

others have advised, and successfully carried out in certain cases, a method of operative treatment by cutting down upon the bone and removing the diseased portion of the epiphysis by the chisel or curette, without sacrificing the joint. Such a method, however, is possible only in early cases, and in cases in which the joint proper is as yet unaffected. These cases are rare, and are recognizable only through the help of the x-ray.

Amputation.—Of the still more radical method of amputation little need be said here (see *Amputation*) except that, in cases of extreme hip disease, it is often to be regarded as a life-saving measure. The percentage of mortality of amputation for hip disease is not so great as that of amputation for injury or malignant disease.

Ashhurst* says that in 34 cases of primary amputation at the hip-joint for hip disease and in 31 cases after excision, he found 19 deaths. The death rate of amputation after injury is 70.9 per cent., and for the disease in general 42.6 per cent.

Wyeth† and Levison‡ show a mortality for the operation by Wyeth's method of 11 in 85 cases, *i. e.*, 15.29 per cent. In the Children's Hospital, Boston, there were 3 cases, and the operation was successful in all, but later 2 patients died of amyloid disease.

In cases of disease of the acetabulum, in which the head of the femur is but little involved, excision of the head of the femur alone is of little benefit. Excision of the acetabulum is a formidable undertaking with a heavy percentage of mortality. As a substitute for this, the following procedure has been tried in a few cases: The joint is cut down upon, and the head of the femur pulled from its position and placed upon the dorsum. A large drainage tube made of celluloid is placed through the incision, long enough to reach to the acetabulum, which is wiped with strong carbolic or corrosive; any sequestrum which may remain is to be removed. If the drainage tube is allowed to remain, the carious acetabulum can be dressed frequently, thoroughly drained, and the bone is free from irritation caused by the rubbing of the head of the femur upon the acetabulum. This procedure is of value only in the severest cases. It will be found that pain will be relieved and the patient given a chance for recovery.

The limb after the operation is secured by a plaster-of-Paris spica. Shortly after the operation the patient can be allowed to walk about on crutches. Correction of the resulting deformity is deferred until all sinuses are healed.

It will be found that in cases of extreme sensitiveness of the hip, in the early stages without much destruction of bone, where night cries are insistent, that these can be relieved by securing the limb in a forced flexed and abducted position, using a plaster-of-Paris spica, including the leg, thigh, and trunk. The patient is kept in bed and the limb is slung from above. This places the limb in a position unfavorable to spasmodic action of the muscles, which action is instrumental in causing night cries. After a few weeks the limb can be brought down to the proper position and treated as is possible in a subacute stage.

Treatment of Complications.—**Abscess.** In certain cases of hip disease the epiphysitis is either so diffuse or so slight that the cicatricial process follows the inflammatory process of the bone without undue cell proliferation; but in others the tuberculous focus is neither encapsulated nor absorbed, but is sloughed out, and, causing an irritation, an abscess follows. This again may be absorbed or it may require treatment.

Simple cold abscesses secondary to hip disease can with safety be left to themselves, if not causing constitutional disturbance or increasing rapidly. It is desirable, however, that pus should be prevented from burrowing or extending in a great variety of directions. This can, in a measure, be done by bandaging the limb, and is done if an extension splint is worn efficiently; the pus being checked from extending along the sheath of the fasciæ by

* Int. Encyclopedia of Surgery, vol. vi., p. 501.
† Wyeth: Ann. of Surgery, xxv., 1897, 127.
‡ Levison: Jour. Am. Med. Assn., June 24th, 1899, p. 1428.

the resistance caused by the perineal strap and the pressure of the padded plates. If the abscess extends, it is well localized in a large majority of cases, and can extend only outwardly.

Aspiration is of assistance in many instances; in some, however, either the fluid contained in the abscess does not flow readily through the aspirating needle, or the latter is directly plugged by the caseous clots. In some instances abscesses have been entirely absorbed after one or two aspirations.

Injection of iodoforn into an abscess cavity or hyperdistention by carbolic-acid solution have been recommended. The latter involves the occasional risk of carbolic-acid poisoning, which may be fatal.

Abscesses that are well localized, if allowed to open spontaneously, are often thoroughly evacuated, leaving a sinus which, discharging for some time, finally heals. Often, however, the abscess is not completely evacuated. Some residue remains, and, gravitating along the lines of fasciæ, gives rise to another abscess, and in this way several may be developed about the joint. It is better in such cases to open the original abscess freely, so that thorough drainage is furnished—large incisions being better than small. If that is done, with thorough asepsis and proper dressings applied, it is not uncommon, when active disease of the bone has subsided, for such abscesses to heal up entirely by first intention, without recurrence or sinus. To gain such results two things are essential, *viz.*, thorough drainage of the whole abscess and perfect asepsis. It is, of course, necessary that thorough treatment for the osteitis be not interrupted.

Nocturnal Cries. A troublesome complication in the early stages of hip disease is often the nocturnal cry. This usually disappears after thorough fixation with distraction. In some instances, however, the cries persist for weeks or months. They are likely to disappear in the second stage of the affection; they can be checked by opiates, narcotics, chloral, or chlorodyne, if not stopped by proper fixation. Stretching the sciatic, trephining the head of the femur, and direct incision of the joint have been advised and tried with success in aggravated cases of this sort.

Distortion. Distorted attitudes of the limb are incident to the clinical history of hip disease, and the correction and prevention of them form an essential part of treatment. In the earlier stages of the disease there is little difficulty in correcting the existing deformities due to abnormal muscular contractions or malpositions of the limb—the ordinary treatment of hip disease being sufficient to correct deformity. If distraction is applied in the line of the deformity, in the early stages of the disease, it will be found, in a few days, that the limb can be placed in a more nearly normal position until it eventually becomes straight.

The deformities occurring are flexion, abduction, and adduction. Flexion can be corrected by efficient traction in the line of the deformity, as already mentioned. It will be found that a traction splint is more efficient for this purpose than the simple weight and pulley; the patient should be fixed in bed, a traction splint applied, the flexed limb raised to the angle of deformity so that the back is flat, and, if necessary, the weight and pulley may be attached to the splint in order to give additional fixation to the limb. It will be found that each day the angle of deformity is less and the limb can be lowered. Flexion can also be corrected by means of the Thomas splint bent to fit the flexed limb and gradually straightened. In the severe cases rest in bed hastens the correction in this way.

Abduction usually corrects itself under the ordinary treatment for hip disease, or is changed to adduction in the natural course of the disease.

The same may be said of adduction, but this latter distortion is often more persistent. It can often be corrected by the ordinary weight-and-pulley method, with fixation in bed. The correction can be helped by counter-extension applied to the well limb, by means either of a perineal strap or of a weight-and-pulley arrangement attached

to the sound limb, and pulling at the head of the bed in opposition to the force on the affected limb pulling at the foot of the bed. The result of the two forces is to correct the adduction.

In later stages of severer deformity forcible straightening under an anæsthetic, with or without division of the adductor tendons and the division of the fasciæ lata, or with division of all fasciæ by open incision, is of help.

Of all the operative procedures subtrocantartic osteotomy is the preferable one in bony ankylosis with deformity.

In cases of deformity with fibrous ankylosis, correction can be made by mechanical means, but in the severest cases much time and patience are required.

In cases with subluxation and absorption of the head of the femur and enlargement of the acetabulum the deformity entailed is necessarily permanent so far as the alteration of the bone is concerned, but the accompanying flexion and abduction can be corrected. Subluxation and the attendant distortion should not occur in the course of hip disease, as they are preventable, and their presence indicates a lack of thoroughness of treatment.

Shortening of the Limb.—Shortening of the limb after hip-joint disease and after excision occurs in a certain number of cases without satisfactory explanation; the shortening is not limited to the femur, but occurs also in the tibia and fibula and the foot. Nothing can be done to prevent this arrest of growth. Prevention of the development of the disease and such use of the limb as is compatible with safety of the joint (inducing proper circulation in the limb) may be regarded as the only means at our command.

PROGNOSIS OF HIP DISEASE.—Judging from the limited statistics at our disposal, the prognosis of hip disease in regard to life and to recovery of a useful limb is encouraging, but a long time is required in all cases.

Cazin reports that in 80 cases of suppurative hip disease treated at the hospital at Berck, in the course of five years, 55 per cent. were cured, 12.5 per cent. died, 25 per cent. were not cured, 7.5 per cent. were improved when removed. Cazin has seen recovery in desperate cases. In 15 cases of suppurative coxitis with albuminuria, 5 were fatal under conservative treatment, 2 were discharged improved, 6 not improved, and 2 cured.

These cases of Cazin were, all but 10, severe cases, sent from the Paris hospitals after they had ceased to improve there.

In 150 cases of Gibney, Waterman, and Reynolds in the Hospital for Ruptured and Crippled in New York, 107 were cured. Of these 107, 21 cases had no shortening, 7 had one-quarter inch, 12 one-half inch, 24 one inch, 22 one to two inches, 9 two to three inches, 4 three to four inches, 1 six inches.

Of 288 cases collected by Gibney, there was a mortality of 12.5 per cent. from exhaustion, meningitis, and amyloid degeneration. C. F. Taylor, of New York, has reported 94 cases in private practice, with only 3 deaths; 24 of these cases were suppurating, and of these 17 fully recovered.

Hueter reports the mortality of hospital cases at 27 per cent., and Billroth at 31 per cent.

Shaffer and Lovett* investigated 51 cases of cured hip disease which had been discharged from the New York Orthopedic Dispensary at least four years previously, and found that 41 had remained cured. Of the remaining 10, 4 had died and 6 had relapsed, although 5 of the latter had been apparently cured a second time. The above cases were under treatment as follows:

2 years.....	4 cases.	4 years.....	8 cases.	6½ years.....	1 case.
2½ ".....	4 " "	4½ ".....	2 " "	7 ".....	1 " "
3 ".....	9 " "	5 ".....	2 " "	8 ".....	1 " "
3½ ".....	6 " "	6 ".....	1 case.		

In estimating the chances of an individual case, not only the severity of the disease has to be considered, and the amount of resistance or recuperative power on the

* New York Medical Journal, May 21st, 1887.

part of the patient, but also the amount of intelligent and skilled care possible in the case for a long time.

In few diseases is the benefit of thorough and long-continued treatment more clear, and in few surgical

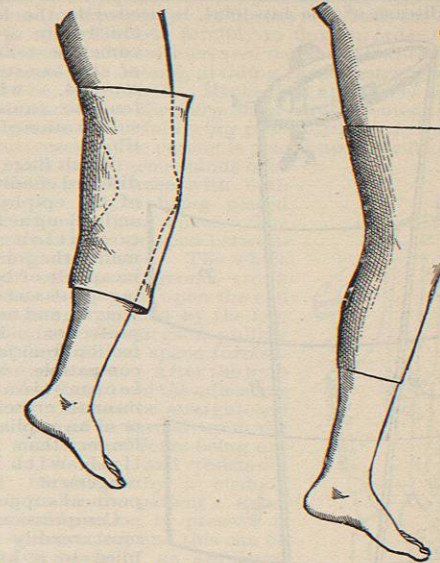


FIG. 3039.—Imperfect Fixation of the Knee by Plaster Bandage.

affections can the surgeon attempt to check the progress of disease and influence recovery with greater probability of success than in hip disease; but the surgical care and supervision should not be limited to the acuter stages of the affection, but should be continued during the convalescent stage if the best results are desired.

KNEE-JOINT.—In considering diseases of the knee-joint, the varieties—synovitis, osteitis, etc.—have to be much more sharply borne in mind than is true of other joints, as these different diseases are clinically more easily distinguished and more common, and the differences more important. The methods of treatment common to all joints—*viz.*, fixation, distraction, protection—are especially needed in affections of the knee. Fixation can be carried out in the knee-joint with much thoroughness. Effective fixation can be accomplished by means of stiff splints, by stiff bandages, plaster silicate, starch, etc.

The splint or bandage should be as long as possible in order to overcome the lever action of the segments of the limb above and below the joint. An additional reason for making the appliance of sufficient length is found in the fact that the thigh is well covered by soft tissues, and a certain amount of motion is possible owing to the yielding of the soft parts (Fig. 3039). Osteotomy may be necessary in bony ankylosis at a flexed angle (Fig. 3040). Distraction of the knee-joint is practicable in a relaxed

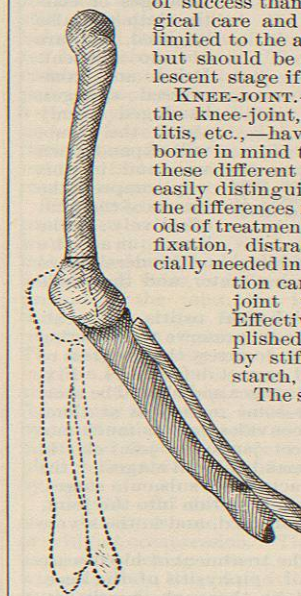


FIG. 3040.—Osteotomy for Deformity with Ankylosis. (After Hoffa.)

(Fig. 3039). Osteotomy may be necessary in bony ankylosis at a flexed angle (Fig. 3040).

Distraction of the knee-joint is practicable in a relaxed

condition of the ligaments and capsule. In a healthy knee-joint it is impossible to separate the tibia from the fibula owing to the strength of the lateral and crucial ligaments.

Counteraction of the reflex muscular spasm, so important in disease of the hip-joint, is needed in the knee chiefly to overcome the tension of the hamstring muscles, which tend to cause a subluxation of the tibia.

When there is a diseased condition of the epiphysis, and as long as that condition remains, the joint is incapable of bearing pressure or weight, and needs protection. Protection from jar is compatible with locomotion by means of crutches, or of an appliance longer than the limb, with arrangement for perineal support.

Compression is most readily applied to a knee-joint by means of a thin rubber bandage wound about the limb; bandages of elastic cloth can also be used, but are not so efficient. Dried and compressed sponges, bandaged firmly about the limb, will expand when wet, and in this way compress the tissues of the joint effectively; or the knee may be

thickly covered with sheet wadding and binders' board made pliable by immersion in hot water, and the whole bandaged firmly.

Tuberculous Ostitis.—In epiphyseal ostitis the treatment requires the greatest care to preserve the function of the joint as far as is possible, to arrest the progress of the disease, and to prevent and correct deformities. Fixation is demanded in the acute stages and should be thorough; in the subacute stages some motion is at times allowable, and in the stage of convalescence as much motion as is possible without direct jar to the joint should be allowed. Protection is demanded in all stages of the disease, and distraction in the acute and subacute stages. Aspiration of the joint, incision, injection into the joint, counter-irritation, may be all indicated, and in the severe cases excision or arthrotomy.

What was said in regard to the treatment of hip disease may be repeated in speaking of epiphysitis of the knee-joint. The treatment should be thorough, persistent, and should meet the indications. Fixation and protection are the most important indications in diseases of the knee, distraction being less so. The employment of protection should be continued until it is certain that the epiphysis is normal, a matter of judgment in every case. Protection should be discontinued gradually and tenta-

tively; if discontinued too soon, recurrence will take place, or the deformity at the limb will increase. Fixation should be used so long as there is any activity of the inflammation; this is indicated by pain, muscular spasm, or tenderness. Efficient fixation of the knee does not require confinement to bed.

Protection can be furnished by means of crutches, raising the sound limb by a thick sole, and allowing the affected limb to swing clear of the ground. Better protection is furnished by means of a splint (with perineal support) longer than the limb and passing under the foot so as to take the jar of locomotion (Fig. 3041). The best of these splints is one similar to that already described as a protective splint in hip disease. It can be readily set at the angle of flexion of the knee and straightened as the limb straightens, and distraction can be added to the splint if necessary.

A simpler appliance is the Thomas knee-splint, which consists of a padded iron ring fitted so as to surround the thigh at the perineum, and fastened to two rods, one on each side of the limb, longer than the limb and secured at the bottom to a metal plate below the foot (Fig. 3042).

In cases of extreme disease of the knee-joint amputation of the thigh is necessary as a life-saving measure. In less severe cases the limb may be saved by excision (for the details of this procedure the reader is referred to the article on *Resection*). As for the indications determining a choice between excision and amputation, it can be said that where the patient's reparative power is slight an amputation is to be preferred. The question is largely one of individual judgment.

One danger from excision in children is that of arrest of the growth of the limb, from removal of the epiphy-

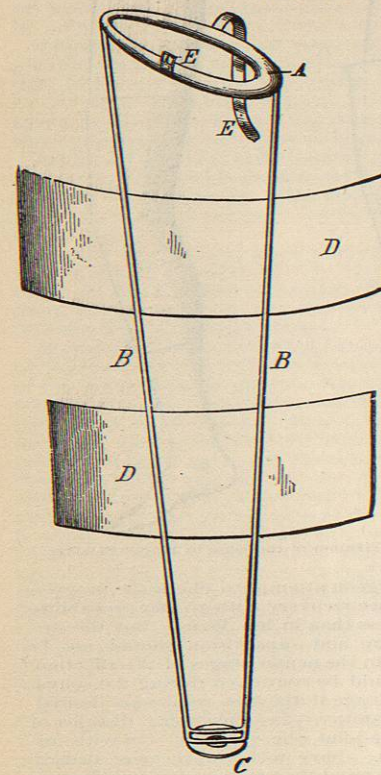


FIG. 3041.—Protective Splint for Knee and Ankle. (Thomas' Knee Splint) for right leg. A, Perineal ring; C, foot piece; D, leather lacings; E, straps to go over shoulder.

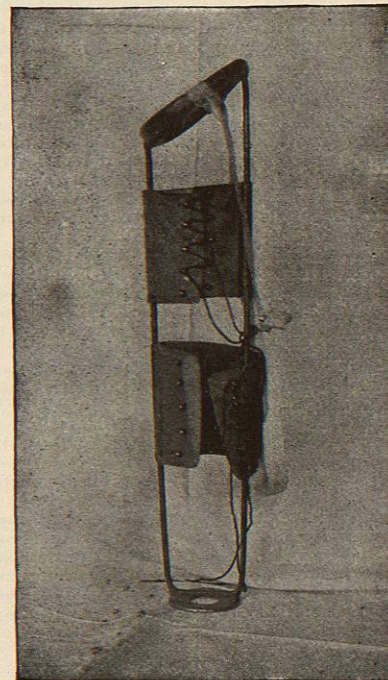


FIG. 3042.—The Thomas Knee Splint. (Children's Hospital Report.)

sis. For this reason excision has been advised in children as a substitute for excision. The joint is opened as in cases of excision, and the whole synovial membrane as far as it is tuberculous should be dissected out; if carious spots are found in the bone these foci should be removed

by the curette or chisel. If the whole epiphysis is diseased excision is of course unavoidable, but in many cases this is unnecessary. Schede, Volkmann, and others have reported excellent recovery with complete healing without suppuration in a few cases of this sort, and similar success has followed the procedure in two cases in the practice of the writer. Strictest asepsis is essential, as well as a thorough removal of all tuberculous tissue in the affected joint, necessitating sometimes complete dissection and removal of all of the synovial membrane, as well as careful curetting of the bone. The patella should be removed or left according to its condition. Either two straight incisions, one median incision, or a cross incision may be used. The patella may be divided and subsequently wired, or the ligamentum patellae cut across. All tuberculous tissue should be removed by the chisel, curette, or scissors.

Statistics in regard to the ultimate results of treatment of disease of the knee are unfortunately of little value as a guide in the consideration of proper treatment of disease of the knee-joint; it may be said that aseptic surgery has materially improved the chances of recovery after excision, and that conservative treatment in children gives most excellent results in cases which can be watched and treated for a long time. The following figures are given by Willemer of cases treated in the course of seven years at the Göttingen Clinic (see *Deutsche Zeitschr. f. Chir.*, 1885, Bd. 21, Heft 4):

The treatment was fixation by plaster-of-Paris bandages preceded by extension, and with or without incision of abscesses, curetting, etc.; or by resection, partial or complete; or amputation. Of the patients *not operated upon*, in three years, 19 per cent. recovered, 15 per cent. died, 66 per cent. were still under treatment. In four years, 26 per cent. had recovered, 17 per cent. had died, 57 per cent. were uncured. At the end of five years, including all cases operated on or not, 29 per cent. remained uncured, 11 per cent. had been amputated (with a mortality of 60 per cent.), 37 per cent. had been resected (with a mortality of 51 per cent.), and 13 per cent. were well without operation.

It should be borne in mind that these figures represent hospital cases, presumably cases treated under more or less unfavorable circumstances.

Periarticular abscesses are to be treated in the same way as cold abscesses are treated in connection with other joints.

The results of conservative treatment of the tuberculous knee-joint may be excellent, but in severe cases a long time is necessary. In adults the prognosis of the conservative treatment of severe cases is much less satisfactory. The reverse may be said of excision.

Prevention and Correction of Deformity.—The deformity most frequently accompanying chronic epiphyseal ostitis is flexion; this can, in the early stages of the disease, be easily corrected by manual straightening under an anæsthetic, by a pulling force with a weight and pulley, by a distraction splint, by bandages and a fixation splint, or by repeatedly applied plaster bandages. If the deformity, flexion, remains uncorrected for some time in severe ostitis of the knee-joint, a subluxation of the tibia backward takes place, due to the contraction of the hamstring muscles. If an attempt be made to straighten the limb, the head of the tibia is held in its subluxated position by the contracted hamstrings in the posterior capsular ligaments, and if the leg is brought into the direction of the thigh the head of the tibia will be found behind its normal position and an ugly deformity will have resulted. This can be prevented only by a forward force exerted on the head of the tibia, pushing it around the end of the femur as the limb is straightened. Various appliances have been used for this purpose, and by the use of long-continued and persistent effort correction can be effected by proper splints (Fig. 3043).

In angular ankylosis at the knee resection for correction of the deformity is not without danger. Poinot collected seventy-seven cases, with a mortality of eight per cent. This was, however, before the days of aseptic

surgery, for the same writer collects thirty-six operations and no death when aseptic precautions were used. For the correction of deformity which has persisted for some time, forcible straightening under an anæsthetic is often necessary; or, in cases of bony ankylosis, osteotomy or excision (see *Resection*). In fibrous ankylosis the readiest way to correct is first forcibly to flex (in order to break up adhesions without increased danger of rupture of the artery) and then extend, dividing the hamstring tendons, if need be, beforehand. Mechanical appliances are often recommended for the purpose of straightening, but are unnecessary if the following procedure be carried out in difficult cases. The patient is placed upon the floor on his back, and the surgeon stands over him holding the knee with both hands, the fingers being placed under the popliteal space. The patient's ankle is grasped between the surgeon's knees. The whole weight of the surgeon's trunk can then be thrown upon the end of the lever furnished by the leg, the hands of the surgeon pulling upon the popliteal space furnishing the resistance. After the limb is forcibly flexed and the adhesions are broken, it can be straightened if the patient is turned upon the face; a downward force being applied to the heel, and resistance being furnished by a cushion placed under the patient's knee. When subluxation is present it must be corrected, and this can be done by means of an appliance which will, however, be needed only in extreme cases.

After correction of the deformity, the limb should be well surrounded with soft cotton and a stiff bandage applied, the limb being held straight until the plaster has become hard. The procedure is sometimes followed by pain, and opiates are necessary for a few days. In the lighter cases no such force is required, but the limb can, under an anæsthetic, be brought into position by manual manipulation.

The dangers incurred by this procedure are not so great as would be supposed. Such a violent procedure should not be undertaken if there is inflammation present at the joint, but in the early acute stages little force is required to straighten the limb. The danger of rupture of the artery can be avoided by care. Separation of the epiphysis of the femur may take place, but is cured by the fixation requisite to treatment, and should not occur if the force is carefully applied. Fracture of the femur and tibia can be avoided by care.

Synovitis.—In chronic synovitis without effusion thorough fixation is needed in the early or acuter stages, with or without compression. The application of cold by ice-bags, evaporating lotions, cold douches, or the cold coil will often be a help, and in some instances hot cloths or poultices relieve pain. Counter-irritation, by means of tincture of iodine or blisters, and cauterization, are of doubtful value except as expectants.*

In chronic synovitis with serous effusion the treatment

* For the treatment of acute synovitis the reader is referred to the article *Synovitis*.

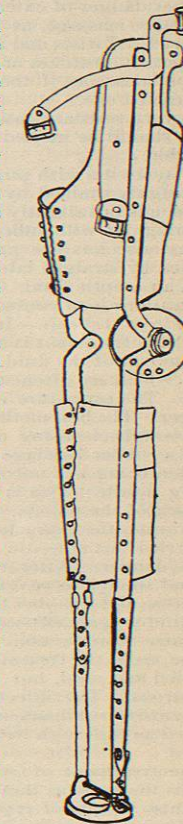


FIG. 3043.—Splint for Traction on Knee at any Angle.

is primarily to cause the absorption of the fluid by means of compression and fixation. Besides this, distraction and protection—one or both—are needed if there is danger of extension of the disease to the bone or cartilage, and fixation if there is any activity of disease; the choice of massage, of passive motion in later stages, or of fixation, is a question of judgment in each individual case, it being borne in mind that motion is a normal function of a joint, and that massage may be supposed, by temporarily improving the local circulation, to promote the absorption of synovial edema or its results, and, on the other hand, that anything which increases the inflammation in a joint, like ill-judged motion, is an injury.

When the inflammatory stage is passed and there is no further danger of extension of the disease to the bones or cartilage, massage, as well as passive exercises, may be allowed. Twists and sudden jars are to be avoided, and protection (crutches or splints) is advisable in the stage of convalescence if the attack has been at all a severe or protracted one.

In very resistant cases of simple chronic synovitis the joint should be incised and explored to find a cause if possible.

In synovitis with purulent effusion the joint should be thoroughly drained by incision and washed out. If the effusion is but slightly purulent, aspiration and thorough washing out will suffice. If, however, the pus is thick, or caseous clots are present, the joint should be freely opened by straight lateral incisions and well washed out with an aseptic fluid. The observance of strict aseptic precautions is of course necessary.

Hydrops Articul.—In hydrops articuli (water on the knee) the treatment is such as would promote absorption or removal of the fluid. Besides friction and compression, which are often sufficient, aspiration is of great service. The procedure may be considered to be free from danger. The best method of applying is as follows: after a thorough cleansing of the skin, the knee is bandaged with a rubber bandage to exert slight pressure, a small portion being left uncovered for the insertion of the aspirating needle. This is best done at a little distance from the side of the patella. The size of the needle should depend upon the character of the fluid; if thorough aseptics is carried out a needle of large size or a trocar is free from danger. After the joint has been aspirated, the wound should be covered with a piece of aseptic gauze or cotton and a rubber bandage applied over the knee. If the fluid is again effused, the joint can again be aspirated.

When reproduction of fluid takes place, injection of iodine, as in the treatment of hydrocele, has been recommended and used, but sometimes the results have been disastrous. The injection of carbolic-acid solutions, or of corrosive-sublimate solutions, is apparently efficacious, as well as thorough irrigation of the joint already mentioned.

The treatment of chronic rheumatoid arthritis of the knee is the same as that of the same disease elsewhere, as may also be said of syphilis and gout. In some cases of chronic rheumatoid arthritis protection is sometimes of use, distraction is not necessary, and fixation should be applied only temporarily. Massage, hot applications, and electricity may be of benefit.

Loose Cartilage.—There are two methods for removal of loose cartilage at the knee: (1) The open incision, introduced by A. Paré, discarded by later surgeons, including B. Bell, who preferred amputation of the thigh, and revived again since the introduction of aseptic surgery; (2) the subcutaneous extraction, which is done as follows: the foreign body is pushed into the external upper cul-de-sac and held by the finger of an assistant under the triceps tendon, and by help of another kept from slipping up. An incision is then made with a tenotome in the subcutaneous tissue, directly under the synovial cavity, and in the synovial wall, directly under the foreign body, which is forced out into the cellular tissue; two weeks later the loose cartilage is removed by direct incision. The difficulties of the second step, namely, removal of the cartilage from the cellular tissue, are great,

and several modern surgeons prefer the direct incision on account of the technical difficulty of the indirect method (*Revue de Chirurgie*, 1881, No. 1).

In removal of a loose cartilage by direct incision, an incision is made at the side of the patella, where the loose body is to be felt; the strictest asepticism is to be observed.

Displacement of the Semilunar Cartilage (internal derangement of the knee-joint) is the result of a sprain, and the symptoms and treatment are those of sprain at the knee with synovitis.

In the severest cases an anæsthetic is necessary in order to restore the cartilage to place, but after the cartilage is replaced by manipulation of the joint immediately after the accident, the knee is to be flexed to its fullest extent, the tibia pulled upon as if to draw it away from the femur, and rotated; the limb is then suddenly straightened, the operator pressing upon the displaced cartilage at the same time. The cartilage sometimes returns to its place with a snapping sensation, but often without the patient's consciousness. Frequently the patient learns, by a sudden twist of the limb, to replace the cartilage himself. In recurrent cases of dislocation it is necessary to remove the cartilage by direct incision.

Slipping of the Patella.—Occasionally, owing to an injury to the lateral fasciæ, or to a loss of tension of the quadriceps extensor muscle, the patella slips to the side, interfering with locomotion, and causing discomfort. The treatment has been spoken of earlier.

ANKLE-JOINT.—In the treatment of the most formidable affection of the ankle-joint, viz., tibio-tarsal ostitis, protection from jar is especially indicated, as will be readily seen, if it be borne in mind that in locomotion the whole weight of the body is borne at each step upon the comparatively small surface of the articulating portion of the astragalus. Fixation of the ankle in a stiff bandage and allowing the patient to walk upon the limb, is a manifest error, occasionally made possible through confusion of a simple synovitis, which at certain stages needs fixation, with ostitis, which should be protected from jar at all stages. Protection can be furnished either by means of crutches, or, more thoroughly, by means of protective splints with perineal supports. Protective splints, described for the knee-joint, are needed in ostitis of the ankle.

Fixation is of advantage in the acuter stages of the affection, and is readily furnished by means of stiff bandages.

If abscesses form, they should be incised. In cases of tuberculous disease of the ankle, with extensive disease of bone, the decision to persevere in conservative treatment, or to resort to operative interference, is one which is based largely upon the patient's age, and the circumstances of attendant care.

In children, the results of conservative treatment are fairly satisfactory.

In adults, however, the treatment is much less satisfactory in advanced cases. Excision or amputation is not infrequently demanded in the worst cases.

Operative interference consists of curetting the sinuses or the removal of the diseased tarsal bones. It will be found that the latter procedure gives much the more satisfactory results when the ostitis has become so extensive as to have occasional sinuses; if it has involved a greater part of the astragalus; and if the curette is unreliable as a means of removing all the disease.

Chronic Synovitis of the ankle-joint is chiefly the result of sprains, and the treatment should be the same as that commonly used in the sprains of the ankle, viz., fixation, compression, massage, passive motion, occasionally protection; and the period of time required for the employment of these several methods varies according to the severity of the attack and the condition of the patient.

Fixation is readily furnished by stiff bandages, and compression by a rubber bandage. Care should be taken that the pressure comes upon the proper part of the ankle, and not upon the most prominent part, viz., the malleoli. The parts requiring pressure are the depressions in front

and behind the malleoli, and these should be filled with pads of cotton or felt, so that the pressure of the bandage shall fall upon the capsule of the joint, and not chiefly on the malleoli; if there is much swelling at the ankle, this precaution is not necessary; but as the swelling subsides the malleoli become more prominent, and would bear the chief pressure of the constricting bandage.

In severe chronic synovitis of the ankle-joint the indications are for rest, fixation, and, if swelling be present, compression. In cases in which there is danger of extension of the disease to the astragalus or tibia, protection is advisable.

In the lighter cases of synovitis of the ankle-joint, or after the inflammatory stage has passed, the need of perfect fixation is not present, and massage, with protected or graduated motion, will be found of great benefit.

METACARPO-PHALANGEAL JOINTS.—In chronic affections of the joints of the anterior part of the foot and of the toes, it is often desirable to allow locomotion without jar at the joint, and to avoid the incumbrance of crutches or of appliances.

The sole devised by Mr. Thomas, of Liverpool, seen in the accompanying diagram, will answer the indications

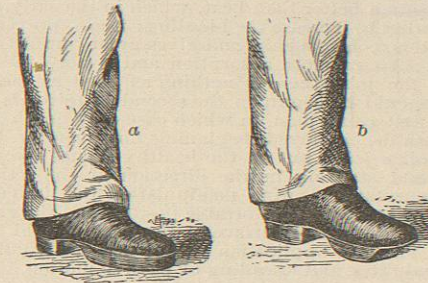


FIG. 3044.—Shoe for Metacarpal Disease.

of protection and fixation, at the same time allowing locomotion (Fig. 3044, a).

The shoe worn by the Chinese, with a thick stiff sole, cut away at a slant at the toes, answers the same purpose (Fig. 3044, b).

It is important, as a preventive measure, that shoes which are too short or which crowd the toes, should be avoided; the foot should also be prevented from slipping forward, crowding the toes against the front of the shoe. This can be done by properly lacing the shoe against the instep and ankle, and furnishing a sole of sufficient length.

SHOULDER-JOINT.—**Chronic Synovitis.**—In synovitis of the shoulder-joint with any active inflammation, the indication is simply for rest and fixation. These are readily secured by means of a sling, and a bandage securing the arm to the side. Compression will be needed if there are swelling and effusion, and this is effected by surrounding the joint with cotton, and covering the whole by a felt or hard-rubber shoulder-cap, which is firmly bandaged to the arm or shoulder.

Fixation should not be continued longer than there is subacute inflammation, and can be gradually discontinued; the bandage which holds the arm to the side being first discarded, and then later on the sling.

The question of the use of forcible passive motion in the convalescent stage is a vexed one. When the adhesions are chiefly periarticular, or confined to portions of the joints, and are firm, forcible motion under an anæsthetic will be necessary; but in the majority of slight cases gradual passive exercises will suffice.

If the fixation is due to muscular spasm chiefly, forcible passive motion will be of no use, as the spasm reflex to the inflammation at the joint will reappear, after the anæsthetic is withdrawn, as long as the disease of the joint remains.

Local applications are to be used at the shoulder-joint for the same reasons and indications as at other joints.

Ostitis.—In tuberculous ostitis at the shoulder-joint, the indications for treatment are practically the same as those present in chronic synovitis.

Distraction is not indicated in disease of the shoulder, as, owing to the laxity of the joint, the weight of the dependent arm, if kept at rest, is sufficient to separate the humerus from the opposing bone surface of the scapular articulation.

Abscesses are to be treated in the usual way. In the severest cases, excision of the shoulder is indicated, and excellent results are attained.

ACROMIO-CLAVICULAR AND STERNO-CLAVICULAR ARTICULATIONS.—Fixation and expectancy are all that can be done for these joints. Fixation can readily be secured by retaining the arm, as in disease of the shoulder-joint.

ELBOW-JOINT.—Synovitis of the elbow-joint recovers usually under fixation, which is readily obtained by fixation splints, internal angular splints, external angular splints, or a lateral splint to which the arm is strapped or bandaged. These splints can be made of tin or pasteboard, reinforced with iron or wire (telegraph wire), or wood, and should be fitted to the arm bent to a right angle. Compression can be effected by surrounding the joint with cotton and bandaging it with an elastic rubber bandage. In time fixation by splints can be discontinued, and the support of a sling alone be relied on, with passive exercises and massage. In cases of ostitis the treatment is the same, except that a much greater length of time is required, and abscesses needing to be incised may supervene.

In the severest cases, excision offers the readiest chance of cure.

WRIST.—The treatment of disease of the wrist-joint is to be conducted on the same principles as that of the other joints, and consists chiefly of fixation, by means of palmar splints, and compression. It may be mentioned, in regard to tuberculous ostitis of the wrist, that excision, till recently rejected as an unjustifiable procedure, is of more assistance than has hitherto been supposed. It is, of course, indicated only in the severest cases. Excellent results have been obtained by this procedure, chiefly in adolescents and young adults.

OTHER JOINTS.—Diseases of the sacro-iliac articulation, and of the temporo-maxillary articulation, are treated elsewhere in this work (see under *Sacro-Iliac Disease*, and *Jaws*, etc.) The treatment of the remaining joints requires no especial mention.

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JOINTS, INJURIES TO.—The injuries from which joints suffer are dislocations, sprains, contusions, and wounds. Dislocations are considered elsewhere; the other injuries are the subjects of this article.

SPRAINS (Distortions).—A sprain is a severe wrenching of a joint followed by stretching or tearing of one or more of its ligaments with effusion of serum or blood into the joint cavity, the extra-articular tissues, or both. They are caused as a rule by the same sort of violence, though in lesser degree, as that which produces dislocations; that is, by forced movements carried beyond their physiological limits, or by movements at variance with the normal mechanism of the joint (Tillmans).

Sprains are most common in early and middle life, and they occur frequently in joints that have previously suffered from sprain, in persons with undeveloped muscles, relaxed ligaments, or deformed limbs. Sprains of the ankle-joint and wrist-joint are most common owing to the relation which these joints bear to locomotion and prehension; the articulations of the foot, especially the calcaneo-astragaloid and the medio-tarsal, and the metacarpophalangeal joints also suffer frequently and for the same reason. The knee is sprained much less frequently than would be supposed from its relation to locomotion and the weight of the body, and the *enarthrodia*, owing to their wide range of motion and the strong muscles surrounding them, seldom suffer from sprains.