inches. Pieces of strong webbing, one or two inches in length, with buckles attached, are sewed to the lower extremities of the plasters. These plasters are then placed on either side of the leg in such a manner as to leave the buckles a little above the ankle-joint, and then so secured by a snugly-adjusted roller as to leave the tabs with the buckles attached hanging loose. The roller is then carried up over the knee, and as far up the thigh as can be done with convenience, when the upper split ends of the strips of plaster are reversed and braided in with the roller as it returns down the thigh, securing it smoothly. The stocking is then pulled up on the foot, holes having been cut on either side for the buckles to pass through, and the shoe applied with holes cut through it in the same way.

The limb now being prepared, the instrument is placed on its outer side, and the cross-bar at the bottom brought in front of the heel of the shoe, and securely buckled to the tabs above described. The pelvis-belt is next brought around the hips, and secured by the buckle upon the opposite side, and the perineal bands are next attached as firmly as may be. The knee-pad band is then slipped up or down until it is made to rest opposite the knee, when it is passed around the leg and buckled. Extension is now made with the key upon the ratchet until free compression is borne without pain, and the patient can walk without cane or crutch. (*See* Fig. 195.)

If the limb is adducted, the abducting screw can be used, daily increasing the tension for the purpose of abducting the limb.

If the limb be strongly inverted, the eversion-screw can be used, the force being gradually applied for the purpose of rotating the foot outward; and, if the thigh is strongly flexed, the force exerted by the elastic band upon the posterior part of the splint can be applied for the purpose of producing extension.

In case you are not able to obtain either a short or long splint, it is possible to treat the case successfully by means of the bed-extension alone. Another method is, in addition to the bed-extension, to make extension by increasing the weight of the shoe worn upon the foot of the affected limb, and permitting the patient to go about on crutches. This can be done by running lead into the sole of the shoe. In such a case you will be obliged to increase the length of the sound leg by making the sole of the shoe considerably thicker. In this manner the patient can be up

and around a portion of the time, sufficient, at least, to relieve him from the bad influence of continued confinement in bed. By using the wheel-crutch, manufactured by Darrach & Co., and the weight in the bottom of the shoe, in addition to the bed-extension, the patient can be made very comfortable indeed.

These are methods which may be resorted to when proper splints cannot be obtained.

LECTURE XXII.

DISEASES OF THE JOINTS.—MORBUS COXARIUS (CONTINUED).

Treatment (continued.)—Treatment for the First Stage.—Treatment for the Second Stage.—Treatment for the Third Stage.—Case illustrating Treatment of Advanced Hip-Disease without Complete Exsection.—Indications for Exsection.

GENTLEMEN: At my last lecture we studied the principles which should guide us in the local treatment of hip-disease, and I also gave you a description of the apparatus and the manner of their application, by means of which you are to carry them into practical operation.

Now, for the sake of clearness, let us return, and to-day consider separately the treatment to be adopted in each stage.

What, then, is the treatment for the *first stage?*

Local depletion by means of leeches or cups is often necessary. The bowels should be kept free.

Such constitutional remedies are to be employed as may be requisite in each particular case.

Such general support should be given as the system seems to demand. Issues in this stage of the disease are worse than useless, and do harm instead of good. The only good they ever have effected can be explained by the fact that they made the parts so painful the patient was compelled to keep more quiet than he otherwise would have done. The occasional application of iodine or a blister may be of some service; but in a majority of cases I have found the application of leeches and ice to be much more beneficial. The most important of all the means to be em-

ployed, and the one upon which all prospect of success depends, is *rest of the joint and perfect freedom from pressure of the inflamed articular surfaces.* If left to itself, the rest which is so essential to the joint is procured by the firm muscular contraction which prevents motion, and this is so perfect, in many instances, as to assume the appearance of genuine bony anchylosis. But such *constant* muscular contraction exhausts the nervous system, presses the head of the femur against the acetabulum, and produces absorption of both.

I therefore at once resort to artificial means for overcoming the muscular contraction, thereby removing pressure from the parts involved in the disease. For this purpose I most commonly employ the extension by means of weight and pulley, while in bed, and the short splint, unless, for certain reasons, the long splint is preferable, while the patient is taking exercise. This apparatus has been already described, with the mode of application, in our last lecture.

If there is a great deal of tenderness around the joint, and other evidences of inflammatory action are present, it is altogether better to first place the patient in bed, and apply the simple extension by weight and pulley, and let him remain in this position until the inflammatory action has to a considerable extent subsided. This may be facilitated by the application of leeches or ice, or both, as already indicated, and the administration of such remedies as the case may demand.

When the inflammatory action has been subdued, the short or long splint may be applied, and the patient permitted to go about.

If the patient is uneasy, restless, irritable, and does not bear the extension apparatus well, he may with propriety be placed in the wire cuirass (*see* Fig. 190), or other fixed apparatus. But I must again warn you of the danger of permitting the patient to wear such fixed dressings too long. If employed at all, they must be frequently removed, and passive motion employed, else anchylosis, more or less complete, will take place, and the last state of the patient may be worse than the first.

Again, the deformity, even in this stage, may be so great as not to permit of the immediate application of the splint. In such cases you must place the patient in bed, and apply extension first *in the line of deformity*, and then gradually, day by day,

bring the limb toward the normal position, and, when this has been nearly or quite reached, the splint may be adjusted and the patient permitted to get up. Sometimes it happens that the muscles have become so firmly contracted that they will require subcutaneous section before the limb can be brought into its proper position.

It should be your aim to bring the limb as soon as possible into a proper position, so that the splint can be used, for, when it is applied, pressure can be removed from the articular surfaces, motion permitted, and the patient is in a condition to obtain all the benefits of sunlight and fresh air. Even if the splint cannot be worn more than two, three, or four hours each day, the change of position, the moderate exercise, the sunlight and fresh air which the patient is able to obtain without endangering the diseased joint, will be of more benefit to him than all the medicine in the world.

In very many cases the bed-extension and the splint can be applied at once; one to be used at night and stormy days, and the other to be worn when the weather is pleasant, so as to permit the patient to be out-of-doors.

Change of air, from the sea to the interior, and *vice versa*, and from low valleys to the mountains, and from the mountains to the sea, is very essential.

Next, what is the treatment for the *second stage?*

The treatment of this stage necessarily differs according to the condition of the joint and the character and quantity of its contents. If the disease is simply subacute in character, the joint not disintegrated, the effusion small in quantity (recognized by the small degree of malposition and limited motion), slight but permanent extension comes first. This can be accomplished by the extension apparatus already described. Extension is employed for the purpose of counteracting the morbid contraction of the muscles, and to relieve the pressure upon the articular surfaces of the joint, and is to be persisted in until the more prominent inflammatory symptoms have subsided. Here, again, the extension must always be made *in the line of the deformity*, and gradually changed until the limb is brought as nearly as possible into the normal position.

The continuous extension in bed, preparatory to the application of the splint, will be more frequently required in this than in

the first stage, and, when the normal position of the limb has been reached as nearly as possible, the instrument may be applied, and the patient allowed to take out-door exercise. If the inflammatory action is somewhat active, repeated but *moderate* depletion by means of leeches or cups, pressure by means of adhesive straps, and a mild mercurial treatment both internally and externally, will assist in subduing it, and promote the absorption of the fluid. This treatment will be applicable in a majority of cases, but there are those in which the inflammation is so violent, and the pain upon the slightest motion so intense, that *absolute* rest will be required for a time. For such cases, the wire cuirass is almost indispensable, especially in small children. If the inflammation is very acute, indicated by local pain, heat, and general constitutional disturbance, and the patient has a vigorous constitution, the cause being clearly traumatic, and suppuration not yet begun, I deem an *energetic* antiphlogistic treatment to be the safest method of subduing the inflammation.

In such cases, the effusion may act as a new excitant for the perpetuation of the inflammation; consequently, if the joint becomes distended beyond endurance, causing great local trouble, and reflects detrimentally upon the general system, the prompt removal of the fluid becomes absolutely necessary. This operation never fails to give immediate relief from all the more prominent symptoms, and restore rest and comfort to the patient. In fact, it is the only anodyne that will perfectly relieve the pain under these circumstances. By removing this intolerable pressure we simply imitate Nature, who accomplishes the same thing by spontaneous rupture of the capsule.

The accumulated fluid in such cases can be safely removed by means of the aspirator. In case you have not an aspirator at hand, a small trocar may be used with a canula, to which is attached an air-tight syringe, that acts upon the same principle as the stomach-pump. A small trocar and canula *may* be employed, but much greater care is necessary in its use, lest air should enter the cavity and become imprisoned. The operation by means of the trocar and canula is to be performed in the following manner: The patient should be placed upon the healthy side, and an anæsthetic administered to obviate the pain caused by moving the limb in the manner necessary to expel the fluid.

The most favorable place for puncture is immediately behind

the middle line of the femur, and *above* the large trochanter, close to the superior margin of the tendon of the gluteus maximus muscle. At this point we can enter the hip-joint just above and in front of the digital fossa. The canula should not enter the joint, perhaps more than one-eighth or one sixteenth of an inch. This is particularly to be borne in mind, when it becomes necessary to use an ordinary trocar and canula, for the moment the capsule has been punctured the trocar is to be withdrawn, and the affected limb steadily inverted, adducted, and rotated over and across the opposite limb for the purpose of completely removing the fluid from the joint. This position should be retained until the canula is withdrawn, the wound carefully closed by adhesive plaster, and the joint carefully surrounded by compress and long adhesive straps, which will exercise pressure and prevent air from entering the vacuum that will be created when the limb is returned to the straight position. The patient should then be secured in some apparatus—the wire cuirass (Fig. 169) is most convenient—which will prevent the possibility of motion. Besides the rest, a low diet and a moderate antiphlogistic treatment may be necessary for a few days. When the fluid has been removed by the aspirator, as in the manner just described, reaccumulation very rarely takes place; but, if it does, the operation may be repeated with safety.

If the fluid removed from the joint is *purulent* (which might have been ascertained previous to the operation, by a careful analysis of the constitutional symptoms), the question arises whether the pus is simply the product of synovitis, or whether it is associated with ulceration of the cartilage and caries of the bone.

With very few exceptions, when there is ulceration of cartilage and bone, we find more or less crepitus, which can be easily recognized by rotating the affected limb after the fluid has been withdrawn. In the absence of crepitus, especially if this disease is of but short duration, we are justified in presuming that the case is simply one of suppurative synovitis; hence we may give the patient a chance of recovery without any further operative procedure.

If, however, we can satisfy ourselves that the articular surfaces have become ulcerated, the cartilages disintegrated, and the bones eroded, which is indicated by the presence of a crepitus peculiar to itself and altogether different from the crepitus of healthy

bone, we consider *exsection* of the joint not only justifiable, but in most instances absolutely essential.

When other joints have been found in a similar condition, more especially where the disintegration has gone on only to a limited extent, I have freely opened them, passed setons through them, injected them with iodine, and thereby obtained satisfactory results.

In many instances I have had perfect recovery, with free motion. But the principle of incision seems not to be applicable to the hip-joint, since its conformation, its deeply-seated situation, and investment with soft parts, obstruct the free exit of the discharge.

In fact, the hip-joint can hardly be said to be freely opened without removing the head of the femur, which fills it completely.

Finally, what is the treatment for the *third stage?*

In this stage there is invariably rupture of the capsule or perforation of the acetabulum. Rupture of the capsule may take place from over-distention with the products of inflammation, such as serum and lymph; or it may follow ulceration of the cartilages and bones, in which case the contents will be purulent. These two conditions differ from each other very widely, for in the former the contents of the capsule escape into the cellular tissue, thereby relieving the pressure within the joint, consequently the most prominent symptoms, and are finally removed by the absorbents or discharged. Inflammatory adhesions will frequently form about the joint, and the limb will be left in malposition, but a spontaneous cure may be effected. Such cases are by no means rare, and it is this fact, probably, that has led many surgeons to rely upon the simple efforts of Nature, more than upon surgical art, to effect a cure. Nor do I propose any active interference; but, on the contrary, I only suggest that Nature should be assisted by mechanical appliances in her efforts to bring about this spontaneous cure. The object of such appliances is merely to relieve the joint from pressure, by permanently extending the morbidly-contracted muscles, and at the same time securing its perfect mobility, together with a normal position of the extremity. When the cure has been effected by the unaided efforts of Nature, it is invariably accompanied by deformity, and that deformity, in a large number of cases, is dependent upon false or fibrous anchylosis. This result was formerly considered the most satisfactory termination that could be expected, but even

this has been brought within the reach of surgical art, and is susceptible of perfect relief; for division of the contracted muscles implicated in the deformity, and breaking up the adhesions by force, while the patient is under the influence of an anæsthetic, followed by proper orthopedic treatment, have in numerous instances removed the deformity, and restored motion and usefulness to the limb. (*See* Case, page 256.)

When, however, ulceration of the cartilages and bone is present and is accompanied by purulent effusion, we have a very different condition of affairs to deal with, consequently our surgical procedure must vary accordingly. In this condition spontaneous cures are extremely rare, and, if we deduct from them the cases of periostitis that have been mistaken for caries affecting the hip-joint, the number will be still further reduced. Indeed, a careful examination of many cases, in my own practice and in the practice of others, has led me almost to doubt whether it ever occurs. We can hardly be surprised at this when we consider the many natural obstacles to a free discharge of the detritus, thereby almost invariably creating new disease in such tissues as it may come in contact with. It is in this manner that the disease is perpetuated, because of the inability of Nature to establish a sufficiently free opening for the removal of the parts already destroyed. Nature, unaided, has only one efficient method for curing caries, and that is by gradual exfoliation and removal of the dead bone, establishing healthy granulations in the sound portion, thereby substituting for the part removed fibrous and oftentimes ossifying structure. This process is extremely slow, and may require even years for the removal of a comparatively small fragment of bone. In this morbid specimen you see here, kindly furnished me by Dr. Janeway, the disease had been in existence eighteen years, and yet, as you see, the removal of the dead bone had not been quite completed. But, if these patients do spontaneously recover, after advancing thus far in the disease, deformity is always present, unless the very greatest care is exercised in retaining the limb in a proper position while recovery is taking place.

It is from Nature's method, however, that we are to deduce the principles that are to govern us in the treatment of these cases. These principles have long been recognized and practically adopted by the profession, for exsection of other joints for the

cure of caries and necrosis is an operation of daily occurrence. But, strange to say, caries affecting the hip-joint has, until within a few years, been excluded from the list of cases to be benefited by this operation, and by many surgeons the operation of exsection is discountenanced at the present time.

The question now arises, How are we to determine whether in a given case the operation of exsection should be performed?

If you find that the discharge is diminishing, the general health of the patient improving, and that the limb can be brought into a position in which it will eventually be of service, it is better to permit the case to go on, and allow the cure to be completed by the gradual exfoliation and discharge of dead bone, according to Nature's method, than to resort to the operation.

In these cases, however, you can do a great deal to assist Nature by dilating the sinuses leading to the dead bone with sponge-tents, and, if necessary, making free openings in various directions, and inserting drainage-tubes of India-rubber or oakum setons, thereby facilitating the ready and complete exit of the discharge.

This was done in the case you now see before you, and, by those who saw the case previous to treatment, the result can be readily appreciated.

Case. *Hip-Joint Disease of Eleven Years' Standing; Excessive Suppuration; Exfoliation of Numerous Pieces of Bone; Great Distortion and Fibrous Adhesions; Numerous Sinuses still discharging; Tenotomy; Forcible Improvement of Position; Sinuses dilated and Dead Bone removed; India-rubber Tubes drawn through the Limb from Side to Side; Extension, Abduction, and Rotation-Splint; Recovery with Moderate Amount of Motion.*—Nellie A., aged thirteen, was brought to me at Bellevue Hospital, December, 1873, in the condition seen in Fig. 172. The right limb was firmly adducted across the left thigh, and fixed by fibrous adhesions; eleven sinuses in different parts of the thigh led to necrosed bone, which was detected by the flexible probe (the sinuses being tortuous, an ordinary probe was useless in the examination); a deep cicatrix extended from the crest of the ilium down through the groin and back upon the outer portion of the thigh, very nearly encircling the limb; another hardened cicatrix passed from the anterior superior spinous process of the ilium down below the trochanter major, and then curved in a

V-shape back to the outer portion of the thigh, meeting the first cicatrix described; in these cicatrices there were various sinuses through which the probe could be passed in different directions.

Fig. 172.

The mother stated that, when the child was two years of age, she fell down-stairs, striking upon her right hip, which resulted in a few months in a severe inflammation of that joint, ending in abscesses, which have been discharging more or less for the last ten years.

During the first year of her suffering, the limb was apparently longer, and turned outward; but, after the large abscess formed on the outer part of her hip, the leg turned inward and was shorter. She was much more free from pain after this than she was during the commencement of the disease, but she became very much emaciated and exhausted from the excessive discharge. All kinds of internal medication had been resorted to, but no efforts had been made to prevent the distortion and deformity.

As she was unable to walk in such a condition, she was sent to me for the purpose of having exsection of the hip-joint performed.

Upon carefully examining the case, I found that Nature had, during these eleven years, nearly succeeded in removing all the dead bone, and, as there was so much deposit around the parts as

to render exsection difficult, if not dangerous, I determined to dilate the sinuses, and thus aid Nature in the removal of the remaining dead bone, and, by tenotomy and section of the contracted fascia, endeavor, by force, to improve her position, rather than take the risk of performing exsection. This operation was performed at the time before the class, the limb forcibly abducted and extended, and secured in the normal position by making a long splint, extending from the axilla to the foot, with a cross-piece, some three feet long, at the bottom. This splint was secured to her well side, by bandages, the foot being firmly placed against the cross-piece. A pulley was placed at the end of the cross-piece, over which the cord from the adhesive plasters upon her diseased leg was run, and a six or eight pound weight was attached. This weight was increased or diminished according to her feelings, thus keeping up constant extending and abducting forces. The hip was enveloped in cloths wet with cold water; but, finding that these gave great pain, large hot poultices were substituted for them, which afforded much relief. The sinuses were dilated with sponge-tents.

In a few days several of the sinuses had become so much enlarged that small pieces of bone were readily picked out with the forceps, and three weeks after the first operation a large flexible probe was passed from the outer portion of the thigh, about an inch above the trochanter major, down through the limb, making its exit through one of the sinuses near the perinæum. A perforated India-rubber tube was threaded through the eye of the probe, and drawn through this canal, and is still worn (as seen in Fig. 173), although there is no occasion for it, the discharge having long since ceased; but the girl having derived so much benefit from its use, insists upon still wearing it—like an ear-ring, more for ornament than use. Within a few months after this tube was passed through the limb, all the other sinuses gradually closed, and have remained so.

Four months from the time of the tenotomy and *brisement-forcé*, I applied to her one of my long splints, with abducting and rotating screws, modified in such a manner as to be slipped into the sole of her shoe, like a spur in a gentleman's boot, by which means the necessity of applying adhesive plaster to the limb was avoided. It also had a joint, at the knee, capable of permitting flexion in the sitting posture, but becoming stiff in

the erect position, and with it applied, and the sole and heel of the shoe elongated to match the opposite leg, she is enabled to walk without cane or crutch, as seen in Fig. 173, and is perfectly healthy.

This patient was last seen December 1, 1875, when the photograph from which Fig. 174 was cut, was taken.

There is no discharge from *any* of the sinuses, and no necessity for wearing the drainage-tube. Has grown very much and

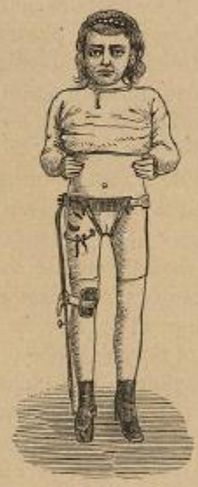

Fig. 173.

Fig. 174.

is in perfect health; has some motion at hip-joint; can flex, abduct, and extend her leg to a considerable degree.

If, notwithstanding this treatment, the discharge does not diminish, but rather increases; if symptoms of progressive caries develop in the part; if the disease, instead of improving, progresses in spite of all your efforts to subdue it; the general health of the patient is daily becoming undermined, and there are no symptoms indicating repair, the only justifiable treatment left for the surgeon is exsection of the joint. Nature cures these cases by exsection, but the patient very frequently dies before the operation is completed, in consequence of exhaustion produced by the long-contin-

ued discharge. It is for this reason that the operation is justifiable. More can be done in half an hour with the knife and saw, in the way of removing dead bone, than can be done by Nature in many years; hence I urge that it is the duty of the surgeon to exsect the joint, thereby removing the patient from the dangers attending long-continued suppuration. It would seem, to an unbiased mind, that the same therapeutical indications might be applicable to the hip-joint, so far as exsection goes, as to any other joint. In fact, it is my firm conviction that caries of the hip-joint, by reason of the impending danger of perforation of the acetabulum, requires more prompt and decided surgical interference than when it manifests itself in any other joint of the body. The operation is not only justifiable, but imperatively demanded. No less an authority than Prof. Syme has made the assertion that, "if the acetabulum be *carious*, the patient *must* die." We can therefore lose nothing by the operation if this be true, but will, on the contrary, invariably procure comfort for the patient. But the assertion is not true, for in the majority of cases, as shown by my own statistical table, the patients have had their lives saved. Nor is that all: we not only save the life of the patient by the operation, but we also restore form and motion to the limb. Of course you must not expect that every case of exsection will prove successful. In one case, the disease may be so associated with constitutional vitiation that a mere local operation will not eradicate it. In another case destructive processes may have gone on to such an extent as to preclude the possibility of removing all the diseased tissues.

In all such cases the disease will probably proceed to a fatal termination. But when the disease is chiefly local, the constitution not yet undermined, and its extent so limited as to admit of its entire removal by the knife, saw, and gouge, and when we can have the advantage of proper air and diet, I am certain that this operation, if performed at the proper time, offers the best possible chance for recovery.

It is now twenty years since I performed the first successful exsection of the hip-joint in this country. And at that time the operation was very severely censured by nearly the entire profession. But the numerous cases in which perfect success has been obtained have proved its feasibility, and it is now quite generally considered as justifiable. From this I now feel like

making the prediction that by the time the entire profession has accepted it as a justifiable operation, surgeons will know sufficient concerning hip-joint disease and its treatment to render the operation entirely unnecessary; for a thorough knowledge of its pathology, etiology, and very earliest symptoms, will lead them to such an early recognition of the disease as will enable them to treat it in a manner that will obviate the necessity of exsection. At present, however, we are obliged to perform the operation in those cases where proper treatment in the earlier stages has been neglected, and must therefore study the method in which it should be done. To this subject we shall turn our attention at the next lecture.

LECTURE XXIII.

DISEASES OF THE JOINTS.—MORBUS COXARIUS (CONCLUDED).

Treatment (continued).—Exsection.—History of the Operation.—The Operation described.—Mode of dressing the Limb after the Operation has been performed.—After-Treatment.—Tables of Exsections appended.

GENTLEMEN: The history of EXSECTION, for the relief of hip-joint disease, lies within the present century.

The possibility of removal of the upper extremity of the femur was first suggested by Mr. Charles White, in 1769; but the first surgeon to attempt the operation in morbus coxarius was Schmalz, in 1816. In his case the head of the bone was found loose, and simply required removal. The cases of Selitching,[1] Hoffmann, Batchelder, and Klinger, were similar to that of Schmalz.

In 1818 Anthony White performed his celebrated operation, which has generally been referred to as the first successful exsection of the head of the femur in morbus coxarius.

From 1818 until 1845, it appears that the operation was performed by only two surgeons, namely: Hewson, of Dublin, in

[1] Selitching's case was one of exfoliation and not exsection, and is the first case of this description ever reported, as far as I can discover. It occurred in 1720.—*See* "Philosophical Transactions" for 1742.