

TREATMENT OF INDIVIDUAL JOINTS.

HIP-JOINT.—The indications in treatment of tuberculous disease of the hip are to furnish, severally, fixation, distraction (extension), protection for the benefit of the patient's general condition: to prevent and correct deformity; to allow locomotion as far as is compatible with the surgical indications, and to meet such complications as periarticular inflammation, abscess and sequestra, as may arise.

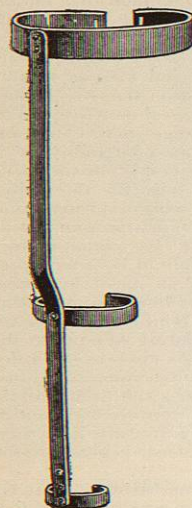


FIG. 3022.—Thomas' Hip Splint, Single. (Ridlon.)

Treatment, it is manifest, should be adapted so that it can be continued not only during the active and subacute stages of the disease, but also during the convalescent period, and until the affected joint is able to stand the jars incident to locomotion without fear of recurrence of the disease.

Fixation.—The means generally used for fixation are: 1. Plaster-of-Paris bandages, or leather and metal splints applied to the hip, pelvis, and thigh, for fixation. 2. The Thomas splint. 3. Gouttière de Bonnet, "wire cuirass," or some modification of it.

Plaster bandages furnish an imperfect form of fixation: owing to the necessary expansion and contraction of the thorax in respiration it is impossible to hold the thorax firmly, and, owing to the mobility of the lumbar spines, the pelvis is able to move within the bandage, thus allowing motion of the acetabulum and distortion of the limb.

Thomas Splint. The Thomas hip-splint, introduced by Mr. Thomas, of Liverpool, is an appliance used in England, and has many points of usefulness (Fig. 3022). It does not, however, furnish complete fixation, nor does it prevent the occurrence of subluxation, or counteract the spasmodic muscular contraction of the muscles connecting the lower extremity with the pelvis—so important a feature in hip disease.

The appliance, however, prevents motion of any noticeable amount, enables the patient to be lifted without jarring the hip, and prevents flexion of the thigh. In certain acute cases the pain may be increased by the Thomas splint, from the fact of the imperfect fixation furnished. The leg and thigh are firmly held by the appliance, *i.e.*, by the flat rod, to which they are bandaged. This rod extends up the trunk, and cannot be so firmly fixed to the trunk but that some motion is possible at its upper end, as the patient turns in bed or moves. Motion of the upper end of the rod is, of course, communicated to the lower, and the joint may, in this way, be twisted and jarred by the long lever attached to the thigh (Figs. 3023 and 3024).



FIG. 3025.—B. Specimen from Excision of Hip Treated by Efficient Traction for Three Years. (Operation done because of failure in general condition.) A. Specimen from excision of hip when traction had not been employed. In severity and duration the disease was similar to that of B.

Wire Cuirass. The Gouttière de Bonnet, or wire cuirass, furnishes excellent fixation. It is, however, cumbersome and expensive, and has the defect of not thoroughly giving the benefit which can be afforded by distraction, in relieving the increased intra-articular

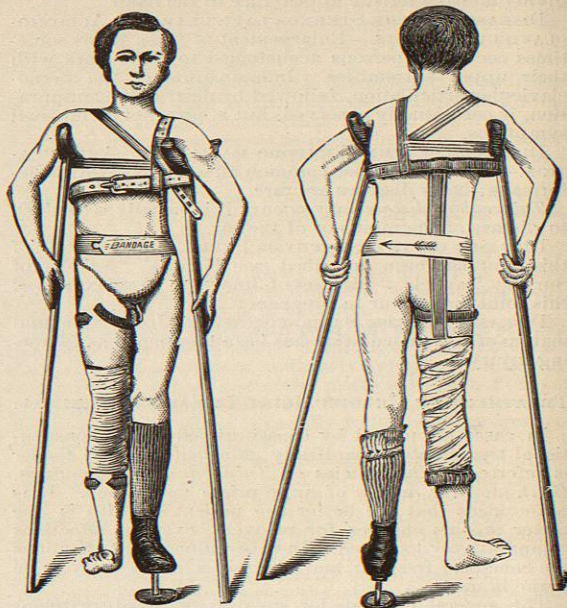


FIG. 3023.—The Thomas Splint Applied. Front view. FIG. 3024.—The Thomas Splint Applied. Posterior view.

pressure. A distracting force can be added, making the appliance of service. The difficulty of manufacture and the expense of the apparatus render it of less use than simpler arrangements.

Distraction.—All the above methods of attempted fixation overlook the injurious influence of muscular spasm of the muscles about the hip, in spasmodically jarring the hip-joint, and in exerting an undue pressure by crowding the inflamed epiphysis of the femur against the acetabulum. This reflex spasm of the muscles about a joint is constant in all inflamed joints surrounded by muscles. It is of special importance in hip disease, from the strength of the muscles about the joint. Such spasm prevents rest of the joint, increases the pressure on the inflamed bone, causes distortion of the limb, absorption of the head of the femur, enlargement of the acetabulum, and subsequent subluxation of the femur. The force of the pressure can be estimated if we consider the great strength of the muscles extending from the pelvis to the femur. A sudden spasmodic

blow, and unless this is overcome, no attempt at securing rest of the joint is complete. To counteract this injurious muscular force, a pull upon the femur away from the acetabulum is necessary. This is often instinctively attempted by patients, who press the foot of the well limb on the dorsum of the foot of the affected side, in the endeavor to force the limb away from the acetabulum (Fig. 3025). The influence of a distracting force has been denied by some writers, who claim that it is impossible to draw the femur away from the acetabulum. This is not only disproved by clinical experience, in the relief afforded by a distracting force properly applied, but the distracting effect of such force has been demonstrated by experiment (Bradford and Lovett, Children's Hospital Report, 1895). The head of the femur is held close to the acetabulum by the cartilaginous collar (cotyloid ligament), which is a prolongation of the acetabulum. In a healthy hip-joint, if all muscles are dissected away, it will be found difficult, if not impossible, to pull the femur from the acetabulum, if the pull is exerted in the line of the trunk; if, however, the limb is abducted, and a pull exerted in a direction not counter to the strength of the ligament, actual distraction takes place.

contraction of all these muscles drives the head of the femur against the acetabulum with the force of a sharp



FIG. 3026.—Traction in Hip Disease.

In a fetus, or young child, distraction is easy from a downward pull in almost all directions, for the cotyloid ligament of a fetus is not well developed. In hip disease the cartilage becomes softened and practically absorbed, and therefore cannot offer the resistance to distraction which is to be met in a healthy joint.

If a distracting force be applied with the limb strongly adducted, the head of the femur is brought against the rim of the acetabulum. This is not the case if the limb is slightly adducted, or if the acetabulum has not attained its normal adult development. But in well-marked hip disease in children, with softening of the cotyloid ligament and imperfectly developed acetabulum, distraction is as feasible as at the metacarpo-phalangeal articulation of the forefinger, where the bones of the joint can easily be separated by traction.

The effect of distraction can be readily estimated by any surgeon, if, in excision of the hip, before dislocating the head of the femur, the finger is placed on the head of the femur close to the rim of the acetabulum. If an assistant pulls upon the limb, the finger can be inserted between the head of the femur and the acetabulum. If the traction is discontinued, the pressure upon the finger will be found to be considerable. This pressure does not, of course, indicate the pressure due to muscular force, which is obliterated under an anæsthetic.

A distracting force can be applied therapeutically, by means either of the well-known weight and pulley method, or of distraction splints.

The former method of distraction or, as it is commonly termed, "extension," is frequently employed, and is often of great assistance, but it is often inefficiently applied.

- The following mistakes are not uncommon:
1. The use of a weight too small to counteract the muscular spasm at the hip.
 2. The neglect of a counter-extending force, or the use of an imperfect one.
 3. Imperfect hold upon the leg and thigh.
 4. Improper fixation of the patient's trunk and limb, allowing motion so that the distraction will fall upon the knee and not upon the hip-joint.
 5. The use of the pulling force in such a direction that the force is not exerted in the line of deformity.



FIG. 3027.—Patient on Ward Wagon, with Arrangement for Fixation and Traction.

(a) The amount of weight to be used should vary according to the case; the patient's sensation may be trusted in a measure. In cases of severe spasm as much as twenty pounds will be found to be well borne in light cases, and in small children four or five pounds will be ordinarily sufficient.

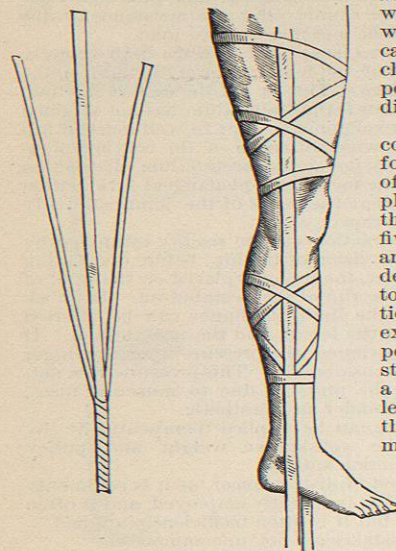


FIG. 3028.—Adhesive Plaster for Traction.

(b) The readiest counter-extending force is the weight of the body employed by raising the foot of the bed five or six inches, and causing a tendency of the body to slide in a direction opposite to the extending force. A perineal strap or straps attached to a weight and pulley, or fastened to the head of the bed, may be used.

(c) The best way to obtain the hold upon the limb for an extending force is by means of adhesive plaster applied as is indicated in the accompanying diagram. It should be applied firmly to the thigh above the knee, so as to secure efficient traction upon the condyles of the femur. If applied to the leg alone, distraction falls upon the knee, and may cause relaxation of the knee-joint. Efficient plaster should be used, of a kind that will adhere readily without being heated. The plasters should be changed every three or four weeks, or oftener if they cause irritation. They can readily be removed, if the skin and plasters be thoroughly moistened with benzoin.

If any portion of the limb is chafed by the plaster, it may be protected by means of a cloth placed over the part, and the plaster reapplied over the cloth and the whole limb; or if the chafing is extensive, the whole limb can be covered with vaseline and protected by a smooth bandage, and the plaster put on over the bandaged limb. This will require frequent renewal, but will answer temporarily. It is usually the practice to apply a bandage over the plaster, but this impedes the circulation, and increases the danger of eczema or chafing. If a bandage be applied, and worn for a few hours after the plaster is first put on, sufficient adhesion of the latter will be secured if proper plaster is used.

(d) If the patient be allowed to roll about in bed, or sit up, or to hold the limb flexed at the knee, it is manifest that no proper distracting force is used. The patient, if restless, should be secured by the use of shoulder straps fastened to the bed, and by the use of sandbags; or, better still, he may be restrained by means of the bed frame to be described.

(e) The ill effect of a pulling force not in the line of the deformity, in acute stages of hip disease, is evident; the psoas and iliacus muscles being contracted by the spasm incident to the disease, the thigh is flexed. If an attempt is made to force the limb down, and traction be made in the line of the axis of the body, the head of the femur is crowded upward to the anterior edge of the acetabulum, by the force applied at the end of the lever, viz., the femur, the attachment of the psoas and iliacus muscles, holding the limb flexed, furnishing the fulcrum. In milder stages of the disease this is not so important as in the acuter stages, but it is a mechanical error in any stage to attempt distraction except in the line of the deformity (Fig. 3029).

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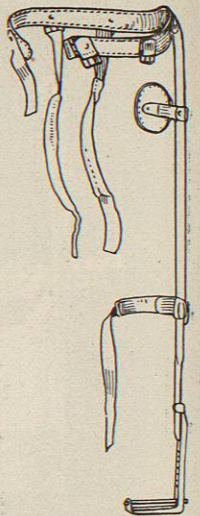


FIG. 3030.—Long Traction Splint. Slightly Modified. (Fiske Prize Fund Essay.)

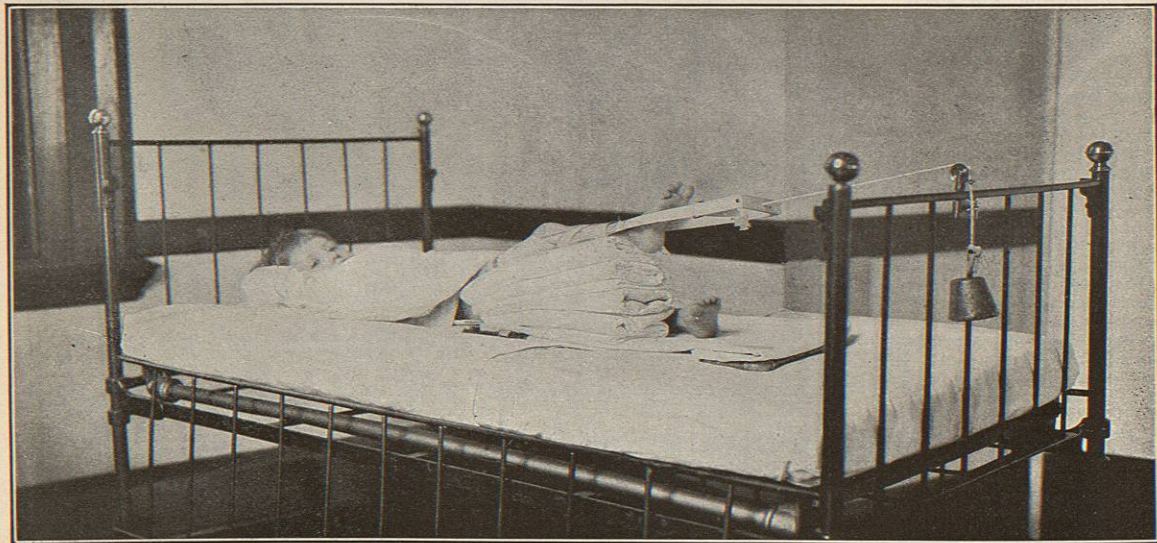


FIG. 3029.—Patient in Bed on Fixation Frame, with Traction in Line of Deformity.

Distraction Splints. A number of appliances have been devised for the purpose of "distraction," the principle of which is practically the same, viz., perineal resistance with a pulling force exerted on the limb. As in most appliances, however, the details of the application of these principles are of so much importance that the efficacy of such treatment will depend on the details (Figs. 3030 and 3031).

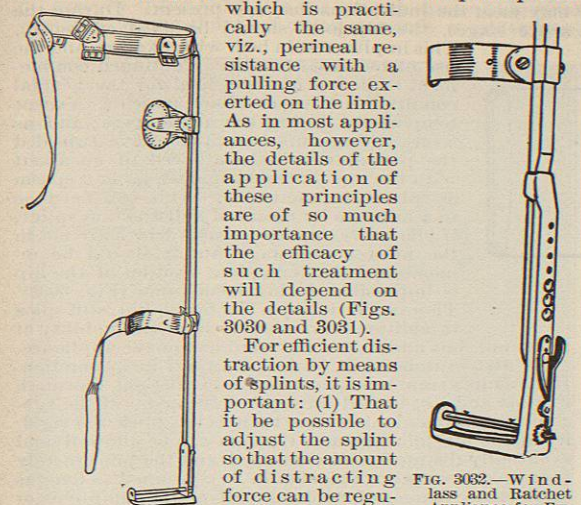


FIG. 3031.—Long Traction Splint. (Fiske Prize Fund Essay.)

For efficient distraction by means of splints, it is important: (1) That it be possible to adjust the splint so that the amount of distracting force can be regulated and properly applied. (2) That the perineal resistance be arranged so that great pain shall not be caused in that way if efficient force is applied. (3) That a proper hold upon the limb be possible for some time. The latter has already been discussed in speaking of the weight-and-pulley method.

The perineal resistance should be so fixed that the perineal straps do not constrict the thigh. The straps should not be elastic and yielding, giving an uncertain resistance, and they should be made of proper material and padded, so that they do not wrinkle or cut at the edges. If the perineum be well anointed with vaseline, and the straps be properly made and padded, no serious trouble need be encountered.*

The first of the essentials of treatment above mentioned is easily accomplished, usually by means of a sliding rod moving within a tube, the amount of motion being controlled by means of a key and ratchet, a spring securing the rod when in the proper position. This constitutes the well-known Davis

* An excellent modification of the perineal strap to be used, devised by Dr. Brackett, will be found described in the Boston Medical and Surgical Journal, October 6th, 1887.

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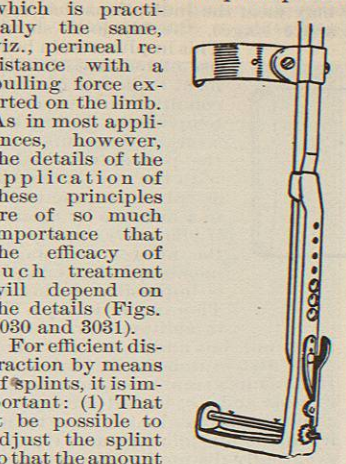


FIG. 3032.—Windlass and Ratchet Appliance for Extension. (Fiske Prize Fund Essay.)

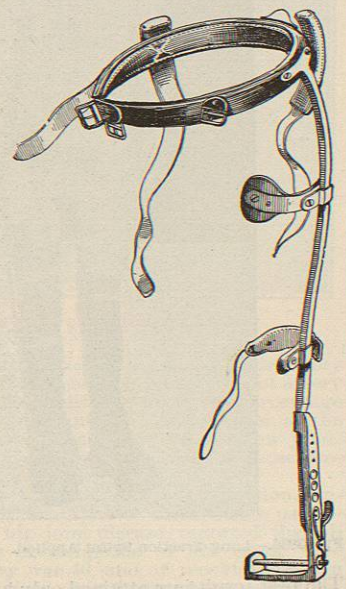


FIG. 3033.—Long Traction Appliance. (Children's Hospital Report.)

Taylor extension splint, illustrated in Figs. 3033 and 3038.

A traction splint manifestly furnishes certain advantages over the method of distraction by weight and pulley, in that distraction by the first of these methods is possible while the patient is going about.

A short traction splint was at one time in use, but it cannot be relied on as efficient.

The distraction splint consists of a rod, *A*, hollow at the lower part into which a rod, *B*, with teeth cut on the edge plays, by means of a key, *G*. The rod can be moved up and down, and it is caught and held in place by means of a spring, *I*, and sliding catch. The lower end of *B* is furnished with a broadened end, bent so as to pass under the foot, and through which a strap, *F*, can be slipped which is attached to buckles secured to the adhesive plaster on the patient's leg. To the upper end of *A* is secured an arm, *C*, which passes in front of the thigh, and to which a strap, *H*, passing under the perineum, can be buckled. A plate, *E*, in front of the thigh, keeps the splint from slipping backward, and the arm *D* passes under the thigh and holds it firmly, and prevents the splint from slipping forward (Fig. 3034).

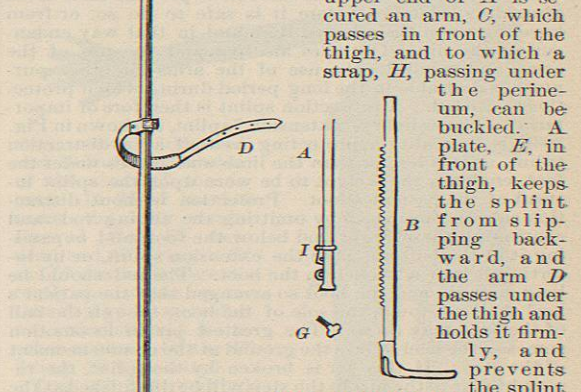


FIG. 3034.—Distraction Splint.

The arm *C* can be made longer, so as to pass around the waist, and hold a second perineum strap passing under the other buttock.

The splint is necessarily modified somewhat to fit different patients, but the above diagram illustrates the principle.

It has been claimed by some writers that if thorough distraction is employed, fixation beyond what is furnished by the distracting appliance is unnecessary.

Although this may be true theoretically, and practically many cases may be successfully treated without complete fixation, yet it cannot be assumed as a surgical aphorism that, where fixation is indicated, it can be furnished by a distracting force.

It is also true that thorough fixation of the hip is not possible without distraction. Efficient fixation can be furnished in the following way, illustrated by the accompanying diagrams (Figs. 3030 and 3035).

Protection.—By preventing injurious jar from being inflicted upon the affected joint, the joint may be said to be "protected." The simplest way to protect a joint is with the use of crutches, the sound limb being raised by

means of a patten on the shoe of that side, enabling the affected limb to swing free of the floor. The weight of the limb exerts a certain amount of distracting force, and it was at first supposed that hip disease could be treated

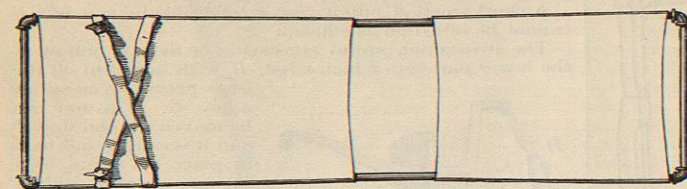


FIG. 3035.—Gas-Pipe Frame. (Children's Hospital Report.)

in this way alone. Although this supposition has not been justified by facts, and it has been found that distortion of the limb and subluxation will not be prevented by this method, yet excellent protection can often be secured in this way.

It will be found, however, that in many cases, especially among children, it is difficult to prevent them from discarding crutches before it is safe to do so, or from kneeling upon the affected limb and in that way endangering the hip. Crutches also demand the use of the arms, and in adults the use of the arms for other purposes is desirable in the long period during which protection is needed. A protection splint is therefore of importance. The ordinary "extension" splint, as shown in Fig. 3030, is in reality a protecting as well as a distraction splint, as it is longer than the limb and passes under the foot, enabling the weight to be worn upon the splint instead of the patient's foot. Protection without distraction can be furnished by omitting the sliding rod, and continuing the upright rod below the foot, and expanding it at the bottom, as in the extension splint, or by inserting it into a socket in the boot. The rod should be long enough, and the boot so arranged that the patient's heel shall not touch the sole of the boot, though the ball of the foot may do so. The greatest jar in locomotion comes as the heel strikes the ground at the commencement of the step. If this jar is broken by the splint, the remaining jar to the hip in the step will be diminished at the ankle and knee, and the hip will be sufficiently protected, except during the acuter stages of the disease (Fig. 3037).

A protection splint can be made hinged at the knee, and if properly adjusted patients can walk about readily with but slight discomfort. In this way reliable protection is secured during the long period of convalescence necessary for the thorough ossification of the affected epiphysis.

If proper protection is neglected and not continued for a sufficiently long time, the jar of locomotion—the whole weight being thrown upon the epiphysis previously carious—is sufficient to prolong the stage of irritability, to prevent complete cicatrization and ossification of the inflamed bone tissue, to promote contraction of the limb and distortion, and in many instances to give rise to relapses.

An appliance which will not interfere with locomotion, which will readily allow walking and the free use of the arms, which is not a great disfigurement, and can be worn without discomfort for years if necessary, is of great use in the convalescent treatment of hip disease. It not only prevents relapse, but also prevents deformity. It is, of course, indicated only in the convalescent stage, and would be injurious in an acute stage.

Simple protection without distraction is not to be relied upon if muscular spasm is present; this point can be determined by palpation of the muscles of the hip. If muscular spasm is present, protection and distraction should both be employed.

Summary of Treatment.—The proper treatment of hip

disease is not the exclusive use of any splint or method (i.e., of rest or extension), but the use of such means as may meet the indications that are present. During the acute stages, the hip-joint should be fixed efficiently.

This implies rest in bed, with fixation, and the use of efficient traction. Continued confinement to bed is not beneficial for the general condition of tuberculous patients, except temporarily during the acute stage; and as soon as the acute symptoms have subsided the patient should be allowed to go about with the hip protected against jar and spasm as far as is practicable. This can be done in a measure by means of a distraction splint, if efficiently applied in cases which are not in the most acute stage, but it should be remembered that complete fixation of the hip is impossible during locomotion (Fig. 3036). Thorax fixation by a Thomas splint, stiff spica in addition to traction, increase the mobility of

the trunk, but add to the awkwardness of the appliance. At first crutches will be found an aid in locomotion. If the acute symptoms return under this method, thorough fixation and rest in bed are again indicated. If the subacute symptoms diminish and there is less muscular rigidity at the hip-joint, greater freedom can be allowed, and eventually distraction discontinued, and the joint merely protected from jar. This should be continued as long as there is any danger of recurrence of active symptoms or any tendency to contraction.

In brief, the hip should be fixed as long as it is sensitive, should be protected and distracted as long as there is muscular spasm, and protected as long as it is weak.

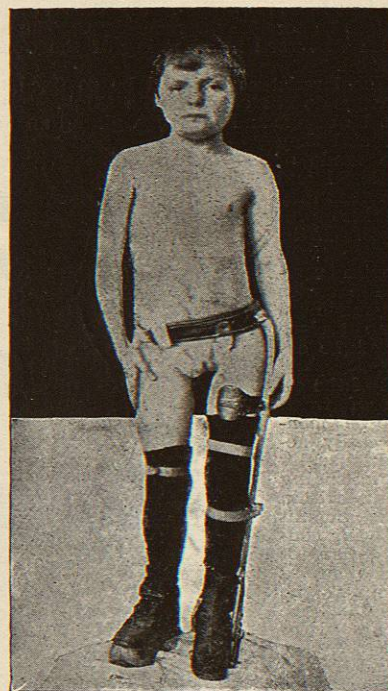


FIG. 3036.—Long Traction Splint Applied. (Fiske Prize Fund Essay.)

The best results are attained only by great care for a year at least, and careful supervision and protection for two or three subsequent years. Distortions of the limb should always be prevented, and in many cases some motion can

be saved at the hip-joint, if protection is not discontinued too soon.

Excision of the Joint.—In the severer cases of hip-joint disease, the question of excision demands consideration.

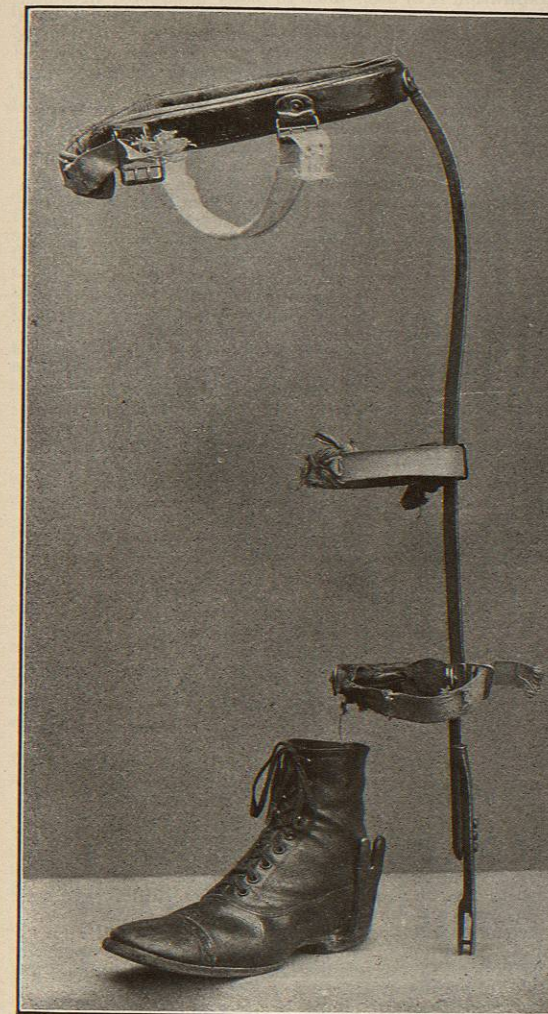


FIG. 3037.—Protection or Convalescent Splint.

The ultimate results after excision are not so satisfactory as at first supposed. The operation is in itself not a very dangerous one. If early excision is done, the percentage of recoveries is quite large, and excellent motion at the joint is often retained with the formation of a new joint. The results, however, are inferior, as a rule, to those procured by conservative measures.

A committee of the Clinical Society of London, appointed to investigate the subject of the ultimate usefulness of the limb after hip-joint disease, reported the following result of their investigation of 320 cases: The percentage of mortality was 40, and of recovery 42. In 15 per cent. death followed directly from the operation; in 13 per cent., from phthisis; in 6 per cent., from albuminoid nephritis; in 4 per cent., from other causes not connected with the hip affection. The treatment of those

who recovered lasted one year and three-fourths, the duration of the affection was three years, and the average shortening of the limb was two and three-fourths inches. The indications for resection, as reported by the committee, were as follows: (1) Necrosis of the head of the femur and separation into loose sequestra; (2) firm sequestra of the head of the femur and the separation into loose sequestra; (3) extensive caries of the femur or pelvis, with fistulae; (4) pelvic abscess, with disease of the acetabulum; (5) old chronic synovial suppuration, with disease of the cartilages of the acetabulum; (6) luxation of the femur on to the ilium, with chronic suppuration and fistula, a condition indicated by early suppuration and general symptoms.

Aseptic surgery has apparently reduced somewhat the mortality from excision at the hip-joint, but has not increased the usefulness of the limb after excision nor in any way prevented a relapse.

Of 121 operations of excision performed on 119 patients, 2 were double, analyzed by Townsend;* 113 had abscesses or sinuses; in 5 cases the spine as well was involved; in 2, the knee; in 2, the tarsus; in 3, the ilium; in 18, the acetabulum

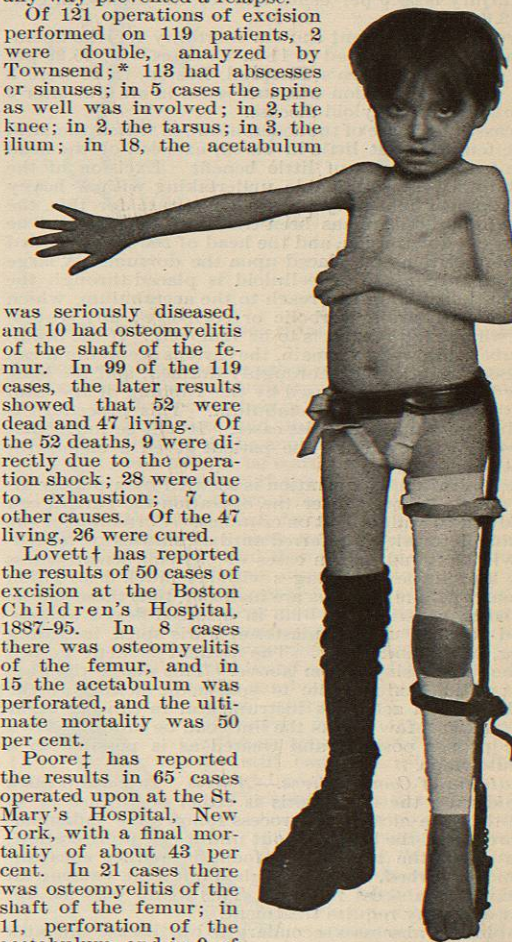


FIG. 3038.—Long Traction Splint Applied.

was seriously diseased, and 10 had osteomyelitis of the shaft of the femur. In 99 of the 119 cases, the later results showed that 52 were dead and 47 living. Of the 52 deaths, 9 were directly due to the operation shock; 28 were due to exhaustion; 7 to other causes. Of the 47 living, 26 were cured.

Lovett† has reported the results of 50 cases of excision at the Boston Children's Hospital, 1887-95. In 8 cases there was osteomyelitis of the shaft of the femur, and in 15 the acetabulum was perforated, and the ultimate mortality was 50 per cent.

Poore‡ has reported the results in 65 cases operated upon at the St. Mary's Hospital, New York, with a final mortality of about 43 per cent. In 21 cases there was osteomyelitis of the shaft of the femur; in 11, perforation of the acetabulum, and in 9 of these the opening communicated with an intrapelvic abscess.

For further details as to the procedure of excision, the reader is referred to the article on *Resection*.

As a substitute for excision, König, Volkmann, and

* Med. News, June 26th, 1897.

† New York Med. Jour., April 23d, 1892.

‡ Trans. Am. Orthopedic Assn., vol. x.