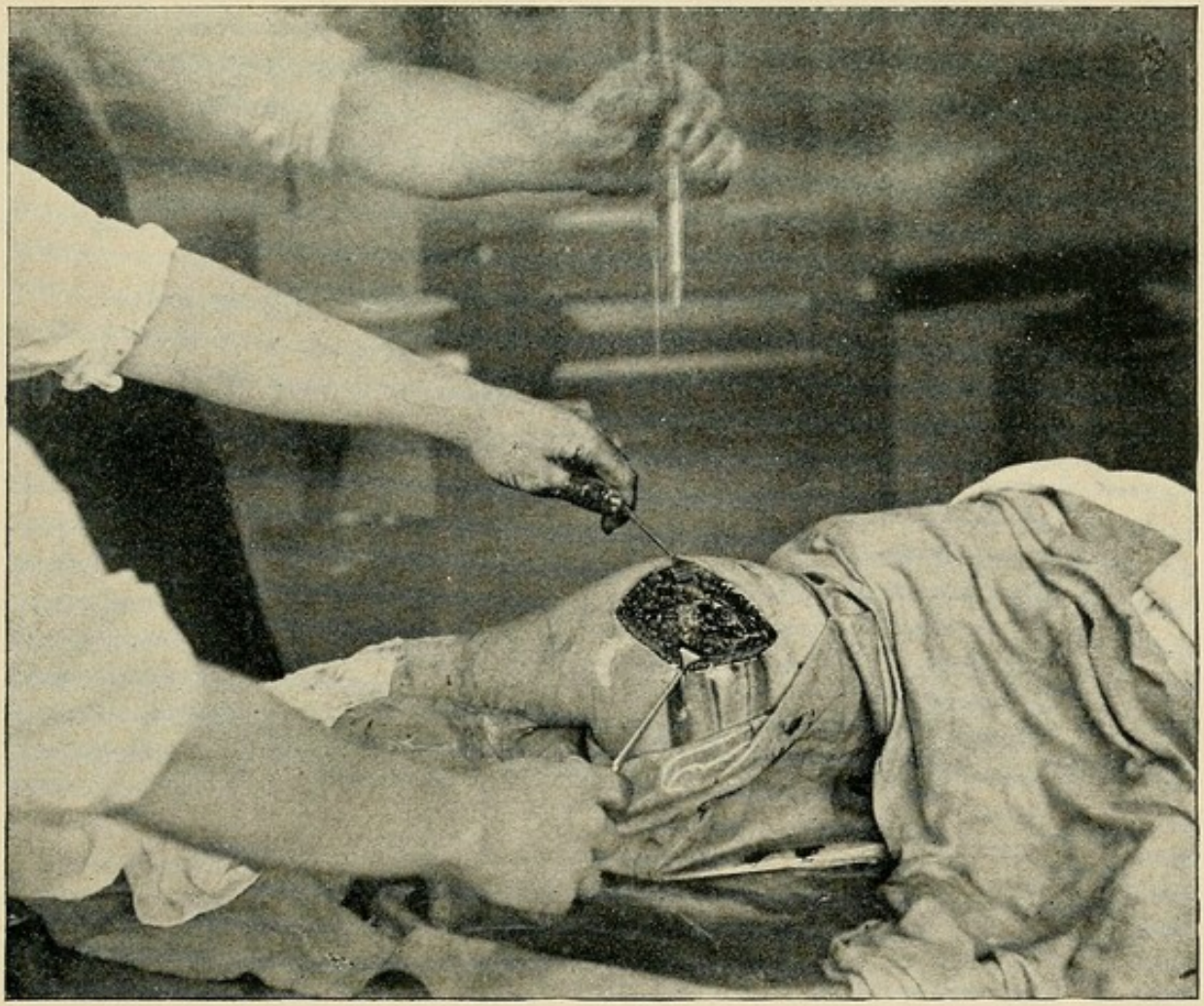

Fig. 45.— THE INCISION EXPOSING THE TROCHANTER AND NECK OF THE FEMUR.

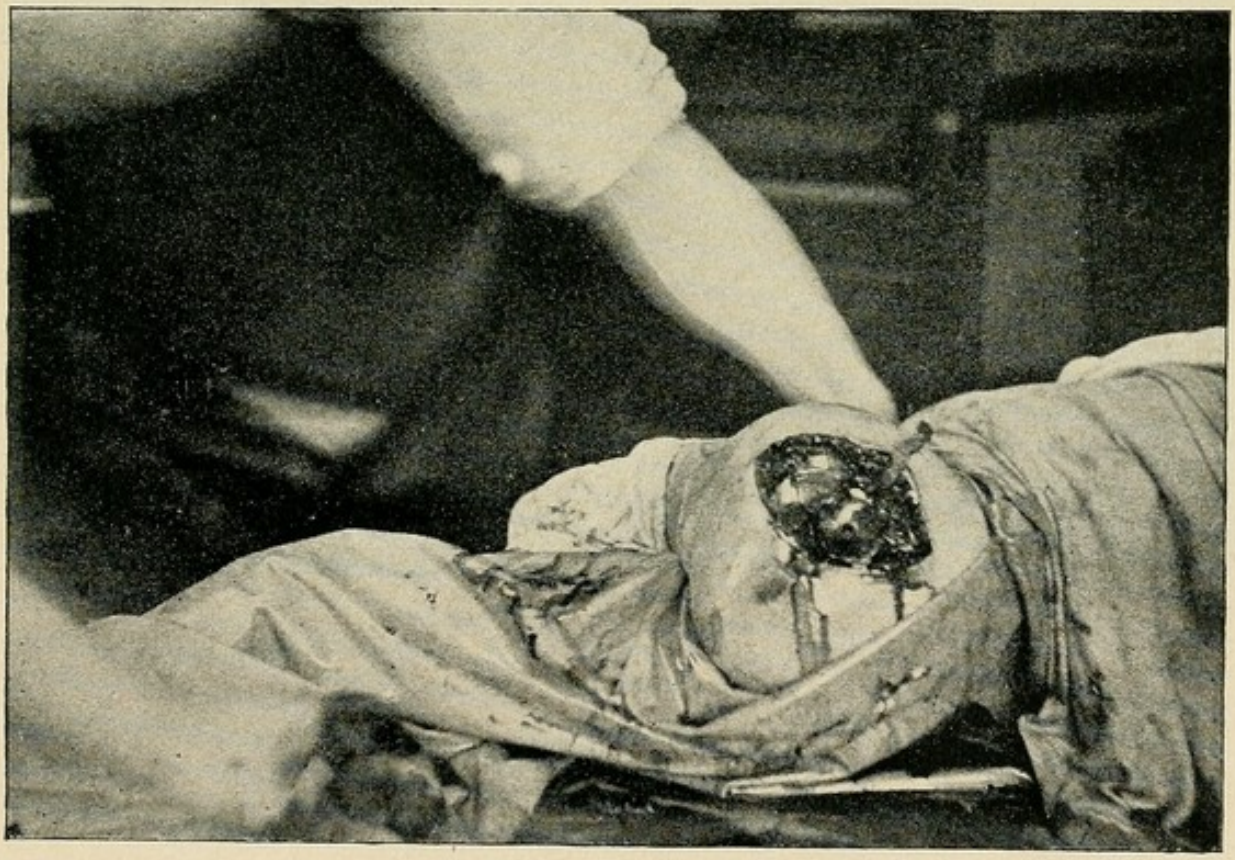

Fig. 46.— THE HEAD OF THE FEMUR THROWN OUT OF THE SOCKET PREPARATORY TO CUT-

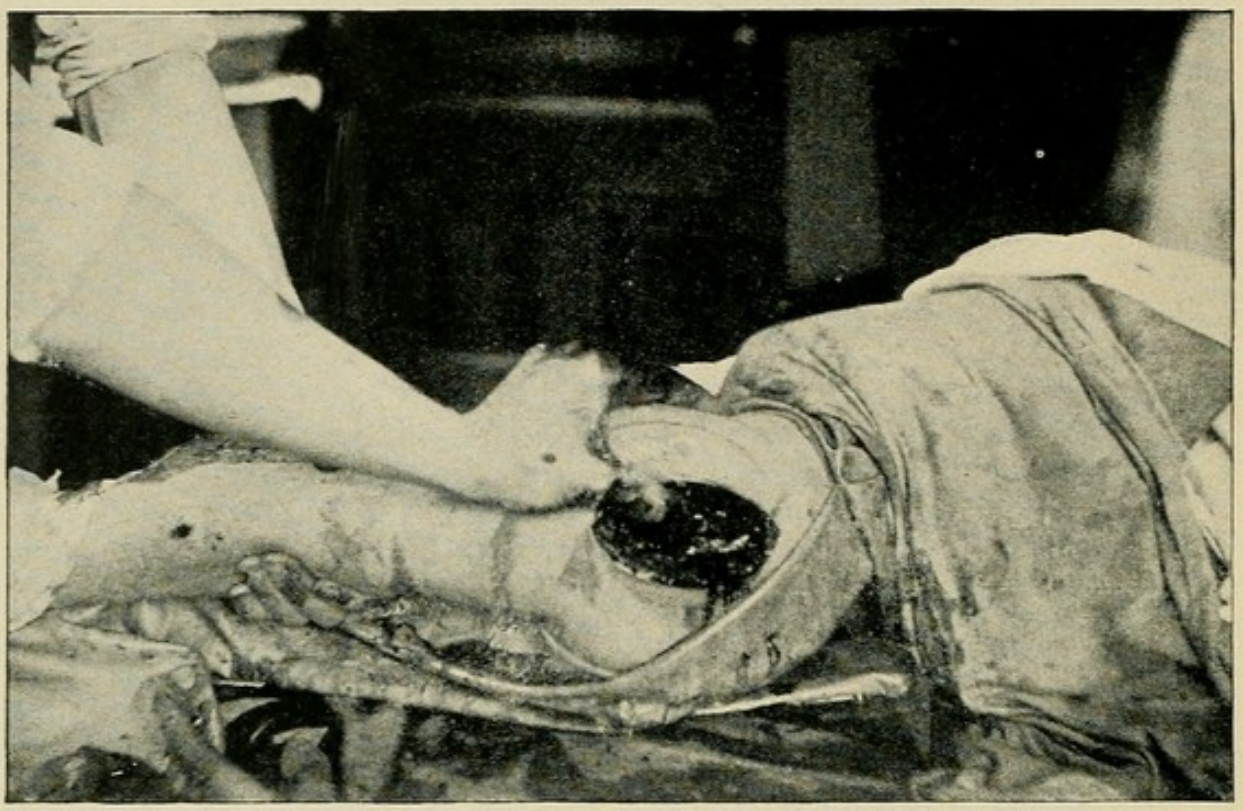

Fig. 47.— THE HEAD OF THE FEMUR REMOVED AND THE LEG AGAIN IN PLACE.

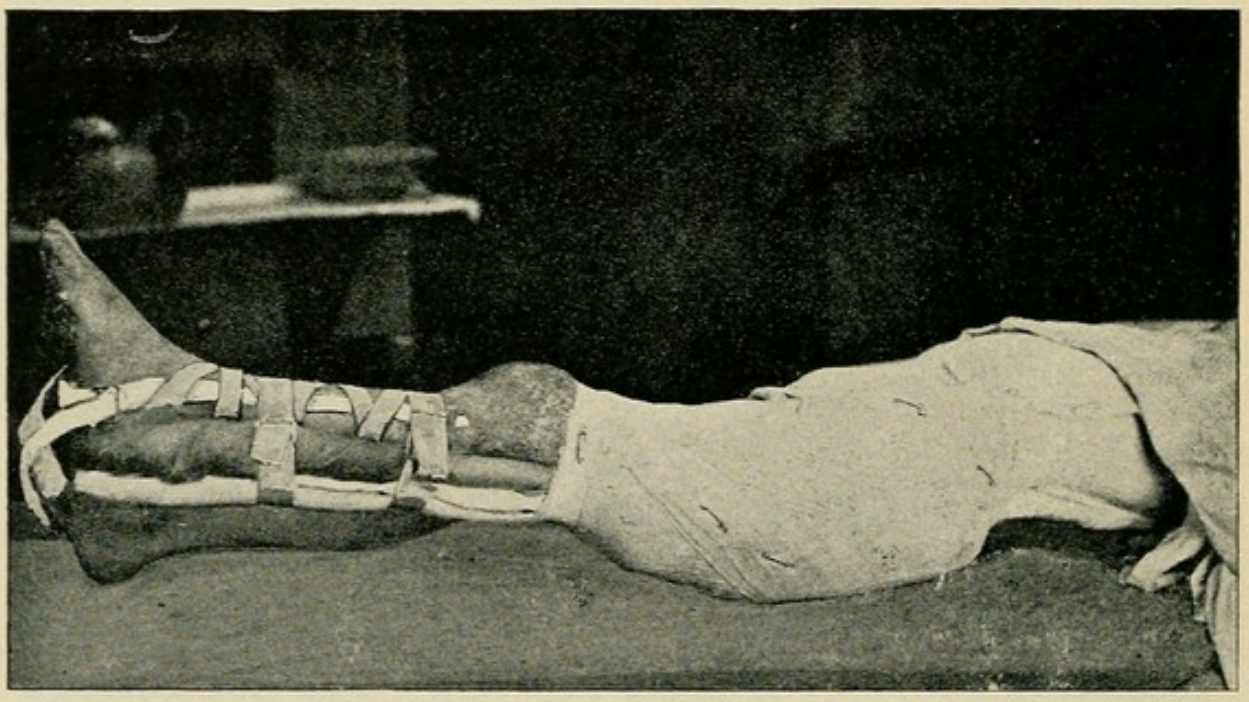

Fig. 48.— THE DRESSING APPLIED. THE SPLINT IN THIS CASE IS THE CABOT POSTERIOR WIRE FRAME.

careful protection, at least from weight-bearing, for many months.

In short, excision should be kept as a last resort, to be undertaken only when mechanical treatment is not to be had, or having been tried faithfully and skilfully has failed.

### *Incision of the Hip Joint.*

This measure is of use in persistently painful cases, where salicylate of soda and traction fail to relieve the pain, and in cases of persistent abduction, where there is slight fulness beneath the adductor tendons, this condition being generally associated with distention of the joint. Two cases were reported by Dr. Bradford, where much relief was afforded.*

The incision may be made either anteriorly, in the line of the anterior superior spine, as described by Mr. Barker, or posteriorly, as for an excision of the joint. The incision is likely to persist as a sinus; but, as it is made for drainage purposes, this cannot be considered an objection.

### *Trephining of the Head of the Femur.*

This operation was advocated by Fitzpatrick twenty-five years ago; and recently Stoker† has written in favor of it, and has advocated it as routine treatment, which seems unreasonable. At times it may be a useful measure, as affording bone drainage; but, in general, it has little place in the treatment of hip disease. One or two cases only have been reported in America. It might be tried in cases where incision failed to relieve an acutely painful condition, and where it was not desired to excise the joint. The trochanter major is exposed, and a trephine, or gouge, is driven through the neck well into the head of the femur. The plan of

* Bost. Med. and Surg. Journal, Aug. 16, 1888. † Dublin Journal, 1886, S. 3, p. 81.

Fitzpatrick was to insert caustic potash into the hole; but a curette will remove all the tissue necessary, and the trephine hole should be kept open as a drain.

*Ignipuncture*, as a mode of treatment, deserves mention only to make the account complete. Kolominn * is the advocate of the measure, and claims wonderful results in hip disease from both deep and superficial cauterizations with the Pacquelin point. The writer has had no experience with it, and has seen no reports of cases.

### *Amputation at the Hip Joint.*

The question of amputation only arises in the case of adults and in patients who are beyond the reach of excision, or who continue to do badly even after the joint has been excised. It is not a measure to be lightly advocated; but, on the other hand, it is capable of producing a marvellous change in the general condition, in certain cases, where there is extensive pelvic disease, and excision has been done, leaving a diseased femur. The combined irritation of the two is enough to cause serious local disturbance; and the removal of the femur and the free drainage to the pelvic disease, only attainable by amputation, may be sufficient to cause a cessation of the local disturbance, to the great improvement of the general condition.

The mortality of this amputation, as done for hip disease, is not so high as one would expect it to be.

The death-rate of hip amputation for injury, according to Ashhurst's tables,† is 70.9 per cent., and for disease in general 42.6 per cent. But for hip disease alone 60 cases gave a mortality of only 32 per cent. Of 22 cases in a collection not given by Ashhurst there were only 3 deaths, making 82 cases with 22 deaths (27 per cent.). And in the 22 cases collected since 1880 there were only 3 deaths (14

* Bost. Med. and Surg. Journal, April 26, 1885, Orth. Report, 392.

† Int. Encyc. of Surg., vol. iv. p. 501.

per cent.), all of which shows that amputation of the hip, as done for hip disease, is an operation much less formidable, as done by modern methods, and especially as done for the relief of hip disease. It should, however, be borne in mind that such statistics as these are undoubtedly too favorable, because the tendency is to report successes, and not to report failures. So that, in almost any operation where the cases are reported only in small groups, as here, the tendency is to present too favorable an aspect, unless one bears this fact in mind.

Unless the femur is very extensively diseased, or unless the amount of pelvic disease is exceptionally large, it is proper to excise the joint rather than amputate the leg in the case of children. But here, again, it is not possible to lay down rules, and each case must be decided by its individual features.

When excision has been performed and has failed to produce much effect, and the vital powers are notably failing, it seems, to the writer, proper to present to the parents the question of amputation as a life-saving measure. And his personal experience with the operation would lead him to advise it, but by no means to urge it.

In many cases, it is possible to fit an artificial limb to the stump; and, in a case reported by Dr. Bradford,* re-formation of bone occurred in the stump. This is, of course, unusual in the extreme.

In adults the operation is more often indicated than in children. Wright would not excise in patients over fifteen, Jacobson would set the limit at eighteen for excision, and nearly all surgeons are in accord that, in view of the severity of tuberculous ostitis of the hip in the adult, the more radical measure is to be adopted, if any operative procedure is undertaken. And the indication for the operation would again be the failure of mechanical treatment after a faithful trial.

* Bost. Med. and Surg. Journal, Sept. 13, 1885.

There is no need of entering upon the technique of amputation of the hip. A great gain has been made by the adoption of Furneaux Jordan's method, which consists briefly in amputation of the thigh at the upper third, with removal of the head and shaft of the femur by a lateral incision. The periosteum should be carefully preserved, in order to favor the formation of new bone, as in Bradford's case. This method saves blood, diminishes shock, and gives a better stump than any flap method possibly can. The method is dwelt upon at length in all modern surgical text-books. The operation must be done rapidly, and with every precaution against hemorrhage and shock.

## Chapter VII.

# GUMMATOUS OSTITIS OF THE HIP.

### Pathology.

Gummatous formations about the hip joint are most often to be found in the synovial membrane or in the ligaments and periarticular structures. These conditions have been discussed in speaking of chronic synovitis.

Especially, however, are they to be found in the periosteum, where they are attended by much thickening and succulency of the covering of the bone, while at times they appear simultaneously in the bone, the joint, and the periarticular structures. When synovitis exists in connection with the formation of gummata, most often it is the primary affection, although the synovial inflammation may be secondary to the osseous trouble.

Gummata of the spongy tissue rarely occur in the epiphyses of the long bones; but some recent researches of Chiari * would seem to show that they are not so very uncommon as had been supposed.

When they are present, they are to be identified as yellowish or grayish nodules, in appearance somewhat like foci of tuberculosis except that they are not surrounded by a zone of hyperæmia. Sometimes they are purulent in appearance, and sometimes cheesy.

Within the nodule the bone is necrotic and disintegrated, and in part broken down into pus, and in part replaced by a typical gummatous formation. Such gummata, rare as they are, almost always exist along with a neighboring periostitis and overgrowth of bone in the neighborhood.

* Vierteljahrsch. f. Derm. und Syph., 1882.

Probably the commonest condition is an osteochondritis, which is accompanied by a periostitis and perichondritis of a gummatous type, all occurring in the neighborhood of the epiphysis of the head of the femur.* There is much enlargement of the bone in that region; and the periosteum is thickened and of an elastic consistency, and on microscopic examination it is seen to be rich in fluid and poor in cellular elements. This condition may result in a purulent degeneration, or in caseation, or in the formation of fibrous tissue leading to a scar formation. Under the place where the gummata are found, the bone is absorbed, and the amount of absorption is great in proportion to the size and cellular activity of the gummata. With this is associated a tendency to the formation of hyperostoses in the neighborhood.

If this osteochondritis becomes purulent and destructive, the epiphysis of the femur may be loosened, or more commonly a purulent synovitis is started up.†

## Etiology.

As elsewhere in the body, the occurrence of gummata in the hip joint is to be attributed to the presence of late syphilis, either acquired or hereditary.

Syphilitic osteochondritis occurs most often in young children who have inherited syphilis. The other manifestations, rare clinically, are to be met in either the inherited or the acquired form.

## Treatment.

The treatment of gummatous inflammation of the hip is, of course, first, the administration of iodide of potash and the inunction locally of mercurial ointment, together with

* Deutsch. Arch. f. Chir., xxviii. 2; Archiv f. Kinderheilkunde, 1884, 5 (Cassell).

† Syphilis of Joints: Lanceraux, Traité Hist. et Prat. de la Syphilis, 1874; Bäumler, Ziemssen's Handbuch, iii., 1886; Deutsch. Arch. f. Klin. Med., ix., 1870; Duffin, Trans. Clin. Soc., London, ii., 1869; Oedmanson, Nordisk. Med. Arck., i., 1869; Gies, D. Zeitsch. f. Chir., xv.; Finger, Wien. Med. Wchsft., 1884; Saug, Vorles. über Path. u. Ther. d. Syph., Wiesbaden, 1885.

the exhibition of tonics and the adoption of hygienic measures. Secondly, local measures are to be adopted to fix the joint and prevent irritation from traumatism, which can easily be accomplished by the fixation splints already described.

If the diagnosis between tuberculosis and syphilis of the hip joint is not clear (and this must often happen in the present state of knowledge), the existence of the more destructive disease must be assumed, and the child subjected to the mechanical measures described for hip disease, as well as to the constitutional treatment just mentioned.

## Chapter VIII.

## ARTHRITIS DEFORMANS OF THE HIP JOINT.

*Arthritis deformans of the hip joint*, or *malum coxæ senile*, is considered by itself instead of in connection with the sections on synovitis or ostitis, because it is an affection whose origin is variously attributed to the three different tissues composing the joint, by the different authorities. It seems also a justifiable division, because the affection is so well marked as to appear as a pathological entity.

The origin of ostitis deformans has been ascribed to the synovial membrane by Volkmann, Brodie, Adams, and others; to the cartilage by Cornil and Ranvier, Howard Marsh, Orth, Garrod, and Billroth; and to the bone by Barwell, and some less reliable authorities. With such a wide difference of opinion among the authorities, it seems wisest to consider the origin of the affection unsettled.

The affection is also spoken of as rheumatic or rheumatoid arthritis (Adams and Garrod); rheumatic gout; osteoarthritis (Royal College of Physicians); nodular rheumatism, *rheumatisme noueux* (Trousseau); nodosity of the joints (Haygarth); chronic rheumatism of the joints (Todd?); *goutte asthénique primitive* (Landré Beauvais); senile arthritis; arthritis urica; malum senile; *rheumatisme chr. primitif* (Charcot); arthritis chronica ulcerosa sicca.

Although it may be questionable whether all these names should be admitted to be synonymous with arthritis deformans (Virchow), the pathological distinctions between them are so slight that it seems simplest, and therefore best, to consider them all practically as modification of one process.

## Pathology.

The characteristics of the affection are chiefly to be found in the disintegration and erosion of the articular cartilages, along with a tendency to increased bony formation about the margin of the head of the femur.

It has been a matter of discussion whether the changes to be described were inflammatory or not; and the modern conclusion is expressed by Senator, who says, "The changes in the joints are partly inflammatory, partly degenerative." *

The changes are perhaps earlier noted in the cartilage than they are elsewhere; and, since cartilage has but one way of reacting to inflammation and but one form of degeneration, it is found in arthritis deformans to follow that type. The cells multiply, and the hyaline substance undergoes fibrillary degeneration. This renders the cartilage more friable than it should be; and it looks yellowish and shreddy, and shows a tendency to wear away where the two articular surfaces are in contact. To the naked eye it presents the appearance of velvet. In other places it perhaps is split off in pieces of considerable size. In connection with this disintegration, there is an hypertrophy of the cartilage around the periphery. Marginal ecchondroses develop, which may reach such a size that they perforate the synovial membrane, and appear in the joint as pedunculated or even as loose bodies.

The ecchondroses are most marked at the margins, probably because the cartilage is in that situation covered by a layer of synovial membrane, which prevents the escape of the proliferating and multiplying cartilage cells.

Where ossification of these ecchondroses begins, it is in the layers nearest the bone; and, even when ossification is well advanced, they are still covered by a layer of cartilage on their joint surface.

* Ziemssen's Hdbch., 1875, art. Arth. Deformans.

*Bony Changes.*

The disintegration of the cartilage brings together two bony surfaces unprotected by articular cartilage. But nature has already provided for this contingency by certain changes which have taken place in the bone before the cartilage was entirely destroyed. The condensation in the ends of the bones where they are in contact is the striking feature. The bony surface, as exposed by the loss of the cartilage, is dense and white, and capable of withstanding pressure. It resembles nothing so much as ivory; and, if motion exists in the affected hip, it is capable of acquiring a remarkable polish, equal to that of the finest ivory. But, with the rubbing together of two such surfaces, wearing away of the bone must ensue; and exposure of the ends of Haversian canals, and perhaps of cystic cavities results, which causes a worm-eaten appearance, which the head of the femur often presents.

The formation of this eburnated bone is variously accounted for. Ziegler believes that it is the result of a softening process which has occurred in the deeper layers of the cartilage. This has resulted in cavities, which have been filled by a vascular marrow which has grown into them from the changed and degenerated bone marrow, which loses much of its fat and becomes in a measure a "lymphoid marrow," or it may become fluid and sometimes be included as cysts, which may afterward be exposed as the bone is worn down. This growth of the bone marrow into the cartilage favors its early ossification.

Other writers attribute the formation of the eburnated bone to a local ostitis, and others attribute it to purely mechanical influences. However it comes about, a thin layer of very dense bone is formed at the articular end of the femur.

Apart from this formation of eburnated bone and the

ossification of the hypertrophies which have occurred around the periphery of the articular cartilage, the process may be chiefly one of bone atrophy or absorption, or one of bone overgrowth.

In the one case, the cancellous tissue of the epiphysis is thinned and eroded, and the cancellous interstices occupied with fat; or, in the other, it is abnormally thickened and dense, not only in the epiphysis, but, in some cases, in the shaft as well.

From the fact that the cartilage and bone are worn away by pressure where the articular surfaces are in contact, and that the activity of cartilage hypertrophy and bone formation is chiefly around the periphery of the head of the femur, it follows that the head of the femur becomes less globular and decidedly flattened. In bad cases, the head of the femur may almost entirely disappear, leaving an irregular, stunted, and useless mass of bone where the globular head formerly was. This change is spoken of as "absorption" of the head of the femur.

A word more should be said about absorption, so called, of the head or neck of the femur, where the neck is shortened and at a right angle to the shaft. The head wears away, and the marginal exostoses carry the rounded joint surface apparently toward the trochanter. As the head is worn away more and more, the marginal overgrowth progresses toward the trochanter; and, in addition to this, the neck hypertrophies, and becomes more at a right angle than it normally should be. This results in elevation of the trochanter above Nelaton's line and consequent shortening of the leg.

The acetabulum, on the other hand, is deepened by the ossification of the cotyloid ligament and by the wearing away of the floor of the acetabulum, which is, however, generally only a slight matter.

### *Synovial Changes.*

The synovial membrane in the early stages of the affection is strongly injected, and on examination appears to be abnormally red. Synovial effusion may be considerable, and in the early stage of the disease, in some cases, may be the only objective sign of the impending trouble. Some writers state that synovial effusion is rarely or never present in rheumatoid arthritis (Senator, Homolle, etc.); but practical experience must negative that assertion, and a very considerable weight of authority is to be quoted in favor of the frequent existence of effusion (Brodie, Adams, Fuller, Garrod).

After the stage of acute injection the synovial membrane becomes thickened, and the synovial fringes are greatly hypertrophied, and may become the seat of fatty, fibrous, or cartilaginous changes to a marked degree. The branching, tufted appearance of these fringes may be so marked that it is spoken of as lipoma arborescens. And the whole appearance of the membrane is to be spoken of as "shaggy."

The change to fibrous or cartilaginous tissue in the fringes is probably due to the fact that embryonic cells have replaced the fat in the synovial fringes. These cartilaginous bodies often become so large and their attachment by the synovial fringe is so small that they become pedunculated bodies, ready to be cast loose into the joint at any time. In certain cases, the cartilaginous bodies in the synovial fringes may become the seat for the deposit of lime salts.

### *Changes in Ligaments and Tendons.*

The ligaments become inflamed and thickened, and degenerate to a substance like fibro-cartilage; and the capsule at the same time suffers a similar degeneration, and is often the seat of cartilaginous deposits. The ligamentum teres degenerates to a frayed out fibrous cord, and gradually disap-

pears; and the muscles controlling the joint become pale and wasted. All these changes of course do much to impair the joint's mobility. Finally, in the severest cases, an ensheathing bony mass begins to form at the attached border of the capsule and in the ligaments, which progresses until the joint is splinted, as it were, in a dense, compact, irregular mass of bone, which prevents mobility, and leads to complete obliteration of the hip.

Cysts near the joint may form, as described by Mr. Morrant Baker. It is very rare in connection with disease of the hip joint; but it does occur, as evidenced by one recorded case.* Such cysts are formed by the hernial protrusion of a distended synovial sac into the periarticular region.

## Etiology.

The antiquity of arthritis deformans† is attested by evidences of its existence in an Egyptian skeleton of the Ptolemaic period, and in a Roman skeleton found in a sarcophagus at Smithfield, England.‡ Chiaje found evidences of the disease in bones unearthed at Pompeii, and the Norse Viking whose remains were entombed in his war-ship in the Christiania fjord was a sufferer from the same affection.

### *Etiological Theories.*

The essential character of the affection has been much disputed, and the long list of names by which the disease has been called is a commentary upon the various views which have been held.

(1) It has been maintained that it is a form of rheumatism, or a combination of rheumatism and gout.

(2) It has been considered by Arbuthnot Lane that it is

*W. M. Baker, St. Barth. Rep., 1885, xxi. p. 177.

† Eve. British Med. Journal, 1890, i. 423; Lebert, Hdbch. d. Pract. Med., 1859, ii. p. 874.

‡ Norman Moore, Path. Soc. Trans., 1883, p. 226; Virchow's Archiv, 1869, xlvii. 298.

not a disease at all, but that the articular lesions merely result from pressure.

(3) It has been attributed to a defective nutrition of the joints, due to a disturbance of the nervous system.

(1) *The Rheumatic Theory.*— Many cases of chronic articular rheumatism which lack the distinctive features of arthritis deformans (the destruction of cartilage and the formation of exostoses) are continually described under the name of arthritis deformans; and the distinction is, in fact, a hard one to make clinically, so that for this reason rheumatism and arthritis deformans necessarily become confused. In a certain proportion of cases, arthritis deformans is clearly dependent upon rheumatism, occurring in rheumatic individuals and in rheumatic families. This proportion is a varying one, and each writer estimates it differently.

But, in general, it would seem that its connection with rheumatism had been overstated. In most cases, it begins as arthritis deformans, and is not preceded by an attack of acute rheumatism. It affects women oftener than men, which is just the reverse of the case with rheumatism, and the old rather than the young. Exposure is a causative factor in both cases, and the clinical expression is much like rheumatism.

But it seems unwarrantable to assume that rheumatism exists as the cause of arthritis deformans in more than a certain proportion of all cases, and the pathological evidence would seem to establish an independent character for arthritis deformans in another proportion of cases.

In the same way with gout, it can be said that arthritis deformans in many instances is associated with and probably caused by gout; but it is an atypical manifestation of the disease, and, although in very many instances associated with that vague condition described as lithæmia, the disease cannot be described as a gouty one in more than a small proportion of cases.

In typical cases of arthritis deformans, it must be said

that sodium urate in excess is not found in the blood in arthritis deformans, and that the symptoms of gout (other than the articular ones) are not present.

It has been established by Sir Dyce Duckworth that in some countries, where gout is all but unknown, arthritis deformans is a very common affection. In Scotland and Ireland, where gout is very uncommon, arthritis deformans prevails to a marked degree.

It is for these reasons that the writer rejected the commonest name of the affection, rheumatoid arthritis, and adopted one advancing no etiological theory.

(2) *The Mechanical Theory.*— Mr. Arbuthnot Lane is inclined to attribute much importance to the effects of pressure in modifying bone structure; and much of his work has been highly instructive and original, as in his discussion of lateral curvature of the spine and bow-legs. But, in attributing the changes in arthritis deformans to pressure effects and purely mechanical influences, he of course goes too far.* The affection of the finger joints in women who have led a life of luxury, and nearly all the phenomena of the disease, tend to negative his ideas. One fact, however, calls attention to the possible value of this theory. The fact that senile coxitis often follows, and seems to have been caused by a fall upon the hip, would lead one to suppose that a purely mechanical influence was in many cases at work, and was in this instance the cause of the affection.

(3) *The Dystrophic Theory* would find the cause of the disease in some disturbance of the nervous system, either primary or reflex, to local causes, which caused trophic disturbances of the joints. This theory was first advanced by Remak,† and at present is advocated by such authorities as Duckworth, Senator, and Ord.

Of late much weight has been given to this view by the fact that the pathological changes in the arthropathies of

* W. A. Lane, Path Soc. Trans., 1884, xxxv., and 1886, xxxvi. p. 387.

† Galvano-therapie, 1858; also Deutsch. Klinik, 1863, p. 107.

tabes and similar affections seem to be only an intensification of the ordinary changes in arthritis deformans. That is, where we know that a lesion of the nervous system exists we find articular changes of a character similar to those of arthritis deformans, only more acute. In Charcot's disease the destructive processes predominate over the formative activity, but the erosion of cartilage and the formation of osteophytes are present in both.

The symmetrical distribution of arthritis deformans in so large a proportion of all cases is thought by some writers to show the existence of some central nervous disturbance; but Sir James Paget puts it on broader ground in saying that symmetrical lesions are due to diseases in which the origin of the morbid process is in the condition of the circulating fluid. Dr. Ord and others would infer that a nervous disturbance was the cause of the affection from the fact that uterine derangements so often stand in a causal relation, and he alludes to the great power of uterine irritation in producing excitement of the spinal cord. Senator lays stress upon the fact that emotional and mental disturbance have an effect in producing and increasing arthritis deformans, as they have in the case of nervous disease proper.

Again, writers who favor this dystrophic theory would find an argument for nervous influence in the existence of muscular atrophy; but there is no evidence whatever to show that it is not an arthritic atrophy, such as is found in all joint disease of any such severity.

In short, the dystrophic theory rests on a very slender basis of facts, and is strictly a theory, and nothing more. It seems to call attention to the fact that general disturbance of the system is most often present, and that cold, exposure, uterine derangements, and all conditions which depress the general health are active as factors in causing the disease. But (except for the similarity of the disease to tabetic arthropathy) the advocates of this theory signally fail to prove the existence of a nervous causation of the disease.

These three theories show certain important points in connection with the etiology of arthritis deformans: that it is often associated with rheumatism or gout, but in a large proportion of all cases exists as a separate disease; and that it is favored by all causes which depress the general condition or lower the vitality, although it cannot be proved that such causes act through the nervous system rather than through the general circulation.

*Traumatism.*— The place of traumatism as a cause of malum coxæ senile is not generally allowed so much weight as it would seem to deserve. It is a frequent cause of the affection, and was first clearly recognized by Canton in 1855.* Much attention was attracted by the case of the elder Charles Matthews, who fell and injured his hip when he was forty years old, and who was treated unsuccessfully by the most eminent surgeons of his time. At the end of ten years of lameness and partial disability he died of some other disease; and in his hip were found the evidences of chronic arthritis deformans, a fact which at the time excited much notice.

Since then it has been recognized that people after middle life who are so unfortunate as to fall and bruise the hip, not uncommonly suffer from pain, progressive disability, and shortening of the leg; and in such joints are found the characteristic changes of arthritis deformans.

The rationale of the process is but little understood, and the fact must be accepted as it stands. It occurs much oftener as a cause of the disease in the hip than elsewhere; and, in the majority of hips affected, the history of an accident can be found.

Injury may cause multiple as well as single joint disease, as in a case related by Garrod, where a patient was kicked in the hip by a horse, and sixteen years later had the affection in the joints of the fingers, in the right shoulder and right hip, the onset of which he traced back to the injury.

* Surg. and Path. Observations on "Shortening of the Leg from Bruise of the Hip."

The hip alone was affected for ten years, and then the other joints became involved.

Localized rheumatoid arthritis, affecting the hip alone, occurs more often in men than women, which is the reverse of the state of affairs in the more general manifestations of the affection.

*Heredity.*— Hereditary influence is less marked than in gout or rheumatism. Charcot obtained a history of arthritis deformans in the parents of 11 out of 41 patients questioned.* In 500 of Garrod's patients with arthritis deformans a family history of such an affection was present in 84, while 64 showed a family history of gout and 48 of rheumatism.†

*Age.*— The disease is essentially one of early old age; and, although occasionally one sees instances of the polyarticular form in children,‡ the writer has never seen an instance of it in the hip. Occurring in the hip joint alone in a child, it would almost surely escape detection during life, however; for the symptoms would differ but little from those of ordinary hip disease. The table of Garrod shows the distribution of the disease by age: —

| | |
|---|---|
| Under 9 years, | 3 |
| 10–19 | 22 |
| 20–29 | 64 |
| 30–39 | 85 |
| 40–49 | 121 |
| 50–59 | 110 |
| 60–69 | 72 |
| 70–79 | 5 |
| 80–90 | 1 |

In women it seems closely connected with the cessation of the menses in very many cases. Of 411 female patients

* Charcot, Thèse de Paris, 1853. † Garrod, A Treatise on Rheumatism, p. 239.

‡ Dally, Journ. de Thérap., 1878, 14; Durand Farrell, Union Méd., 1881, xxxii.; Gazette des Hôp., 1882, No. 116; Henoch, Kinderk'h'ten, 1883, p. 728; Mantisen, Thèse de Paris, 1884; Moncows, Rh. Chronique Noueux des Enf., 1880; Wagner, Münchener Méd. Wchnsft., 1888, xxxv.; Weil, Nouvelle Iconographie de la Salpetière, 1890, i. p. 16.

the disease began in 18 in the two years preceding the menopause, and in 41 in the two years following it.

*Sex.*— In the polyarticular variety women are much more commonly the victims, no less than 411 of Garrod's 500 patients being females. When the hip alone is affected, men are affected rather more commonly than women.

*Uterine derangement* is a very frequent cause of arthritis deformans. Dr. Ord * reported 38 cases of the disease in women of all stations, and in 30 of them some uterine difficulty was present. It is questionable whether such derangements act directly in causing the disease or merely by lowering the general condition.

### *Mental and Emotional Causes.*

Mental shocks are thought to be occasional causes of the affection.† Leyden states that many of those who suffer from arthritis deformans in Strassburg attribute the commencement of it to frights received, chiefly by the exploding shells, during the bombardment of the city in 1876.‡ Prolonged worry, mental overwork, and protracted mental anxiety have a marked influence in many instances in causing and aggravating the disease.

*Dampness and exposure* are two of the more common causes in the disease as it appears in the lower classes. Joined with these two conditions, one finds generally bad hygiene and insufficient food. With regard to these, as to the preceding causes, it must be said that it is not clear whether they act directly or by depressing the general condition.

## Treatment.

The treatment can best be discussed as general and local. In the case of the disease as it affects the hip, local meas-

* Brit. Med. Journal, 1884, ii. p. 268. † Kohts, Kl. Wchsft., 1873, p. 304.

‡ Klinik der Rückenmarkskrankheiten, 1874, p. 270.

ures are of such importance that they deserve the first consideration, especially as they are very generally left out of account, and senile coxitis is merely treated on general principles.

## Local Treatment.

### *Mechanical.*

Certain theoretical considerations should suggest the propriety of local treatment. These are the fact that in so many cases the disease is caused by traumatism, whence it would seem proper to avoid the further traumatism of walking by protecting the joint. The fact that the joint is in a condition of inflammation and that walking is painful would also seem to indicate the propriety of joint rest.

The theoretical objection to joint rest would be found in the fear that it would favor anchylosis.

Patients with senile coxitis suffer much from pain, muscular spasm, and sensitiveness of the joint in walking. This symptom group is the expression of joint irritation, and is associated in arthritis deformans, as has been seen, with a low grade of synovitis.

Rest in bed, with traction if necessary, will do much to quiet this discomfort. The stiffness is in the early stages the result of muscular contraction, and not of anchylosis, and is diminished rather than increased by any measure which quiets the irritability of the joint.

Traction is indicated in all cases where passive manipulation of the hip is painful and restricted by muscular spasm, and in cases where pain is continuous and excessive. The patient should lie in bed with a weight and pulley arranged for traction, as described under ordinary hip disease. The weight should be five pounds or more or less according to circumstances, and should pull in the normal direction of the leg ordinarily; but, exceptionally, it will be found necessary to allow for malposition of the limb and to make traction in the line of the deformity.

The weight should be enough to ease the pain without tiring the leg too much; and traction should be continued for some days, or perhaps two or three weeks, when in most instances much improvement of the joint will be noted, and motion will be more free and less painful.

Nowhere is traction of greater benefit, and nowhere is the relief from its use more quickly noticed, than in senile coxitis.

After the pain and irritability are controlled, the patient should be allowed to go about; but the joint should be protected from jar and traumatism, and this is best done by the convalescent hip splint mentioned above. In this way the patient gets out of doors, and the joint is exercised within narrow limits, while pressure and the constant jar are removed; and such splints should be jointed at the knee.

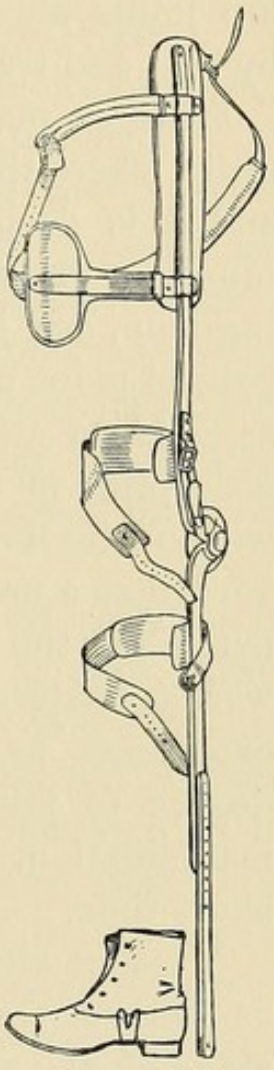

Fig. 49.— PROTECTION SPLINT FOR THE HIP.

Such a splint should be worn during the day, and exercise encouraged. If sensitiveness returns, the patient should be subjected for a few days to rest in bed and weight and pulley traction.

The results of treatment by this method are surprisingly good; and such patients are much more comfortable than if dependent on crutches, while it is a treatment which is capable of producing much permanent benefit. The only article dealing with this aspect of the subject with which the writer is familiar is the admirable one of Dr. H. L. Taylor.*

### *Other Measures of Local Treatment.*

*Counter-irritation.*— Other measures must be regarded as only accessory. Counter-irritation is of use in many in-

* N.Y. Med. Journal, Dec. 15, 1888.

stances. Perhaps as efficient a form of relieving the pain as any, when traction fails or is not available, is by the use of the Pacquelin cautery, which should be lightly and very quickly drawn over the skin, leaving a very superficial and almost painless eschar. The sensation is as if a mustard plaster had been over the hip. Liniments and blisters may at times be of use, but the effect of all these is only temporary and palliative. Hot applications are useful in painful hip joints alone, or especially in connection with treatment by rest and traction.

*Massage* may be of much benefit in senile coxitis, especially where the sensitiveness of the joint has been controlled and it is desired to develop as far as possible the wasted muscles. It should not be carried to the extent of developing pain, and joint manipulation should not be carried to a painful point under any circumstances. The object of massage is to stimulate the local circulation, to promote the absorption of the diseased products, and to provide exercise within safe limits to the diseased limb. It is not to be regarded as a means of breaking down adhesions or of roughly extending the arc of motion of the joint. If such a process were considered desirable, it should be done under ether; but experience has shown that, although temporarily a greater degree of joint motion may be obtained by such forcible manipulation, a greater degree of stiffness follows after a short time.

Massage should ordinarily be given every other day, and, as has been said, it is not so well adapted to the painful stage of the affection as to the quiescent period which succeeds good mechanical treatment. In cases where the latter is not obtainable, massage may be of use if gently given in connection with rest and hot application.

*Electricity* is often of much use in senile coxitis, chiefly as it modifies the circulation and improves the local nutrition. It is for this reason that the galvanic is the more beneficial of the two forms.

## General Treatment.

It was formerly supposed that therapeutic measures had little power over arthritis deformans. Later years have shown that, although the disease is one which is not easily controlled, it is, nevertheless, in most cases susceptible of much improvement. Where senile coxitis exists alone, less is to be expected from general measures of treatment than where it coexists with the affection of the other joints.

*Drugs.*— The long list of drugs is a sufficient commentary upon the ill success of a purely medicinal treatment.

Iodide of potash, iodine,* arsenic,† lithia and its salts, cimicifuga, the salicylates,‡ alkaline diuretics, quinine, and similar tonics, Fraxinus excelsior (Fuller), Actœa racemosa (Ringer), ichthyol (Lorenz), and many less important drugs have been advocated as beneficial. The drug treatment advocated by each writer is, as a rule, a matter of personal opinion; and widely differing results are obtained from the same treatment by different authors.

The first essential is that the general condition should be kept as good as possible. If the appetite is poor, bitter tonics are indicated, the bowels should be kept in good order, and a general régime followed out which should aim at keeping the patient in the best possible condition in every particular. It is unnecessary to say that there is no specific for arthritis deformans. The writer has obtained better results with the salicylate of soda and alkaline diuretics than with any other drugs. The patients have taken five or ten grains of salicylate of soda after meals for long periods, and with the meals some mild diuretic, such as Vichy water or the artificial effervescent salt. A simple and nutritious diet has been enforced, avoiding large quantities of meat and taking from one to two quarts of milk daily. Where milk has been

* Lasègne, Arch. Gén. de Méd., 1856, viii. 300.

† De Mussy, Bull. Gén. de Thér., 1864, lxvii. 241.

‡ Lancet, 1882, p. 141; Sée, Bull. de l'Acad. de Méd., 1877, v. 689.

badly borne, a measured quantity of water has been prescribed.

With regard to this treatment the writer can only speak of his own experience, which is that the majority of patients improve perceptibly under such a régime as this, while some are relieved of their symptoms to a large extent. This, however, is not so likely to happen in arthritis deformans of the hip as where it is more generally distributed. Such a treatment should, however, be pursued in connection with the local measures advocated.

*Climatic Treatment.*— Persons affected with arthritis deformans are, as a rule, more comfortable in warm weather and in warm climates than in cold. Certain localities seem to exercise a very favorable influence on the disease, especially in connection with the various baths and springs to be found at such health resorts.

In America the Hot Springs of Arkansas deserve the first mention, while Richfield Springs in Central New York are often of benefit. But either place is inferior to some of the more widely known and better organized resorts in Europe.

Aix-les-Bains * is, perhaps, as well known as any place where massage and hot douches constitute the essential part of the treatment. In England the same measures are employed at Bath. Harrowgate and Buxton are other English resorts. On the continent one finds Bourboule, Aix-la-Chapelle, and Mont Dore especially advocated for these affections; while resorts of a wider range of applicability are Homburg, Carlsbad, Vichy, Wildbad, Marienbad, Kissingen, and similar spas, and these are much resorted to by patients with arthritis deformans.

With regard to the relative importance of general and local treatment, the writer would be glad once more to emphasize his belief in the great benefit to be derived from rational mechanical treatment, consisting in joint rest and protection,

* Garrod, Lancet, 1889, i. 869.

with traction where indicated. Massage, electricity, etc., he would regard merely as measures of secondary importance, which should facilitate and assist this main line of treatment. From the combination of these, very satisfactory results are, in many cases, to be obtained in arthritis deformans of the hip.

In short, joint irritation due to arthritis deformans is to be met by the same measures as joint irritation due to other causes.

*Other References.*

Althaus, Brit. M. J., 1872, p. 211, ii. (electricity); Bardeleben, Lehrb. d. Chir., ii., Berlin, 1880; Bardsley, Med. Rep., 1807 (arsenic); Brachet, Brit. M. J., 1884, ii. p. 411; Benedict, Wiener Med. Halle, 1864; Baker, W. M., St. Barth. Hosp. Rep., 1877, xiii.; 1885, xxi. p. 177; Cheron, Gaz. des Hôp., 1869, No. 150 (elect.); Drachmann, Virch. Jahresber., 1873; Duckworth, Br. M. J., 1884, ii. 263; Echer, Arch. f. Phys. Heilkunde, 1843; Gürlt, Beitr. z. Path. Anat. d. Gelenkkrankheiten, Berlin, 1853; Meyer, Berl. Kl. Wchsft., 1870, p. 265; Moore, N., Path. Soc. Trans., 1883, xxiv.; Nüscheler, Zeitsch. f. Rar. Med., 1855; Popu, Thèse de Paris, 1881; Rhoden, D. Med. Wchsft., 1876; Riess, Eulenburg's Real Encycl.; Remak, Galvano-therapie, 1858, 413; Schömann, D. Malum Coxæ Senile, Jena, 1851; Trastour, Bull. Gén de Thér., 1879, cxvii. 509; Volkmann, Hdbch. d. Chir. von V. Pitha und Billroth, ii., 1872; Virchow, V. Arch., Bd. 4 and 47; Weber, V. Arch., Bd. xiii.; Wehrner, Beitrg. zur Kennt. d. K'h'ten d. Hüftgelenkes, Giessen, 1847; Wymer, Lancet, 1889, i. 933; Ziegler, Pathol. Anat., 1887, 5th ed., p. 169.

## Chapter IX.

# CHARCOT'S DISEASE OF THE HIP JOINT.

A curious affection of the joints has been described by Charcot, which occurs in connection with certain affections of the nervous system. The affection is consequently most often called by his name, while other terms in common use are spinal arthropathy, tabetic arthropathy, and arthropathy.

### Pathology.

The pathological changes, it has already been said, are similar to those of arthritis deformans,* although, as a rule, more rapid and destructive, and possessing an occasional tendency to suppuration, which is almost unknown in that disease. Moreover, the effusion is generally more extensive, and the rôle played by the synovial membrane is a more active one than in arthritis deformans.

The synovial membrane goes through the stages of a chronic synovitis, and becomes thickened, succulent, and pale, finally passing on to a granular condition in cases which suppurate.

The cartilage degenerates, and the ends of the bones are exposed, to rub together and wear each other away, and, if suppuration should be present, to melt down into pus.

At times bony overgrowth prevails, when the ends of the bones are much enlarged and irregular, while at other times they are atrophied and fragile. Spontaneous fracture and dislocation may occur. The capsule becomes thickened in

* Virchow, Cent. f. Chir., 1887, No. 22, p. 417.

some cases, and perhaps invaded by the osteophytes, while in other cases it degenerates and disappears, as does in most instances the ligamentum teres. There is generally much thickening of the trochanter, and periarticular infiltration occurs in most of the cases to a very marked degree.

Microscopic examination shows in the atrophic form the changes of rarefying ostitis, a widening of the Haversian canals, and their coalescence with the general cavity of the medulla, thinning of the trabeculæ, etc.

Cases in which the early pathological condition can be investigated are not common. Where it has been possible to do so, the synovial membrane has been found smooth, and the fringes hypertrophied to form tufts. The synovial effusion is generally serous, and only seldom a purulent one. The capsule is thickened, and the bones are either atrophied or hypertrophied. If atrophied, the rim of the acetabulum is lowered, and the cavity, although more shallow than normal, is broader. The hypertrophic form shows bony overgrowth, much as in arthritis deformans.

A. S. Roberts classifies the pathological changes, perhaps more systematically, as follows: (1) a chronic asthenic hyperæmia of the synovial membrane (hydrarthrosis); (2) an interstitial atrophy of the epiphyses; (3) a fungous or rarefying hypertrophy of the epiphyses; (4) the formation of bony stalactites. These conditions may exist separately, but some combination of them is more common than any one alone.

Analysis of affected bones shows that the fat is increased, while phosphorus and calcium are diminished, when compared with normal bone. This is practically the same state of affairs as in osteomalacia.

Associated with the joint changes are apt to be such trophic disturbances as dystrophy of the nails, muscular atrophy, etc.

## Etiology.

This condition of the joints occurs most commonly in locomotor ataxia (tabes dorsalis), and is most known in its connection with that disease. But it is found at times also in acute myelitis and the paralysis of Pott's disease, in hemiplegia and disseminated sclerosis, in progressive muscular atrophy, in syringomyelia, in connection with some tumors occupying the gray matter of the cord, and in certain traumatic lesions of the spinal cord. In short, a joint disease of this type is likely to occur in any lesion of the cells of the anterior cornua of the cord.*

The disease affects the knee most often of all the large joints, and the hip comes next in the order of frequency. In Weizsächer's cases, of 169 joints analyzed the knee was affected 78 times, the hip 31 times, the shoulder 21, the tarsus 13, etc. Most often one joint is affected, but occasionally two or more are involved. The 169 diseased joints mentioned above occurred in 109 individuals. The right and the left side of the body are affected with equal frequency.

The joint affection, as a rule, occurs at a comparatively early stage in the spinal cord disease.

The frequency of the affection is but little known. In 56 cases of tabes, Erb observed joint trouble in only 2.

Of 109 cases collected by Weizsächer, 72 were men and 37 were women.

The identity of this affection has been a matter of much discussion. It has been asserted that it was only the result of constant traumatisms to a joint whose sensation was destroyed. Just as the section of the facial nerve destroys the sensitiveness of the eye and renders it unconscious of harmful substances which may be rubbing it, so, it has been asserted, do these joints become inflamed and injured from

* Charcot, vol. i. p. 121; Michaud, Sur le Meningite et Myelite dans le Mal Vert, Paris, 1871; Gull, Guy's Hosp. Rep., 1858; Daun, Lancet, 1831, ii. p. 235; Cent. f. Chir., 1887, Nos. 22, 25, and 42; Phila. Medical Times, April 18, 1868.

the fact that the patient does not feel pain from slight traumatisms, and guard his joint accordingly. But this theory has fallen into discredit, because the joint affection is often found where the disturbances of co-ordination are slight and not enough to account for rough, inco-ordinated use and insensitiveness of the limb. This is the condition in most cases.*

The present disposition is to regard the affection as a distinct entity, and not as a form of either arthritis deformans or syphilitic disease of the joints, both of which it resembles pathologically. Virchow attributes the destruction to a faulty cellular change in the affected joint, which amounts merely to calling it a trophic change, which explains very little. It must be accepted as such, however, in the absence of more definite pathological knowledge.

## Treatment.

The treatment, of course, should aim at controlling, so far as possible, the spinal cord disease, whatever may be its nature. For the joint disease but little can be done, from the nature of the case. If syphilis is present, mercury, and especially iodide of potash, are indicated, and in some cases have a very favorable effect upon the local condition. In many of the cases it may be desirable to keep the joint at rest, which will limit or retard the destructive process; but such joints are not commonly painful, and motion is likely to be somewhat restricted by nature through the periarticular swelling and the degeneration of the capsule in the hypertrophic cases.

If the swelling is excessive from joint distension, aspiration will give relief temporarily.

Apparatus is of little use except to fix the limb in painful cases, and the motor disability of these patients would often contra-indicate the use of anything more than bed traction.

* Weizsächer, Beiträge zur Klin. Chir., Bd. iii. Hft. 1.

Excision of the joints has been done in some cases with fair success at the knee, but at the hip nothing seems likely to be accomplished, because in the severer cases the process of disease will lead to a result which is practically a spontaneous excision; and so extensive an operation in tissue with so little reparative power would seem to be hardly justified.

Incision may be necessary for the evacuation and drainage of pus.

## Chapter X.

# MALIGNANT AND OTHER TUMORS OF THE HIP.

### Malignant Disease of the Hip Joint.

Malignant disease of the hip occurs very rarely, yet often enough to make it worthy of careful consideration. In nearly all cases, the malignant growth is a sarcoma. But formerly such tumors were classified as cancers; and, for this reason, it seems worth while to discuss somewhat carefully the structure and pathological characteristics of sarcoma of bone, as accepted by modern writers. Although excessively rare, carcinoma of bone is not unknown. Ziegler states that primary cancer of bone never occurs. On the other hand, Virchow, Volkmann, Förster, and Paget believe that primary cancer of bone is occasionally to be met. However that may be, in nearly all cases one has to deal with sarcoma, and it is that which should claim the first consideration.

#### *Sarcoma of the Hip.*

The name of osteosarcoma should be restricted to the description of those cases where ossification is present in the tumor to some extent. The name has been loosely applied to all the sarcomas of bone by many writers; but modern usage is restricting it to that especial significance, and using the simple term sarcoma in connection with the ordinary cases.

For our knowledge of the pathology of malignant growths of the bones we are largely indebted to the classical papers of Dr. S. W. Gross,* who has analyzed 165 cases of sarcoma

* Am. Journ. Med. Sci., July and October, 1879.

of the long bones. He is inclined to attribute much clinical importance to the variety of the sarcomatous growth, a matter in which German pathologists do not agree with him; and in malignant tumors of the hip joint the matter possesses practically no significance.

There are two large divisions of sarcomas which are of practical importance. They are either central or periosteal. In most instances, the central growths are of giant-celled variety, while the periosteal tumors are composed of spindle cells. Central tumors are generally spherical, when seated in the epiphyses, and on section are seen to be dark red and moist, with perhaps an admixture of bony spicules.

Periosteal tumors, on the other hand, are more fusiform in shape and of greater density; and the tissue composing them is grayish white and dense. Here, also, bony tissue is more likely to be present.

Both forms are extremely malignant, although, so long as they are contained in their investing capsules, they merely push aside the healthy parts, but, so soon as they rupture their proper covering, they infect the neighboring tissues for a wide distance, not so much by the lymphatics as by the circulation; and metastases are common, so much so that Gross found them recorded in 46 per cent. of the cases reported by him.

The tendency of these tumors to suppuration is very slight, which is a most important matter in their diagnosis, and often aids in distinguishing them from tuberculosis of bone.* Spontaneous fracture may occur at the seat of the disease in some cases, but not so commonly where an epiphysis is affected as where the growth is situated in the shaft of the bone.

In considering these growths as they affect the hip, one is surprised to see how small a percentage of reported cases have been situated in the hip.

*Gillette, Bull. et Mém. de la Soc. de Chir., Paris, 1876, ii. 115; Poinsot, Bull. et Mém. de la Soc. de Chir., Paris, 1877, iii. 208.

Of 70 cases of giant-celled sarcoma, 21 were in the femur, and only 2 of these were in the upper epiphysis, while 17 were in the lower; 28 cases affected the upper epiphyses of the tibia and fibula, giving in the 70 cases 2 which affected the hip, while 45 were in or about the knee joint.

Periosteal sarcomas do not invade the joints in so large a proportion of cases as do the central sarcomas, of which 20 per cent. were found to have affected the joint, while in the periosteal variety only 5 per cent. are so recorded.

The 165 cases analyzed by Gross were classified by him as follows: 70 were giant-celled sarcomas, 45 were periosteal osteoid sarcomas, 16 were central spindle-celled sarcomas, 13 were periosteal round-celled sarcomas, 12 were central round-celled sarcomas, 9 were periosteal spindle-celled sarcomas.

## Central Sarcomas.

### *Giant-celled Sarcomas.*

Giant-celled sarcomas are also described as myeloid tumors (Paget *) and myelopaxic tumors (Nelaton †). Formerly such tumors were classed as spina ventosa, cancer of bone, spleen-like tumor, fungus hematodes, erectile tumor of bone, encephaloid tumor, hematoid tumor, etc. This was before their true nature was understood.

The tumors are circumscribed and smooth, although at times they may be uneven in contour. On section the consistency is seen to be much like that of muscular tissue, but sometimes softer. The color is most often reddish buff and mottled, while at other times the cut surface may be of a uniform dark red. Fatty degeneration gives a marbled appearance. Cysts are likely to form. They are due to the disintegration and liquefaction of the elements of the tumor, and are filled with either clear straw-colored fluid or extrav-

* Surgical Pathology, 1853.

† D'une Nouvelle Espèce de Tum. Benignes des Os, etc. Paris, 1860.

asated and degenerated blood. The occurrence of calcification or ossification is not nearly so common as in periosteal growths.

Microscropic examination shows a stroma of spindle cells and round cells, in which are imbedded the characteristic giant cells. Fatty elements and blood may be present in the degenerating cases.

Other varieties of the central sarcoma are the spindle-celled and the round-celled.

### *Central Spindle-celled Sarcoma.*

These have been described under the names of fibroplastic tumors (Follin), recurrent fibroids (Paget), fibronucleated tumors (Bennet), albuminous sarcoma (Gluge), and fasiculated carcinoma of bone (Müller).

There are no cases on record where they have affected the hip.

### *Central Round-cell Sarcomas.*

These growths have been described as embryoplastic tumors (Lebert), medulla-celled tumors (Nelaton), granulation sarcomas (Billroth), encephaloid sarcomas (Cornil and Ranvier), juiceless cancer (Förster), medullary cancer (Paget, Holmes, etc.), hematoid cancer (Paget), hæmatoma of bone, etc.

The growth consists of spherical cells, scarcely to be distinguished from white blood corpuscles in a fibrillated matrix. They are generally excessively vascular,* and the arrangement is usually alveolar.† Hence they resemble cancer structure very closely, which has been the cause of much confusion in their classification.‡

* Mercier, Bull. Soc. Anat. de Paris, ii., 2d Ser., 241; Virch. Archiv, xxxv. 530; Bryant, Guy's Hosp. Rep., xx. 358; Poland, Guy's Hosp. Rep., xvi. 469; Weil, Prag. Viertjhrschft., 1877, iv. 14.

† Billroth, Langenbeck's Archiv, xi. 224.

‡ Virchow's Archiv, iv. 151.

It should be borne in mind that from their very vascular structure they may pulsate, and simulate aneurism. They may also rupture internally or externally, and become the seat of extensive extravasations of blood.

Of 12 cases collected by Gross, 3 were situated in the hip. They are the most rapidly growing of all malignant tumors affecting the hip.

## Periosteal Sarcomas.

### *Periosteal Osteoid Sarcomas.*

The second commonest variety of bone sarcoma is especially prone to attack the articular ends of the long bones, particularly of the femur. Of Gross's 45 cases of this variety, the femur was affected in 24.

This form of malignant tumor has been described under the names of ossifying fungus (Müller); malignant osseous tumor (Stanley), and many of the growths formerly described as osteoid cancer * are to be included under this affection.†

These tumors consist of a groundwork of ossified tissue, surrounded by a hard or soft homogeneous mass like the variety just described. The osseous tissue consists of plates or spicules of bone radiating out from the shaft of the bone from which the growth comes. The interspaces are filled out with the sarcomatous mass. In the great majority of instances, the microscope shows the growth to consist of spindle cells, while round-celled growths and mixtures of round and spindle cells are also found.

Until a late stage of the disease, the growth does not attack the bone proper, although in nearly half the cases there exists along with the periosteal tumor a sarcomatous condition of the marrow, or the spongy tissue of the epi-

* Schuh, Der Zottenkrebs und das Osteoid, Mainz, 1852; Paget, Surg. Path., 1853; Wedl, Grundzüge d. Path. Hist., 1854; Rokitansky, Wchnblt. d. Ztschft. d. Wiener Aerzte, 1857, i.

† Virchow, Deutsche Klinik, 1858, No. 49; Volkmann, Bemerk. über einige von Krebs zu trennende Geschwülste, Halle, 1858.

physis. It is important to state that in these growths there is no alveolar arrangement of the stroma and no included epithelioid cells.

Other varieties of periosteal sarcomata are the round-celled and the spindle-celled, the characteristics of which are well enough defined by their names. There are no recorded instances where either of these varieties has been known to attack the hip.

### The Etiology of Sarcoma of Bone.

Bone sarcomas occur, in most cases, before the age of thirty years (the average age being twenty-seven). In 147 of Gross's cases, where the age was noted, it was distributed as follows:—

| | | |
|---|---|---|
| From 10 to 20 years, | 45 | cases |
| From 20 to 30 " | 55 | " |
| From 30 to 40 " | 26 | " |
| From 40 to 50 " | 11 | " |
| From 50 to 60 " | 7 | " |
| From 60 to 70 " | 3 | " |

Males are slightly more liable to the affection than females, 87 out of 149 cases being men.

Traumatism is the only definite causative factor of which anything is known. In about half of the cases some clearly marked injury is to be remembered, which in most cases is clearly to be accounted the cause of the affection.

The history of a personal case of the writer's is characteristic.

A little girl of ten, who was in good health to all appearance, while running on a sidewalk caught her right foot in the root of a tree, and violently wrenched her right hip, being thrown to the ground. She walked home, and complained of soreness and stiffness there; but on that day and the next day she was able to walk about the house with very little discomfort. On the third day the leg became very painful; and she was under the care of various physicians for six

weeks, in which time a purely expectant plan of treatment was pursued. Six weeks after the accident, when seen by the writer, she presented the appearances of acute hip disease, except that the swelling was disproportionate to the other symptoms. Many months have elapsed since that time, and the thigh is now an enormous mass of fungus and degenerating tissue, which leaves no doubt as to its malignant character.

### Treatment of Sarcoma of the Hip.

The practical question that arises in the treatment of these malignant tumors is whether or not it is worth while to amputate the diseased leg at the hip joint, and statistics are not enough to settle the question. In fact, practically all the operations have been done for tumor of the knee joint or arm; but in two cases of disease of the humerus, involving the shoulder joint, disarticulation was done, and the disease returned very quickly. The statistics of cases where the growth and all neighboring tissues can be removed by operation have no bearing upon the question of malignant disease of the hip joint, because the complete extirpation of the sarcomatous growth is not possible.

On general grounds the operation would be practically hopeless as far as eradicating the disease, unless performed at so early a stage that the diagnosis could not be expected to have been made.

At the same time a thorough operation at times is likely to afford relief in removing a large, bleeding, and fungous mass, and allowing free drainage to the part that remains attached to the pelvis. The enormous size of the leg becomes a most distressing feature in these cases; and its removal, although attended by a very serious risk of death as a result of the operation, is, in some of the most distressing cases, to be considered. Practically, however, very few patients will be found ready to submit to so serious and for-

midable an operation, which holds out practically no hope of cure.

*Cancer of bone* in the modern pathology is exceedingly rare. It may begin either in the periosteum or the marrow, and may contain bony tissue in its meshes. It is accompanied by much hypertrophy of the periosteum and absorption of the bone tissue by rarefying ostitis. To warrant the diagnosis of cancer, the microscopic structure should be thoroughly characteristic.

*Hydatid cysts of the hip* joint have been described, and they have presented most of the characteristics of cold abscess. Tapping and the injection of iodine have sufficed to cure them. The two cases in the foot-note* are such hydatid cysts of the hip joint.

*Lipomata of the hip* have been described in the following instances: Dupuy, Bull. Soc. Anat. de Paris, 1876, 4 s., 323; also Prog. Méd., Paris, 1876, iv. 635; Ferguson, Lancet, London, 1862, i. 120; Péan, Méd. Prat., Paris, 1883, 13; Zaboklicki, Gaz. Lek., Warszwaza, 1878, xxv. 33; Wade, Dublin Med. Press, 1843, ix. 5.

### Cases of Malignant Tumors of the Hip.

Holmes, Trans. Med. Ass'n South. N.Y., 1858–61; Murray, Br. M. J., London, 1865, ii. 254; Niese, Deutsche Klinik, Berlin, 1855; O'Ferrall, Proc. Path. Soc., Dublin, 1840–49, i. 331; Santesson, Hygeia, Stockholm, 1859, trans. in Dublin Med. Press, 1859, xliii.; Sawyer, Am. J. Med. Sci., Phila., 1858, N. S. 35, 109; Awan, Förh. Svensk. Läk. Sällsk. Sammank., Stockholm, 1870, 104; Jeffreys, Lancet, 1836, ii. 429; Key, Lancet, 1828, ii. 508; McRuer, B. M. & S. J., 1854–55, li. 498; Malgaigne, Gaz. d'Hôp., Paris, 1846, viii. 562; Mears, Med. News, 1884, xlv. 752; Smith, Med. Exam., London, 1877, ii. 566; Taramelli, Ann. Univ. di Med., Milano, 1827, xlii. 295; Tansini, Gaz. Med. Ital. Lomb., Milano, 1886, xlvi.; Baralz, Berl. Klin. Wchsft., 1887, xxiv. 610.

* Abeille, Gaz. Méd. de Paris, 1872, xxvii. 420; Bourdy, Bull. Soc. de Méd. de la Sarthe, 1875, 33.

## Chapter XI.

# LOOSE BODIES OF THE HIP JOINT.

The possibility of the occurrence of this affection makes its consideration necessary, but the affection is of such rarity that the section need be only a brief one. Loose bodies are nearly always found in the knee joint; but the hip, elbow, and other joints are not to be considered exempt.*

Such loose bodies are also called loose cartilages, joint mice, rice bodies, floating bodies, corpora libera articulorum, etc.

In structure they are either to be described as fibromatous, lipomatous, or chondromatous, according to the structure found on section.

They are formed in one of the following ways: —

(*a*) As the fibrous residue of an exudation.

(*b*) As residue from a blood clot. This was Hunter's idea of the cause of most loose bodies; but proof that they may exist as the outcome of a simple effusion of blood is still wanting, although the possibility of free bodies from this source is recognized in every modern classification.

(*c*) Broken off osteophytes in arthritis deformans.

(*d*) Hypertrophied or degenerated portions of the synovial fringes, as seen in chronic synovitis and arthritis deformans.

(*e*) Marginal ecchondroses, as seen in arthritis deformans, which have grown into the joint and have been broken off.

(*f*) Foreign bodies, such as bullets and needles, which have penetrated into the joint cavity and perhaps have become encapsulated.

* Howard Marsh, in Treves' Surg., vol. ii. p. 250; König, Arch. f. Klin. Chir., 1888.

(*g*) Bits of cartilage or bone chipped off by accident, or more often loosened by a degenerative process set up by the accident.* It has been clearly proved that such bodies can be formed in consequence of a wrench or fall.† They seem capable of independent growth ‡ as well as of calcification.

These bodies may exist free in the joint, or they may be pedunculated and attached to the mucous membrane. In size they vary from that of a pin-head to that of a horse-chestnut, so far as the knee is concerned, where they have been chiefly studied.

It will be seen that they exist most often in connection with some synovial affection, generally arthritis deformans. Traumatism would be much less likely to be a cause of loose bodies in the hip than in the knee.

The treatment of loose bodies of the hip can be settled very briefly. No measure short of their excision would offer any prospect of relief. Consequently, in the event of such a diagnosis having been made, the question which arises is the delicate one of undertaking so extensive an operation as incision of the hip for the removal of the loose body.

Under exceptional circumstances, this might be justified; but, in general, the treatment would best consist of palliative measures. Two cases are reported by König where an operation was successful in removing what was practically a foreign body, being the entire cartilage of the femur cast off by an osteochondritis, and lying loose in the hip joint, where it gave rise to the classical symptoms of a foreign body.

* Brodhurst, St. Geo. Hosp. Rep., 1867, ii. 141; Deutsch. Klinik, Volkmann, 1867, No. 48; Virchow, Die Krankhaften Geschwülste, Berlin, 1863.

† Marsh, Brit. Med. Journal, April 14, 1888; Shattock, Path. Soc. Trans., xv. 206.

‡ Recklinghausen, De Corp. Lib. Artic., 1864.

## Foreign Bodies of the Hip Joint.

Afanasjev, Ejened, Klin. Gaz., St. Petersburg, 1882, ii. (formation of a large number of loose bodies); Beraud, Compte Rend. de la Soc. de Biol., 1852, iii. 27; Erchmann, Journ. d. Chir. und Augenk'h'de, 1883, xix. 120; Wagstaffe, Trans. Path. Soc., London, 1872–73, xiv. 192.

## Chapter XII.

# CONGENITAL DISLOCATION OF THE HIP JOINT.

### Etiology.

Congenital dislocation of the hip is not an affection which is at all common; nor, on the other hand, should it be spoken of as a very great rarity. In 3,100 cases of surgical disease in children applying at the Boston Children's Hospital there were only 24 cases of congenital hip dislocation, * or a little less than one in a hundred cases of surgical disease. Chaussier † found only one case of congenital dislocation of the hip in 23,293 children born at the Paris Maternité; but Parise,‡ who dissected the hip joints of 332 children dying at the Hôpital des Enfants Trouvés, found 3 congenital dislocations. But any attempt at picturing the frequency of the disease by statistics must needs be unsatisfactory. The frequency of cases in the streets of any city must show to the careful observer that the affection is more common than is generally believed.

*Sex.*— For some unexplained reason it affects girls much more often than boys, as will be seen from the following table, which includes all large groups of reported cases: —

* Bradford and Lovett, *loc. cit.* † Chaussier, Deutsch. Chirurgie, 26, p. 83.

‡ Parise, Bull. de la Soc. de Chir., 1866, vii. 331.

| *Reporter.* | *Number.* | *Boys.* | *Girls.* |
|---|---|---|---|
| Drachman,* | 77 | 10 | 67 |
| Pravaz, | 107 | 11 | 96 |
| Krönlein, | 90 | 14 | 76 |
| N.Y. Orth. Hosp.,† | 25 | 2 | 23 |
| Boston Ch. Hosp.,† | 24 | 0 | 24 |
| Prahl,‡ | 18 | 3 | 15 |
| | 341 | 40 | 301 |

*Location.*— The affection is more often single than double, and affects the right and left hip in practically the same number of cases.

Of 313 cases, 122 were double, and 191 single. Of these, 95 affected the right hip, and 96 the left.

*Connection with Other Deformities.*— Occasionally dislocation of the hip exists in connection with other deformities, such as congenital valgus, anencephalia, hare-lip, and the like; but, for the most part, it occurs in well-formed and healthy children, and in this respect it differs from other congenital dislocations, as well as in its greater frequency.

The theoretical discussion of the etiology is capable of prolongation to any extent. There are a few settled facts which should be reviewed before going on to the intricate theories which strive to account for this remarkable condition.

Girls are very much more often affected than boys.

The affection is more often single than double.

The affection is in some cases hereditary (Dupuytren,§ Bouvier,‖ Stadtfeldt, Verneuil,¶ and Volkmann **).

To pass now to the purely theoretical considerations which have been advanced, one finds a series reaching from the time of Hippocrates (who believed the dislocation to be due to injuries or uterine pressure) to the present day, when the

* Drachmann, Schmidt's Jahrbuch, 1881, p. 170. † Bradford and Lovett from reports.

‡ Cent. f. Chir., 1881, p. 57. § Leçons Orales de Clin. Chir., Paris, 1832, vol. iii.

‖ Leçon Clin. sur les Mal. de l'Appareil Locomoteur. ¶ Gaz. des Hôp., 1886, 68.

** Volkmann, K'h'ten der Bewegungsorgane.

theory of non-development has established itself, and is accepted as the probable explanation of the condition.

It will hardly be worth while to do more than to pass in review the other theories, and this can be done most clearly and easily by following Krönlein's* most admirable classification.

1. The so-called dislocation is traumatic, and is caused: —

(*a*) By external forces acting upon the fœtus, or by its own muscular contractions. Chaussier quotes, in support of this theory, a case where a woman, nine months' pregnant, felt such violent fœtal movements on three occasions that she became unconscious, and was delivered of a child with dislocation of the forearm. Chatelain, Kleeburg, and Zielewicz attributed three cases to a fall in the seventh month.

(*b*) By injury during delivery.

It is possible to see how in some cases traction in the groin, during breech deliveries, might cause dislocation, especially where the hip ligaments are weak. The proportion of breech deliveries in these cases is abnormally large, as is well known, Adams reporting 7 breech presentations in 45 cases.

2. The so-called dislocation is spontaneous, and is caused (*a*) by softening and laxity of the ligaments (Sédillot), (*b*) by fœtal hydrarthrosis (Parise), fungous synovitis, and effusion (Verneuil and Broca), or destructive disease of the bone (Morel, Lavallée, Albers, Von Ammon, Guérin).

3. The so-called dislocation is due to the peculiar position of the lower limbs of the fœtus in utero.

(*a*) This may be strong flexion, causing pressure on the lower and posterior part of the capsule (Dupuytren).

(*b*) Strong adduction may be induced by a compression by the uterine walls, due to deficiency of the amniotic fluid (Roser).

4. The so-called dislocation is due to primary muscular contraction (like the deformities of club foot, wry neck, and

* Deutsche Chir., Lief. 26, p. 82.

scoliosis); and this is to be regarded as evidence of an affection of the central nervous system. This theory has had many supporters, among whom may be mentioned Jules Guérin, Chaussier, Melicher, Mercer, Adam, and Carnochan.

It may be said in regard to this theory that the analogous deformities from which the theory was derived are not now regarded as the results of primary muscular contraction by most modern orthopedists. Club foot, at least, is regarded rather as an expression of retarded fœtal development.

5. The so-called dislocation is often the last stage of a paralysis and atrophy of the peritrochanteric muscles (Verneuil, Reclus,* and Dalby); and iliac dislocation is the most common form, because of the paralysis of the gluteal and pelvitrochanteric muscles and the integrity of the adductor group.

Such theories as these need little refutation. They were devised in the absence of any satisfactory theory, and rest, for the most part, on a purely fanciful basis. They explain nothing for the most part, and can only be accepted as explaining an occasional case. Cases which are caused by traumatism at birth undoubtedly occur; but they are not, strictly speaking, congenital. The causation of dislocation by external violence to the mother rests on a very slender basis. In the same way it may be said of the other theories that it is perfectly possible that they may account for an occasional case, but that good evidence is, for the most part, wanting. Destructive bone disease in the fœtus is very rare; but one cannot say that it is not the occasional cause of a congenital dislocation, especially since the acute arthritis of infants produces a condition at the hip almost indistinguishable from congenital dislocation.

In general, however, it should be said that the interest of these theories is chiefly historical, and that most cases are to be considered as coming under the head of the theory

* Rev. Mens. de Méd. et de Chir., 1878, p. 88.

of retarded development about to be considered, which has received the sanction of nearly all modern authority.

6. The so-called dislocation is in most cases due to an arrest or defect of development. A theory of this nature was first advanced by Paletta, and taken up by Breschet, Dupuytren, and Schreger. Von Ammon * elaborated it still more fully, and the theory often goes by his name. It was, however, Grawitz † who put the theory on a sound scientific basis; and it seems more just that it should be known by his name, if it is desirable that any person's name should be given to the theory which is the outcome of the writings of so many.

According to Von Ammon, this affection cannot properly be called a dislocation. He would class these cases as "dysarthroses congenitæ," and he says in defence of this position: "In many cases there is in part the greatest certainty and in part the greatest probability that the affection depends upon an arrest of development of the constituent parts of the joint. . . . If the term 'luxatio' is, in general, understood to mean the slipping of a movable bone out of its natural joint connections, it is applicable only with the greatest restrictions to the congenital dislocation in question."

The fault seems to lie in the failure of the Y-cartilage at the bottom of the acetabulum to carry on the growth of the three segments of the acetabulum. Dollinger believed that this defect was due to a premature ossification; while Grawitz, from the examination of 12 specimens in 7 new-born children, seems to have proved that it is rather an arrest of development. For instance, in one case the acetabulum was only as large as that of a fœtus of five months, and the cartilage was abnormally broad even then because of delayed ossification. The formative zone in each epiphysis on microscopic examination was seen to be very imperfect, with cells widely

* Von Ammon, Die Angeborene Chir. K'h'ten des Menschen, 1842, ix.

† Virchow's Archiv, 1878, vol. lxxiv. p. 1.

separated and scanty; while in two other cases the zone of calcification was wanting, and the cartilage cells contained no nuclei and only fat granules. In no case was there any evidence of premature ossification.

The femur in these cases seemed to have reached a comparatively normal size, and in this disproportion lies the secret of the deformity. The head of the femur is too large to enter the shallow and constricted acetabulum, and lies outside of it, not dislocated, but never having been in the proper relation with it.

Although, as has been already stated, this theory cannot be held accountable for all cases, the whole weight of modern authority regards it as the most acceptable and most scientific of all the theories which would explain the cause of the deformity.

One merit of this theory is to be found in the fact that it makes congenital dislocation analogous with other deformities, inasmuch as it finds its causation in a retarded development, as is the case in hare-lip, cleft palate, and other deformities. The fact that congenital dislocation occurs, in a certain proportion of instances, in connection with these deformities, also lends weight to this view. Numerically, females are more liable to deformity of all sorts than are males; and, consequently, this theory gives a certain sort of explanation of the great preponderance of females among those affected by congenital dislocation of the hip. At the same time it is far from a satisfactory explanation of this overwhelming proportion.

The conclusion of the whole matter cannot be stated better than has been done by Stimson, who says that, while "a limited number of cases of dislocations existing at birth, especially in joints other than the hip, may have been caused by traumatism, abnormal position of the limb, or paralysis, in the manner alleged by various writers, yet, in the great majority of congenital dislocations of the hip, the cause is to be found exclusively in an arrest of development of the ace-

tabulum by deficient action or vitality of the cells of the Y-cartilage."

In conclusion, it may be permissible to call attention once more to the fact that dislocations occurring during birth are not to be classed as congenital, but as traumatic; and, although they are undoubtedly in the minority, still they should be recognized as a special class of hip dislocations, to be in some cases distinguished practically from congenital dislocations.

## Pathology.

In discussing pathological changes found in connection with congenital dislocation of the hip, it should be remembered, as has been pointed out by Gurlt, that there should be distinguished two kinds of changes,— those due to the affection itself, and those changes produced by weight bearing upon the affected limb, which latter changes are superadded to those of the disease itself.

Autopsies on cases which have not walked are rare, and most of the pathology has been learned from the examination of cases which have borne weight on the limbs. Early autopsies have been reported by Mercer, Adams,* Parise,† Dollinger; ‡ and the seven cases of Grawitz § are the most important of all, as well as the case of Verneuil. ‖

In the vast majority of cases, the head of the bone is found upon the dorsum of the ilium, resting either upon the iliac bone itself or upon the gluteus minimus muscle. Cases, however, have been reported where the head of the femur was dislocated on to the pubis and into the obturator foramen. They are, however, extremely rare. It should be borne in mind that the femur and the acetabulum are developed in the embryo from one continuous tissue, and that, although at first they are for this reason necessarily in contact with each other, when the development of the acetabulum becomes

* Journal Edinb. Phys. Soc., 1853. † Quoted by M. Adams.

‡ Virchow, Archiv. § Arch. f. P. Anat., lxxiv. ‖ Gaz. des Hôp., 1852, 530.

retarded and the growth of the femur goes on normally, it is impossible for the normal relation to be maintained indefinitely. Consequently, even before weight is borne upon the limb, the head of the femur is drawn upward and backward, resulting in a distortion of the capsule and the formation of a new articular surface, where the head of the femur finally rests. So that, added to the naturally imperfect growth of the acetabulum, comes a still further element of disturbance in the fact that the femur is not in contact with it, as it should be, during its period of active growth.

To consider the changes as they have been found in the cases reported, one comes first to the acetabulum. In no reported case has this been entirely absent; and, on the other hand, rarely has it been reported as normal. In general, it is found smaller and more shallow than normal, often being changed into the shape of a flattened oval, a change due to the altered position of the femur. Sometimes the new acetabulum is continuous with the old one, while at other times the two form distinct cavities. In cases which have not walked, the new acetabulum is not an important feature. In the case of Paletta, three distinct depressions had been made by the head of the femur. In cases which have walked, and especially in cases where the deformity is comparatively little disabling, one finds a rough elevated border of bone, consisting of osteophytes deposited upon the upper border of the elongated oval, which is merely nature's effort to strengthen this new socket, and to protect, so far as may be, the head of the femur from slipping upward. The cartilaginous rim of the acetabulum is often wanting. Sometimes exostoses develop in the acetabulum itself (Porto).

The femur shows changes that are less marked, but at the same time distinctive. The head of the femur in the reported dissections may be normal, or the head and neck may be entirely wanting. Intermediate conditions are found in all degrees. As a rule, the neck is shorter than

normal, and is more at a right angle to the shaft than is commonly found.

Perhaps some of the most important changes are to be found in the capsule of the joint, which is much hypertrophied, and thickened and stretched. It may be constricted at its centre into an hour-glass form. In cases which have walked, the hypertrophy is the result of its new function ; for, in most cases of bad congenital dislocation, the body is hung upon the femur by means of the capsule of the hip joints, in the same way, as Volkmann has pointed out, that an old-fashioned stage-coach was hung upon its leather springs. The head of the femur plays loosely against the dorsum of the ilium, and is retained by a bony socket. The only thing that keeps the head of the femur from slipping up indefinitely is the capsule of the hip joint, which runs from the rim of the acetabulum to the head of the femur. Consequently, it forms, perhaps, the most important part of the congenitally dislocated joint. Although the capsule is usually entire originally, the wearing upon it of the head of the femur may cause wearing away over the new acetabulum.

The synovial surface of the capsule is usually smooth and moist, and of normal appearance ; but attachments to the rim of the acetabulum from which the capsule is stretched, as well as to the head and neck of the femur, are common. The synovia varies in amount, sometimes being normal and sometimes excessive. The capsule, which is especially thickened in that part corresponding to the Y-ligament, is sometimes attached to the fascia of the gluteal muscles ; and the hour-glass constriction, already alluded to, is an important factor in preventing apposition of the head of the femur and the acetabulum.

In cases of long standing, that part of the capsule which lies between the head of the femur and the new socket is liable to be worn out by the constant rubbing and to disappear. In this case, the capsule appears to be attached to the rim of the new acetabulum. This, however, may not be

the case; and the capsule, along with the pelvitrochanteric muscles, and even the psoas and iliacus at times, serves only as a tough suspensory ligament. In the case first mentioned,

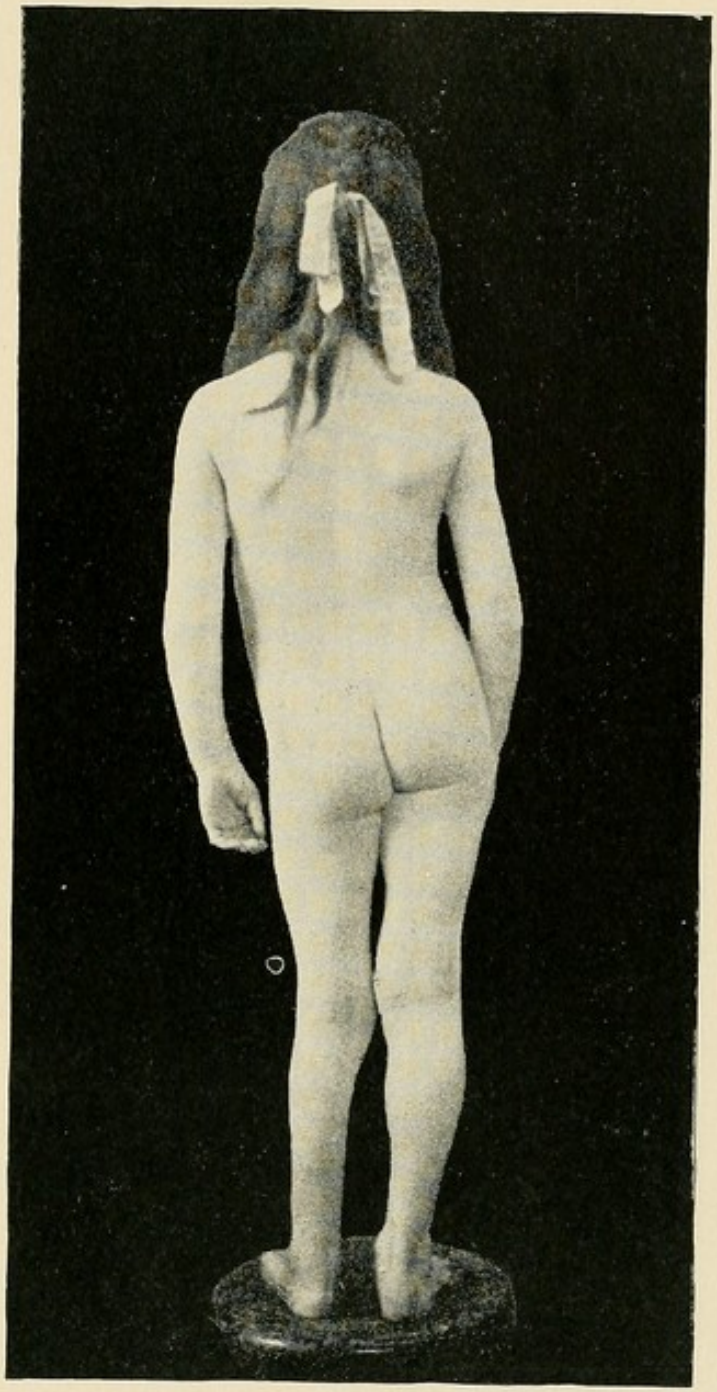

Fig. 50.—UNILATERAL CONGENITAL DISLOCATION OF THE LEFT LEG, SHOWING THE NATURAL POSITION IN STANDING.

the capsule is fused with the periosteum of the ilium, and is adherent all around the periphery of the new socket.

Inasmuch as the pelvis is suspended by the capsular ligament, it is a matter of some practical importance whether

the new acetabulum forms directly over the old one or above and behind it. If it forms directly over the old one, the pelvis remains in practically the normal plane. If, however,

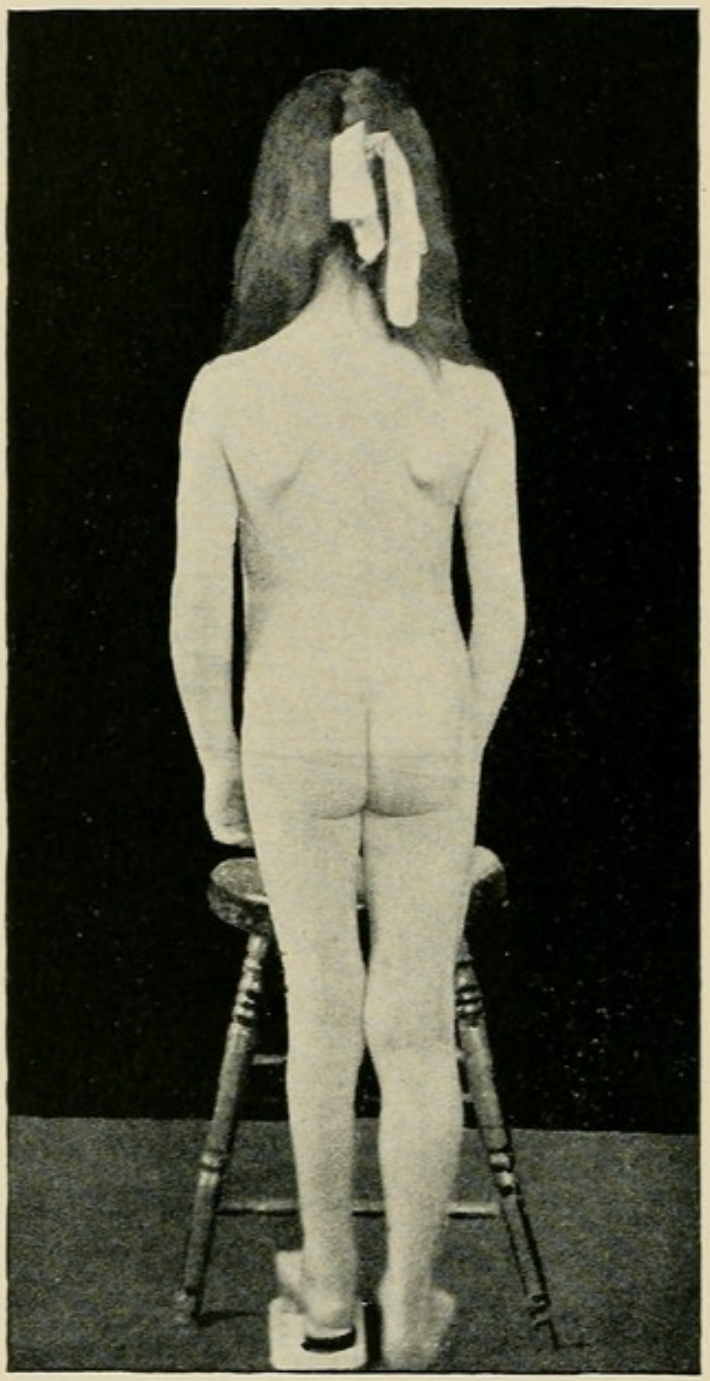

Fig. 51.— THE SAME CASE AS IN FIG. 50. SHOWING THE CORRECTED POSITION.

the new socket develops posteriorly, the angle of the pelvis is of course changed, and it is tilted forward on a transverse axis, occasioning some lordosis in the back. This pathological condition is probably the explanation of the varying amount of distortion which is noticed clinically.

Suspended in this way, one would suspect that the development and growth of the pelvis would be abnormal; and such is the case. The crests of the ilia come nearer each other: while the tuberosities of the ischia are separated, so that the upper part of the pelvis is constricted, while the lower part is elongated. In addition to this, the sacrum is more curved than it normally should be.

The condition of the ligamentum teres varies within wide limits. In the infant it may be fused with the capsule, but it is never entirely wanting (Krönlein), although it may be represented only by a very small thread. In the case of persons who have walked it may be wanting (Bowlby, Coudray, etc.). Most commonly it is elongated and thickened, apparently aiding in the suspension of the pelvis from the femora. Again it is subjected to all sorts of irregularities, sometimes rising by two heads from the acetabulum, and varying in many other ways from the normal condition. It is not an important factor in the pathology. The muscles around the hip joint are modified chiefly in a mechanical way, as must evidently be the case from the distortion of the parts involved. The gluteal muscles

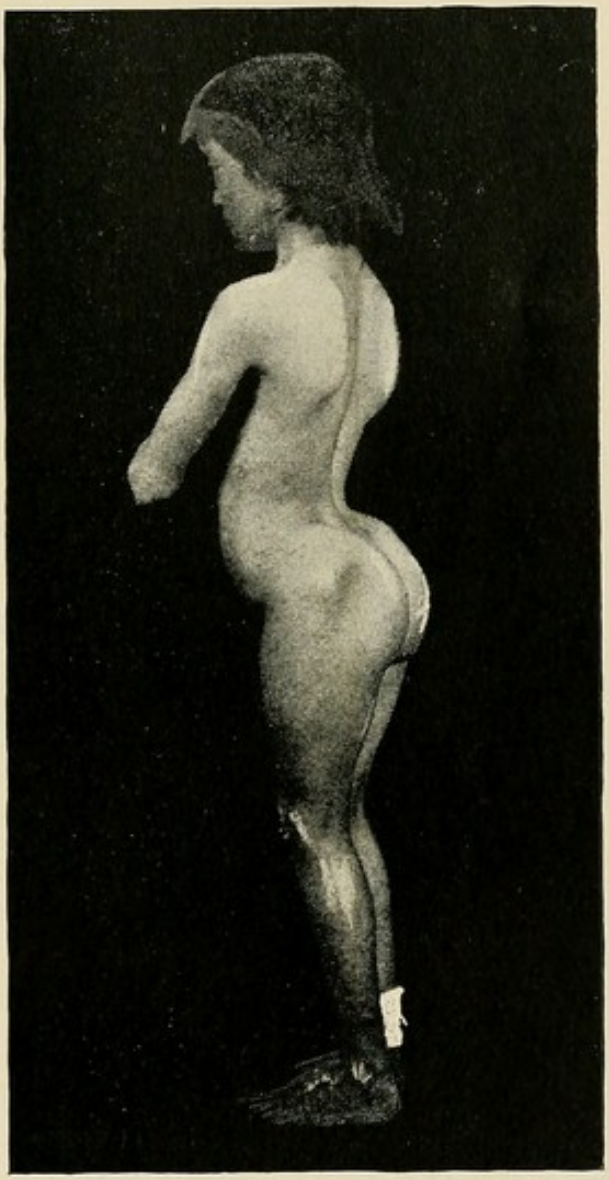

Fig. 52.— DOUBLE CONGENITAL DISLOCATION OF A SEVERE GRADE, SHOWING THE LORDOSIS OF THE BACK AND THE PROMINENCE OF THE TROCHANTERS.

are contracted; and the muscles inserted around the neck of the femur are of course, for the most part, stretched and atrophied, as is also the case in the other muscles which

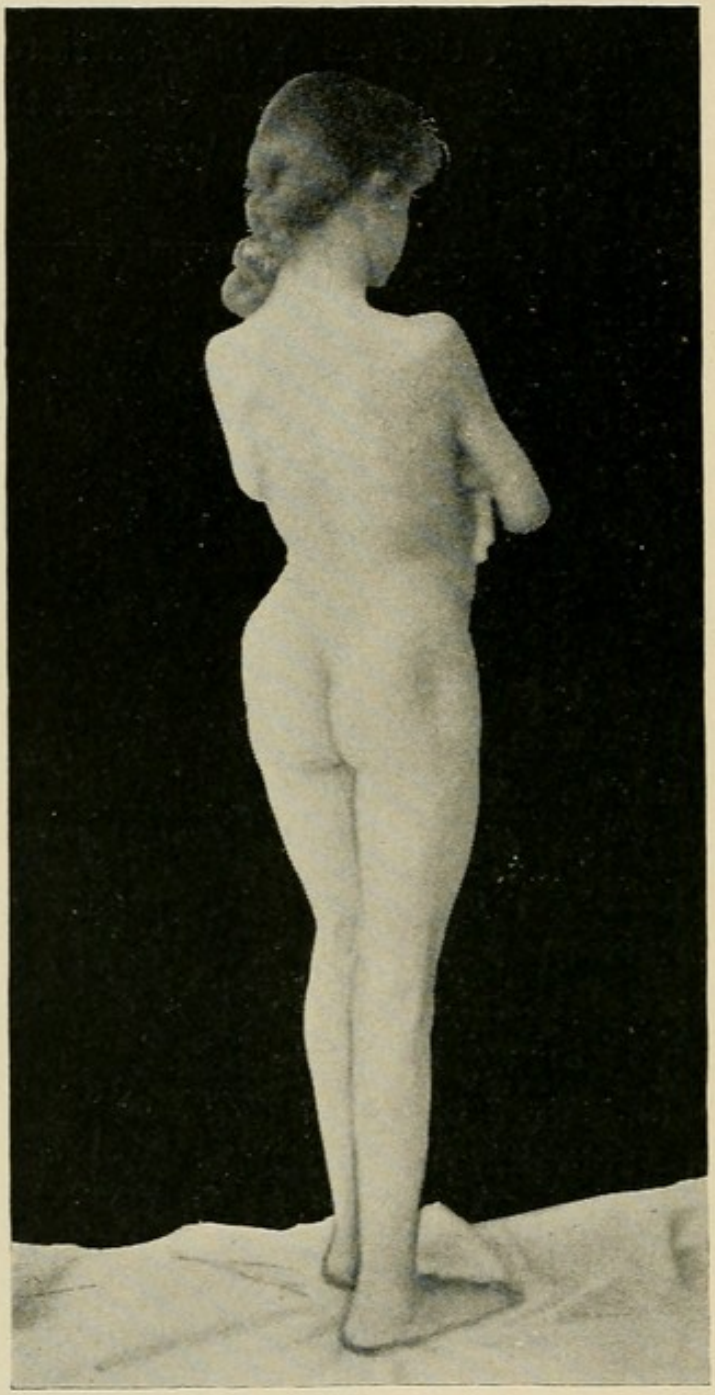

Fig. 53.— DOUBLE CONGENITAL DISLOCATION OF A MILD GRADE, SHOWING LESS LORDOSIS AND BUT LITTLE DEFORMITY.

are not brought into activity in the new position assumed by the femur.

Fatty or fibrous degeneration of the disused muscles is not uncommon (Krönlein, Bardeleben).

## Treatment.

The treatment of congenital dislocation of the hip has never been regarded as a credit to surgery. For the most part, the deformity has been regarded as irremediable, and surgeons have been slow to advise either operative or mechanical treatment. Before the advent of antiseptic surgery operation was, of course, not to be advised; and the results of mechanical treatment have been such that there was little to be said in favor of that.

### *Treatment by Extension and Apparatus.*

The latest method of this form of treatment is that by continuous extension, made most often by a weight and pulley while the patient is confined in bed. Pravaz, senior,* claimed to have cured a case by this method, and a committee was appointed from the French Academy of Medicine, which should investigate the claims advanced by the surgeon. This committee disagreed as to the cure, but considered that the patient was much benefited. Pravaz, junior, claimed a similar result some years later in a patient whom he exhibited. A committee from the Society of Surgery† was

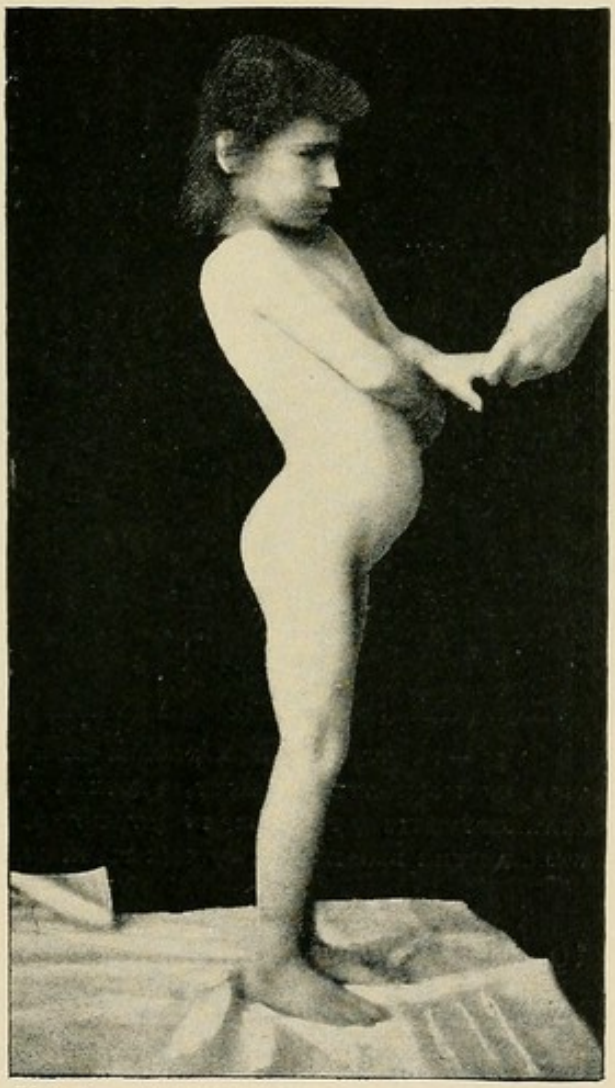

Fig. 54.—SIDE VIEW OF A MILD CASE, SHOWING THE CHARACTERISTIC ATTITUDE.

* Bull. de l'Acad. de Méd., Paris, vol. iii. p. 408. † Bull. de la Soc. de Chir., 1864, 218.

again appointed to examine the case, but was of the opinion that, although much benefit had resulted, a reduction of the dislocation had not occurred. This is not surprising in the light of the modern view, which would regard the so-called dislocation as a malformation rather than a true dislocation. With an imperfect acetabulum and the head of the femur too large to enter it, it is not surprising that so many surgeons have failed to cure the deformity by extension, however prolonged. A similar result was reached in the case of Guérin, who also treated cases by continuous extension. The committee reported that two centimetres had been gained in one case, but that in this case, also, it could not be claimed that the dislocation was reduced. Mr. William Adams* has recently reported satisfactory results in the treatment of hip dislocation by the method of extension. In four cases, two unilateral and two bilateral, he reports that the head of the femur seems to be retained in its proper place in each case. Inasmuch as only two years and seven months have elapsed since the beginning of treatment, it seems hardly fair to consider the cases of Mr. Adams as more than very doubtful results.

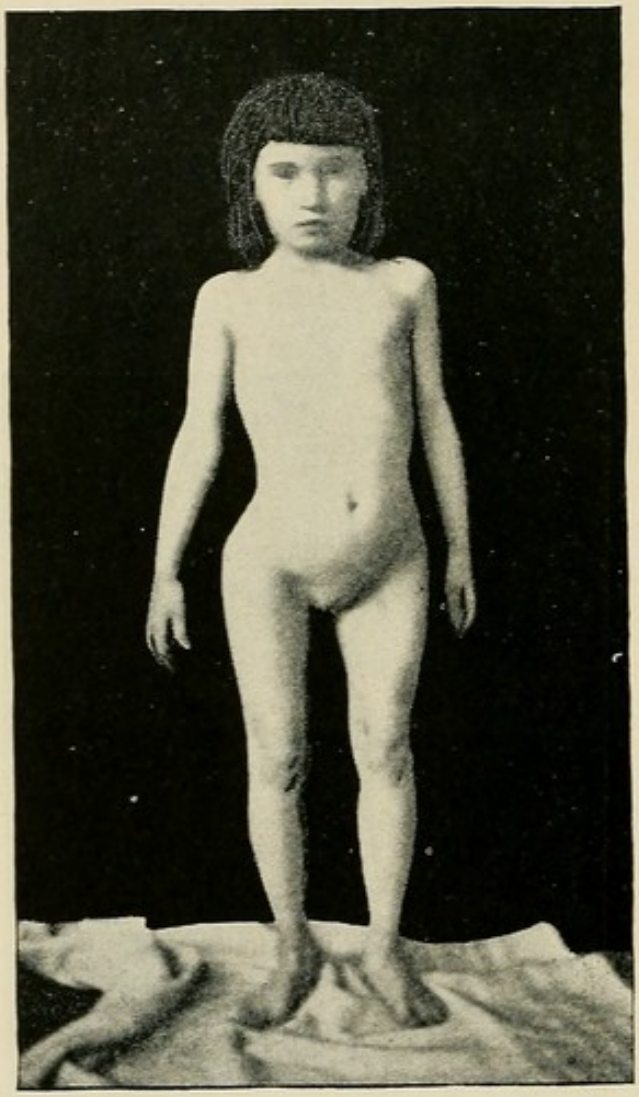

Fig. 55.—FRONT VIEW OF A DOUBLE DISLOCATION OF MODERATE SEVERITY, SHOWING THE CHARACTERISTIC ATTITUDE IN STANDING, AS WELL AS THE BROADENING OF THE PERINEUM.

* British Med. Journal, 1890.

The classical case that gives hope that extension may often be regarded as a cure for this distressing deformity is the one reported by Dr. Buckminster Brown, of Boston, in 1885.*

A girl four years old had double congenital dislocation of the hip. The joints were loose, the walk was very bad, and no trace of an acetabulum could be found on manipulation. The patient was put to bed, and traction was made by weights which had for their object the stretching of the contracted tissues and the bringing of the femur into its proper position. After some weeks, passive movements were made by changing the position of the pulleys. For thirteen months the child was kept in bed recumbent, and then she was encouraged to make the movements of walking without bearing weight on the legs. This was accomplished by the wheel crutch. About two years and three months after the beginning of treatment the heads of the femora were found in place on Nelaton's line, and the child was allowed to walk gradually; and at the time of Dr. Brown's report the

Fig. 56.— FRONT VIEW OF A VERY SEVERE CASE OF DOUBLE DISLOCATION WHERE FLEXION OF THE LEGS WAS PRESENT AND WALKING WAS ALMOST IMPOSSIBLE. THE LORDOSIS IN THIS CASE WAS EXCESSIVE.

* Boston Med. and Surg. Journal, 1885, No. 23.

walk was normal, and she was able to play and run about like other children. This case stands alone in the literature of orthopedic surgery. Most of the results obtained by operative measures are not worthy of comparison with it; and no other case, so far as the writer knows, has ever been reported where so successful a result was obtained by mechanical means. In such treatment, of course, the first matter must be to draw the head of the femur into place by continuous traction made upon the leg. This is not so easy a matter as it would seem, and is often accomplished only by prolonged and continuous traction. Then by passive movements, as in the case of Dr. Brown, it may be hoped that at the site of the old acetabulum a lodgment of the head of the femur may be effected; and this can only be accomplished by continued movements of the femur after it has been reduced to its proper place.

It is very undesirable to begin on a treatment of this sort unless there is a prospect that it can be carried out to the end, because simply to stretch the connections between the femur and the pelvis, without being able to retain the femur in its new position, is simply to make the limb worse, and the patient's condition more unfortunate than it was before. An apparatus is described by Dr. Bradford which has as its aim the maintenance of continuous traction without such prolonged recumbency as in the case of Dr. Brown, which consists of a leather jacket to which rods are attached at right angles, from which traction is made upon the flexed joints, so that the child may be kept on a frame or sitting up without loosing the traction force. The writer has had no personal experience with the method, but it seems to offer certain advantages over the treatment by continued recumbency.

The use of corsets and pelvic bands, which have as their object the retention of the head of the femur in its proper place, has been largely advocated, especially by German writers. König* and Landerer† use corsets of felt, sili-

* Lehrbuch d. Spec. Chir., 1887, iii. p. 287. † Archiv f. Kl. Chir., 1885, xxxii. p. 516.

cate, or plaster, which, they think, retain the head of the femur in place and improve the walk. In one of Landerer's cases shortening was reduced from two inches to two-thirds of an inch. Motta suspends the patient by the head and axillæ, and takes a plaster cast of the affected side, while the limb is pulled down as far as possible into place. From this he makes a poroplastic splint, which is worn by day; and at night he uses a gaiter and extension. He advocates the method as "giving an immediate correction, or at least a decided lessening, of the limp"; but from Landerer's corset he could not get any good results.*

Volkmann's pupil, Martin, published the results of his master's experience with hip dislocation in the course of twenty-five years; and the best that could be said was that in unilateral dislocation the results were partly satisfactory.†

The method brought forward by Paci, of Pisa,‡ has recently attracted attention as a means of reducing congenital dislocation of the hip. It has as its object a series of manipulations to cause the descent of the head of the femur to a place near where the acetabulum should be, and, if such an acetabulum exists, to cause a reduction of the dislocation. It is claimed for this by Redard § that a better position may be obtained by affording a solid bony support to the head of the femur upon the ilium, which may result in the formation of a new joint. The obstacle to reduction is found in the pelvitrochanteric muscles and those of the thigh and leg. The first attempt is to cause relaxation of these muscles by effecting leverage upon the dislocated bone. This method consists of four steps. With the patient held firmly and the pelvis fixed, flexion of the leg to the full extent should be accomplished. This causes the descent of the head of the femur as far as possible. Next a slight amount of abduction is made, which is designed to

* Giorn. della R. Accad. di Torino, 1886, xxxiv. p. 675.

† Deutsch. Med. Wchsft., 1889, No. xvi. ‡ Quoted by Redard.

§ Archives for Ped. (abst.), March, 1891.

place the head anterior to the acetabulum, if the descent has been complete, or against its posterior border, if the descent has been incomplete. In the third step, while abduction is maintained, slow external rotation is effected, which brings the head of the femur still more forward. Finally, and lastly, the thigh is slowly extended, one hand pressed upon the knee, while the other holds the foot and leg, the whole limb being turned outward. After a moderate degree of force has been used, the contraction generally yields ; and the thigh can be completely extended in general. It is said that anæsthesia is not generally necessary for this manipulation. It is directed that the limb should be kept in an immovable apparatus for a month, and that extension should be kept up for three months. It seems impossible to believe that so serious a deformity can be corrected by so simple and rapid a treatment.

Some years ago Dr. Post, of Boston, * treated a case of single congenital dislocation of the hip in a young child by etherizing it, and pulling the head of the femur into normal position (in this case there was an acetabulum), and retaining it there by a plaster of Paris bandage worn for a year. In discussing the various methods advocated for the reduction of hip dislocations by mechanical measures, it is difficult to judge their merits correctly. The case of Dr. Brown was perfectly successful. In the case of the method advocated by Redard and others, it is doubtful if the results were equally good. With the attention paid to mechanical orthopedics in America, it would seem as if there were a future for the treatment by extension properly carried out. In a personal case of the writer's recently under treatment, a girl of thirteen with single dislocation was very much benefited by six months' extension in bed, and after that wearing a protection splint. The limb was lengthened nearly an inch ; and the gain has been held, although it is too early to judge of the case, only

* Quoted by Bradford and Lovett, p. 519.

a year and a half having elapsed since the beginning of treatment. The success of mechanical treatment would often seem to justify the undertaking of a course of traction treatment in the case of careful and faithful parents. The child should be first subjected to continuous and prolonged extension in both the extended position and with the thigh flexed at a right angle to the body, in order to loosen up the contracted muscles and ligaments, due to the abnormal position of the femur. This may be accomplished — although hardly so well — by the use of the long traction splint. After that it would seem advisable that the head of the bone should be manipulated in this new position, in the hope of establishing a new connection for it. Then walking might be attempted very gradually, with the joint protected; and the discontinuance of apparatus should only be considered after the lapse of a great many months, as the mechanical conditions are obviously not favorable for the maintenance of the new condition. The writer has had no personal experience with the method advocated by Redard, and is not competent to speak of its merits.

### *Operative Treatment.*

The treatment of congenital dislocation of the hip by operation apparently dates from the time of Guérin,* who believed that the cause of all congenital deformities lay in a primary muscular contraction, and practised tenotomy of the peritrochanteric muscles for the relief of this dislocation. Later he realized that there was present, also, an abnormality of the acetabulum; and he added to his tenotomy subcutaneous cuts of the capsule, and, following it, progressive movements of the limb, hoping to obtain the formation of a new articular surface. And, to aid in this, he used also prolonged extension. This method was tried in three cases of unilateral dislocation, and in one where both hips were in-

* Jules Guérin, Recherches sur les Luxations Congenitales. 1841.

volved. Two years later a commission of the Academy of Medicine, examining these cases, reported that two cases of the dislocation were not cured, but that a lengthening of two centimetres had been obtained. The treatment of the third dislocation had been temporarily given up, and the double dislocation was not far enough advanced for the report. This method is of significance, inasmuch as it has been the basis of similar operations largely practised since.

Bouvier * performed subcutaneous tenotomy of the adductors and of the psoas on both sides. This was followed by an apparatus which held the limbs abducted. Some benefit followed the operation. Pravaz, junior,† performed a subcutaneous section of the fascia lata. Corridge ‡ employed tenotomy and continuous extension in 1860. Brodhurst,§ in 1865, performed a subcutaneous tenotomy of the contracted muscles in the case of a child twelve years old, who had not been benefited by continuous extension employed for some months. It is reported that at the end of a year the patient walked with scarcely a limp. A second case was operated upon by Brodhurst; and it is said that six months after operation the patient walked without apparatus, and that the head of the femur was in place. Brodhurst apparently performed a third operation, which he alluded to in a discussion with Bennett.‖

An entirely different line of operation was undertaken by Mayer,¶ in 1845, which has never been repeated, for obvious reasons, by any other surgeon. It deserves mention on account of its uniqueness. In a case of unilateral dislocation an osteotomy of the unaffected leg was done, in order to shorten it, and thus lessen the limp.

Barwell ** claims to have obtained two good results by the old operation of Guérin. He performed in these cases a

* Leçons Cliniques sur les Mal de l'App. Locomoteur. Paris, 1855.

† Union Médicale, 1869.

‡ Quoted by Giraldès, Union Méd., 1869.

§ Lect. on Orth. Surg. London, 1876.

‖ Lancet, 1885, i. p. 271.

¶ A. Mayer, Das Neue Heilverfahr. bei Fötalluxationen durch Osteotomie. Würzburg, 1855.

** British Medical Journal, May 28, 1887.

subcutaneous tenotomy, making section as close to the bone as possible. Continuous extension was then maintained for some weeks. The cases, however, were reported too soon after operation to be of any great value.

Hueter * proposed an operation which, so far as the writer knows, has never been performed. It was to free and resect the head of the affected femur, and then, making periosteal flaps from the neck of the femur, to sew them to periosteal flaps made from the ilium, thinking thus to obtain an osseous union between the pelvis and the femur. The extreme difficulty of the technique would make the operation seem impracticable.

König † performed a similar operation, however. He made an incision exposing the posterior part of the acetabulum and the neighboring part of the iliac bone. Then, incising the periosteum in a curved line parallel to the border of the acetabulum, a flap of periosteum was detached from the ilium, running from this incision to the articulation, thus being attached to the bone only at the border of the cavity. It was twisted so that the articular head was completely covered by it, and a series of sutures attached it to the capsule. Unfortunately, the child died of scarlet fever, so that the results of the operation cannot be stated.

De Paoli ‡ shaved down the head of the femur, and, having enlarged the acetabulum, he nailed the femur in place. The result was so bad that he abandoned the operation in favor of resection.

### *Resection of the Head of the Femur.*

Resection of the head of the femur is a proceeding which is open to two objections. In the first place, a stiff joint is very likely to result; and in the second place a certain amount of shortening is necessitated by a removal of part of the epiphysis of the femur in a growing child, as well as by

* Klinik der Gelenkkrankheiten. 1870. † Lehrbuch d. Spec. Chir., 1889, iii.

‡ Cent. f. Chir., 1877, p. 336.

the amount of bone actually removed. Nevertheless, the operation has been largely performed, almost entirely, however, by continental surgeons. It was apparently done first by Edmund Rose,* in 1874, for a unilateral dislocation; and the result of the operation is not on record.

Reyher † removed the head of the femur in two cases of congenital dislocation. He refreshed the surface of the acetabulum, and, replacing the neck of the femur, immobilized the articulation. In two cases operated upon, at the end of three months the patients were able to walk.

Margary ‡ at first attempted a proceeding similar to that of Hueter. In the hope of improving on the simple operation of resection, he chiselled an acetabulum where it should have been found, and, replacing the head of the femur in it, he made a capsule of periosteum. The patient died of pyæmia after operation, which was attributable to septic catgut. Since that time Margary has become a warm advocate of excision of the head of the femur, which he would practise systematically as a routine treatment in dislocations of the hip. He has reported six cases, three of unilateral dislocation and three of double. In all the cases but one, the difference in length of the limb was corrected. With regard to the ultimate results, one of the patients is said to have walked well, one walks well with two canes, one limps even with two canes, one walks badly using two canes, one is recorded simply as limping, and the condition of one is not stated. Even before Margary presented his cases to the International Congress at Copenhagen, the operation had been performed in Germany by Heussner, Schuessler, and Luecke. In Heussner's case § a girl of twenty was operated upon, who had suffered very much in walking. The head and neck of the femur were excised, and the acetabulum was deepened. The result as shown by Heussner, in 1884, was that the girl

* Quoted by Krönlein (Deutsche Chir.).

† Cent. f. Chir., 1884, No. 14.

‡ Archivio di Ortopedia, Anno i., fasc. 5, 6.

§ Arch. f. Klin. Chir., xxx. 666, and Cent. f. Chir., 1884, No. 45.

could walk for half an hour with the aid of a cane without fatigue. The dislocation was a double one, and ultimately the patient was resected upon the other side as well. Yet she was finally obliged to undergo ovariotomy, after which the pain subsided.

In the case of Schuessler,* it was a unilateral dislocation in a girl sixteen years old. Six months after operation the femur was firmly in its new cavity, and could not be displaced upward. The leg could be flexed through an arc of 40 degrees, and abduction of 8 degrees could be made, while rotation was fairly free. The leg was 5 centimetres short, and the walk was decidedly limping. Two years and a half after operation the patient could walk without a cane, and the trochanter was 5 centimetres above Nelaton's line. It is only necessary to add the comment as to the success of the operation that before excision the trochanter was only 6 centimetres above Nelaton's line.

In the case of Luecke, † the patient was a boy of fourteen, the subject of various malformations besides the unilateral dislocation of the hip. The ordinary operation was performed, and a year and a half after operation the patient could walk a couple of hours without fatigue, and a new articulation was said to have been formed, which did not permit the displacement of the trochanter upward.

Lampugnani, ‡ a pupil of Margary, has reported two cases of resection of the hip. In one, an excision was performed by the Langenbeck incision, with removal of the head of the femur. The patient was four months in an extension apparatus, and finally had a corset applied. Seven months after operation the extremity of the femur could be displaced upward and backward. There was some limping present, and the trochanter was still 5 centimetres above Nelaton's line, originally having been only 8 centimetres. Move-

* Berl. Klin. Wchsft., 1887, xxiv. 398.

† Quoted by Teufel, Deutsche Zeitsch. f. Chir., xxix. 343.

‡ Giornale della R. Accad. di Med. di Torino, fasc. 6, 7, 1885.

ment at the joint is said to have been fair. In a second operation he modified the proceeding by removing the head of the femur obliquely, so that the upper half of the head would be the part to come in contact with the upper part of the acetabulum. The patient was a girl twenty years old, and the trochanter was 10 centimetres above Nelaton's line. The head of the femur was removed obliquely from the point of insertion of the round ligament to the limit of the neck and the head, so that the upper half of the head remained in place. In an examination nine months after operation, the legs were found to be of equal length, the trochanter was only 5 centimetres above Nelaton's line, and the movements of the joint possible to a moderate extent, but were accompanied by creaking.

Motta,* another pupil of Margary, has reported two cases of excision for congenital dislocation in children six and nine years old. After excision he treated the cases by extension in a position of abduction and outward rotation. This was maintained even after the patients were allowed to go about in an immovable plaster splint. One case was able to walk indefinitely without fatigue, and the shortening of the limb was compensated by the obliquity of the pelvis.

Raffo † is reported to have resected a case with much improvement in the walk. Battini † has resected one case of unilateral dislocation and two of double dislocation, with very bad results.

De Paoli ‡ has modified the simple excision by nailing the head of the femur to the pelvis by a nail driven through the trochanter into the acetabulum. A good result was obtained in a case where a shortening of three inches had existed, but an alarming amount of fever and reaction accompanied the operation.

Molliere § has reported two cases operated by the method

* Archivio di Ortopedia, ii. Nos. 3, 4, and 5.

† Quoted by Hoffa, Revue d'Orth., March, 1891, p. 101. ‡ Cent. f. Chir., 1877, p. 336.

§ Quoted by Porto, Les Lux. Congen. de la Hanche, etc. Paris, 1887.

of Margary. One, a girl twelve years old, with unilateral dislocation, was resected by the usual method, and was confined to bed only two months. After that time she began to walk, and the length of the legs was shown by measurement to be equal: the trochanter of the right side, however, was 4 centimetres higher than the well side. Three months later the patient was improving in her walk from day to day. In a second case, a girl fourteen years old had double congenital dislocation of the hip. Resection of the right side was done in the usual way, and in six weeks the patient is reported as walking without pain. Two months later the other hip was resected, and at the end of a month the patient walked with the aid of a cane. Some months after the last operation the patient was still progressing favorably.

Postempski * reports a very good result due to resection. Ogston † has operated twice for dislocation of the hip by resection. In one case, a young man was operated on on both sides, and the result is reported as an improvement one year after operation. The second patient was less satisfactory, and complained of weakness in the operated limb.

In France, Vincent ‡ resected a hip for congenital dislocation by the method of Ollier. The result at the end of two years was a fibrous anchylosis, which permitted walking with much less pain and fatigue.

One finds, therefore, 27 cases of reported resection for congenital dislocation of the hip, 17 of which were unilateral and 7 bilateral, leaving 3 cases in which it was not stated. In the 7 cases of double dislocation the results were not altogether satisfactory. Of these 7, 3 walked badly after operation in spite of the support of crutches, 4 walked passably, but required the use of a cane. Displacement of the femur during walking persisted in the 3 cases which were examined in regard to this.

In unilateral dislocation the results are but little better.

* Quoted by Hoffa, *loc. cit.*

† Ogston, Ann. of Surgery, viii. p. 1.

‡ Brit. Med. Journal, 1885, 116.

In 16 cases of the 17 operated upon, one was able to walk all day without fatigue (Motta), 2 could walk for a time not exceeding an hour and a half, 5 presented an improvement in the walk in general, 2 were obliged to use crutches, 6 limped, while 1 walked worse than before operation (Langenbeck, Battini).

These might be classed 3 good results, 5 moderate results, and 8 bad ones. The defective walk, as Hoffa points out, is due largely to the shortening produced by resection; and it is to be expected that in certain of these cases shortening will ultimately appear in the operated leg, as the result of the injury done to the epiphysis of the femur.

It therefore seems safe to say with regard to resection of the femur as a curative measure in congenital dislocation of the hip that the results are far from satisfactory. In double dislocation the results are notably bad in many cases; and in the best cases they are not worthy of comparison with such a case, for instance, as that reported by Dr. Brown.

In unilateral dislocation the results are somewhat better; but the details of the cases as presented by the reporters are not altogether satisfactory, and a large proportion, as has been seen, are failures, so that even in these cases the operation is to be regarded as a measure of doubtful utility.

### Cases of Resection already alluded to.

| | | | |
|---|---|---|---|
| Rose, | 1 case. | Raffo, | 1 case. |
| Reyher, | 2 cases. | Battini, | 3 cases. |
| Margary, | 6 cases. | De Paoli, | 1 case. |
| Heussner, | 1 case. | Postempski, | 1 case. |
| Schuessler, | 1 case. | Ogston, | 2 cases. |
| Luecke, | 1 case. | Vincent, | 1 case. |
| Lampugnani, | 2 cases. | Molliere, | 2 cases. |
| Motta, | 2 cases. | | |

### *Hoffa's Operation.*

Hoffa,* who believes firmly that the obstacle to reduction consists more in contraction of the periarticular soft parts than in any bony condition, has modified the operation to combat what he believes to be the source of failure. He operates by a free incision of all the soft parts which oppose reduction, following the example of Lorenz. In cases operated upon by this method he reports a practical success enough to justify his theory. The essential point is the section of the soft parts all around the great trochanter, which permits the replacement of the head in the acetabulum, which can easily be made of the proper size to receive the head of the femur. The operation is, in a word, to cut down on the joint, extirpate the capsule, enlarge the acetabulum by a heavy curette, and then reduce the dislocation by the ordinary manipulation. A tight plaster dressing is then applied to the thorax and leg. Dr. Hoffa has recently informed the writer that he has already operated upon several more cases successfully. He reports 7 cases operated upon by this method: Case one, double congenital dislocation in a girl two years and a half old. The operation was done by the Langenbeck incision, and at first without division of all the soft parts. It was impossible to make the head of the femur descend more than a centimetre and a half. However, when subperiosteal division was made of the muscular insertions into the great trochanter, it was easy to make the head of the femur descend as far as the acetabulum. The acetabulum was slightly enlarged and the head of the femur was replaced, being kept there by strong extension in an abducted position; and, owing to the free division of the parts, it showed no disposition to leave its new place. A slight difficulty was experienced by tension of the anterior soft parts, which was corrected by a transverse incision of the fascia lata. The flap, which had been detached from the bottom of the

* Revue d'Orthopédie, March, 1891.

acetabulum, was turned back and attached to the head of the femur. The wound was sutured as usual and the plaster bandage applied, fixing the limb in a position of abduction. Sixteen days later the wound was healed, and the head was found in the acetabulum with free movement. The great trochanter, moreover, was on Nelaton's line, and the operated leg was 3 centimetres longer than the one which had not been touched. The patient was discharged from treatment two months and a half after operation; and, when seen five months after excision, she could walk all day without any appliance. The characteristic limp had disappeared on the operated side, and the great trochanter was still on Nelaton's line. Nine months after operation the movement in the limb was perfect, and one year after the original operation the left hip was operated upon with the same success. Three months after leaving the hospital, the child was seen walking without appliances, there was no lordosis, and the heads of the femora were not displaced. In short, the case may be considered, so far as it has been reported, as a complete success.

The second case, a girl a year and a half old, with double dislocation, was operated upon as in the former case, and both hips were exposed and the heads of both femora replaced. The two limbs were kept in a position of abduction for a month, when passive motion was begun; and two months after operation the patient left the hospital to have massage and passive movements done at home. When seen three months after operation, the patient could stand without support and solidly, the lordosis had disappeared, and the trochanter was on Nelaton's line. A final examination, made nearly a year after operation, showed that the child could walk without a trace of limp, and she used no support.

The third case was a boy, four years old, with double dislocation. The patient had been treated for a year by the method of Landerer, and the trochanter was 6 centimetres above Nelaton's line. The operation was done on the left

side, and five days later on the right side. The patient died of the influenza, which was prevailing at that time, ten days after the second operation. The autopsy showed pneumonia, w hich was the cause of death. The heads of the femora were very firmly fixed in their new cavities, and a certain effort was necessary to dislocate them. The head itself had preserved the same a ppearance it presented at operation. Where the muscular insertions had been detached from the great trochanter, there were granulating surfaces. The new cavity was round, large, and deep, and admitted the first phalanx of the thumb entirely. It was covered with cartilage, except in a place at the bottom where the round ligament was inserted. The muscular insertions, which had been detached from the trochanter, were attached to it entirely, but a little higher than their original insertion. In short, the condition at the end of ten days showed the heads of the bones in place, and progress being made toward a firm and probably useful joint.

The fourth case was a girl, nineteen years old, with double congenital dislocation. The operation was done on the two sides at an interval of fifteen days, and four months after operation the patient could walk with two canes without a trace of limp. The heads of the bones were solidly in their places and only two months' recumbency had been necessary to obtain this result.

The fifth case was a girl, two years old, with unilateral dislocation. The operation was successful, and the child left the hospital two years after operation, completely cured. She wore, however, a Taylor's splint, in order to prevent relapse.

The sixth case was a girl, six years old, with unilateral dislocation. She left the hospital two months after operation, and is recorded a complete cure.

The seventh case was a girl, two years and a half old, with double congenital dislocation. One side had been operated upon successfully, and the patient had been discharged at the end of a month. The other leg had not been touched.

It is obvious that this series of results is far superior to any set of cases which have been reported. The movements of many of them are recorded as perfect, the limp is said to have disappeared, and, so far as one can judge from the mere record, in operative cases the method should be accounted as a wholly successful one. Hoffa believes that there is no fear of a relapse if one enlarges the cavity enough, to which excavation he attaches extreme importance. Once having reduced the dislocation, he believes that there is little danger of the head of the femur leaving the acetabulum, and with the beginning of movements the head adapts itself still better to the cavity. He quotes the law of Julius Wolff, which is that, when one has re-established normal relations between the bones, after static laws, nature tends to re-establish the architecture and the normal forms. The objection to the operation which Hoffa states himself is that in certain cases no trace of an acetabulum can be found. This amounts to but very little, because it would be very easy to raise the flap of the periosteum at the corresponding place and to chisel an acetabulum, as Ogston has done in his case. Certainly, the operation is so simple and so well vouched for that one would be justified in trying it, especially in unilateral cases.

The writer regrets to state that he has no personal experience in the operative treatment of congenital dislocation, and is merely able to present the literature of the subject, with only such obvious comments as may be made from the study of the cases.

It is a difficult matter to sum up the results of this discussion of the treatment of congenital dislocation of the hip. Mechanical measures are, as a rule, unsuccessful; and only in exceptional cases where the patient is under perfect control can they be advised, and only then when an almost unlimited time is at the disposal of the surgeon and patient, and where the patient can be under control to the end. These cases are, of course, very unusual. On the other

hand, the operative treatment, as a rule, has given unsatisfactory results; and but little can be said in favor of tenotomy as practised by Guérin and Barwell.

Resection of the hip is obviously a measure which is likely to cause a stiff joint, which must cause shortening of the limb, and which in a certain proportion of cases, as can be seen from the table given above, ends in absolute failure.

With regard to the operation of Hoffa it must be said that it is still on trial. All the cases which have been reported are comparatively recent; and in spite of the very favorable showing of these seven cases, until the conclusions of the originator have been verified by the profession at large, it can only be said that the operation should be considered as being on trial, and one of much promise.

## Paralytic Dislocation of the Hip.

A word should be said of a class of hip dislocations which simulate congenital dislocation very closely. These are dislocations due to an anterior poliomyelitis which has destroyed the muscular tissue and weakened the ligaments about the hip, so that a flail-like joint may result by this. These joints are readily amenable to orthopedic treatment; but certain of these patients are not able to carry this out properly, and in these the question of operation comes forward.

Karewski * has operated seven times in cases of paralytic hip dislocations with the best of results. An operation similar to that of Hoffa or even resection would seem to be indicated in these cases.

## Recent Literature with regard to Hip Dislocation.

Krause, 2 cases of catarrhal inflammation of congenitally dislocated joints; Arch. f. Klin. Chir., 1889, xxxix. 477;

* Quoted by Hoffa, *loc. cit.*

Motta, Arch. di Ortop., Milan, 1889, vi. 304; Adams, Br. M. J., London, 1890, i. 406; Clark, Glas. Med. J., 1890, xxxiii. 102; Verneuil, Rev. d'Orth., Paris, 1890, i. 23; Dubreuil, Rev. d'Orth., Paris, 1890, i. 185; Hoffa, Wien. Med. Wchsft., 1890, xl. 926; Poggi, Arch. di Ortop., 1890, vii. 105; Rosenfeld, Münch. Med. Wchsft., 1890, 37, 415, etc.; Paci, Arch. di Ortop., 1890, vii. 151.

The rest of the bibliography has practically been given as references in the course of the section.

## Chapter XIII.

# HYSTERICAL AFFECTIONS OF THE HIP JOINT.

### Pathology.

The appearances are entirely negative except for pallor and atrophy of the muscles of the diseased leg, occasioned by disuse.

### Etiology.

The designation of the diseases of this class as hysterical is more or less unfortunate, and the word neuromisis, or functional affection, is perhaps to be preferred. The disorder is not to be regarded as imaginary, but is due to a disordered nervous and circulatory condition, the character of which is obscure, and the evidences of which are not revealed by microscopic examination. The term functional merely means that there are no evidences of organic disease, and the affection is one of such practical importance that its etiology and treatment deserve consideration. Brodie makes the assertion, which Esmarch indorses, "I do not hesitate to declare that among the higher classes of society at least four-fifths of the female patients, who are commonly supposed to labor under disease of the joints, labor under hysteria, and nothing else." Skey added that this includes a large proportion of the lower classes, and further: "In reference to spinal affections in young persons, I unhesitatingly assert that the real disease is not found in a greater proportion than one case in twenty." In these statements Shaffer agrees, believing neuromimetic joints are exceedingly frequent both in the upper and lower classes, especially at that age when hysteria is most likely to

develop. The cause of the manifestations of these symptoms is obscure. The symptoms, as it is known, simulate very closely those of the real disease, even in persons ignorant of the symptoms of hip disease.

The patients are for the most part young girls or women who are not robust, as a rule. Occasionally, it occurs in connection with overgrowth, and not uncommonly at the age of puberty. In older women it is likely to be associated with ovarian tenderness or uterine disorders. It is not always confined to persons of an excitable, emotional temperament, but it is sometimes seen in persons who might be considered otherwise phlegmatic. It is rarely, however, that it is found without some other symptoms of the condition known as neurasthenia. Most often there is associated with it a nervous condition, with either backache, tingling of the hands and feet, tenderness over the abdomen, or some other sensory disturbance.

It must not be overlooked that, although, for the most part, these affections are seen in young women at or shortly after puberty and in women at the time of menopause, they occasionally occur in young children and in young men. Such cases are not common, but they occur frequently enough to deserve mention.

Perhaps the most constant accompaniment of the condition is a state of disability and ill health, perhaps marked, perhaps only slight.

Hysterical disease is associated in a large proportion of instances with a fall or sprain. In these cases, it seems as if an acute synovitis had occurred, which had been the occasion of real pain, and that on account of some circulatory disturbance the sensation had persisted after the cause for it had disappeared. It is not always the case by any means that these cases are traumatic, but a large proportion of them show this clearly. In other cases, which constitute a still more difficult class, the hysterical symptoms are associated with a certain amount of real disease; that is to say, a

slight ostitis of the hip is exaggerated by the patient into a condition of excessive sensitiveness, so that it resembles the severest hip disease that one would see. In these cases, the affection is more functional than real, and ostitis is to be accounted as one of the causes of functional hip disease.

The place of errors of refraction of the eye in the causation of hysterical joint manifestations ought not to be overlooked. In a certain proportion of cases where functional affections of the spine or hip exist, a myopia or an astigmatism may be found to exist, which, if corrected by proper glasses, will aid much in the treatment of the local trouble.

In a certain proportion of cases, however, it seems impossible to assign any reasonable cause for the hysterical joint affection, and patients may be in what appears to be good health. There is no history of accident, and they may be no more emotional and excitable than the average woman; but the hip disease may nevertheless have occurred, and these cases are set down in the unsatisfactory classification of idiopathic.

In short, apart from traumatism, there is little to be said about the etiology of hysterical hip disease which is different from the etiology of the hysterical manifestations in general, as they affect the same class of people and are subject to most of the same conditions.

## Treatment.

It is exceedingly difficult to lay down any routine treatment for an affection which manifests itself in so many ways as does hysterical hip disease. The general treatment forms an important part, perhaps the most important part in the whole. The general condition is almost always below what it should be, and the *morale* is almost invariably at fault. The remedy of these two conditions requires all the surgeon's skill, and often for its conduct a knowledge of human nature.

In regard to the general condition, a good plan of treatment is, as a rule, that of Weir Mitchell. It consists in the free nourishment of these patients. Even where confinement to bed and isolation are not necessary, additional meals and overfeeding with easily digested substances are of the greatest possible benefit. These rank in their usefulness much higher than the use of any medicine; and the use of drugs, as a rule, should be limited to tonics, and temporarily to the use of nervous sedatives, such as bromide of potash.

With regard to the diseased *morale* of the patient, it must be remembered that the fault lies in a concentration of the attention and of the imagination upon the affected joint. In directing this part of the treatment, it is absolutely essential that the surgeon should be sure of his diagnosis. Temporizing has no place in the treatment, and the treatment that would be proper for hip disease is wrong for hysterical disease; and no middle course of treatment can be adopted which will cover both conditions.

Consequently, the treatment must be based absolutely on the diagnosis, of which the surgeon must be sure. Having assured himself that there is no organic trouble in the hip, the problem is one of diverting the patient's attention from the sensations experienced in the hip. This may be done in one of two ways: by a sudden mental impression, such as is made by charlatans and faith-healers, it is often possible to divert the attention, for instance, by a sudden command to walk, that the patient finds herself accomplishing movements which she had for a long time supposed herself unable to make. It is in these cases the absorption of the sensation in a stronger emotion; but such treatment is not, as a rule, applicable in legitimate medical practice, and an attempt to carry out this treatment and its failure would be obviously disastrous to the future conduct of the case.

With regard to the second and more usual method of treatment: this may be said to consist in a gradual education of the patient into better methods of thinking, by di-

verting the attention from the diseased structure, and by gradually conducting the patient to use the affected limb without regard to the pain experienced. It is obvious for this reason, as has been said, that the diagnosis must be one which can be relied upon. In these cases, it is generally advisable to put the patient to bed at first, with perhaps traction made in the line of deformity. Then either with or without the use of apparatus, as would seem best, the patient is encouraged to walk, perhaps one step; on the next day perhaps two steps may be accomplished, and by gradual careful increase of the exercise the patient is led into the use of the affected limb, without always perceiving the progress which is being made at every step in the treatment. The surgeon's own personal attention is almost an essential to the rapid and successful treatment of these cases.

The problem is, as has been stated, simply to educate the patient unconsciously into the use of the affected limb; and, when this has been accomplished, the pain is less complained of, and with the normal use of the hip the circulatory conditions are improved and the local trouble is diminished, so that the patient ceases to complain of pain, and the normal function seems once more established. Pain must be disregarded as a significant symptom.

It is not possible to lay down the use of any one apparatus for these cases. In some cases, a traction splint or a protection splint may be indicated. In other cases, nothing more than crutches may be necessary. In other cases, plasters and electricity may be applied, whichever will appeal more to the imagination of the patient.

One grand aim of the treatment is to impress upon the patient's mind the fact that the therapeutic measures employed are those which are best suited to her individual case, and, as a rule, to use those which will make the strongest mental impression. In other cases, mechanical, passive and active exercises by Zander's system may be of use.

Gymnasium exercises of a simpler character for the affected limb are also useful when the function has been partially restored, on account of the muscular atrophy which has accompanied the disease of the limb, which gives rise to a feeling of weakness. Massage often is of much use. In short, the treatment must be modified to suit each case, following in general the lines laid down in the earlier part of this section.

One word should be said as to the absolute necessity of the surgeon's having complete control of the patient. Home influences are often much to be blamed as the cause of the affection; and often isolation of the patient is necessary as a therapeutic measure, to cut her off from the ill-judged sympathy of friends and relatives.