Congenital dislocation of the hip / by J. Jackson Clarke.

CONGENITAL DISLOCATION OF THE HIP JOINT

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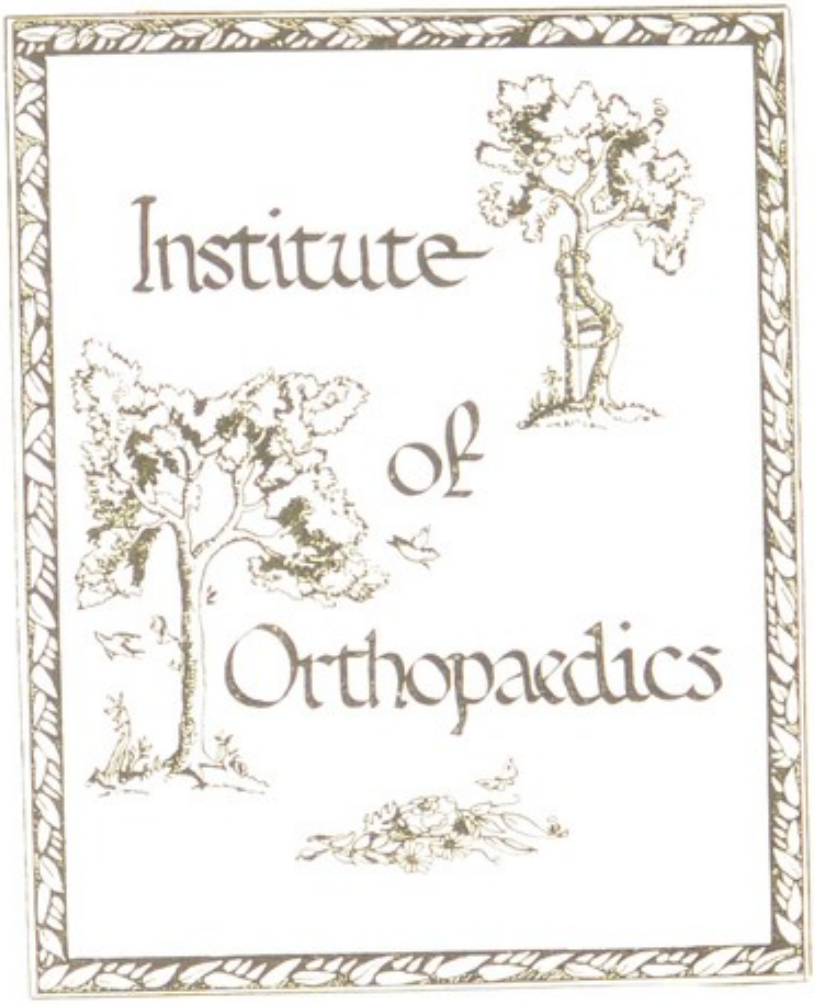
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CONGENITAL DISLOCATION OF THE HIP

CONGENITAL DISLOCATION OF THE HIP

BY

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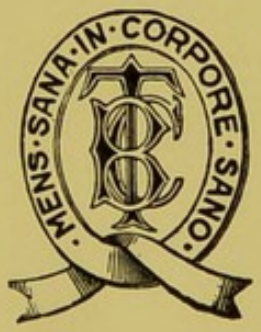

LONDON
BAILLIÈRE, TINDALL AND COX
8, HENRIETTA STREET, COVENT GARDEN
1910

PREFACE

It is now fully established that the manipulative method of treatment of congenital dislocation of the hip-joint, when skilfully carried out at a suitable age, results in the cure of nearly 75 per cent. of these previously incurable and usually distressing cases. This is one of the most striking advances in surgery made during the past twenty years.

The method is truly surgical, in both the etymological and the scientific sense of the word: being 'hand-work,' it is also sound surgery, in that it leaves the patient permanently cured without the need of instrumental support.

The method is also truly orthopædic; for Andry, the founder of this branch of surgical pædiatry, defined the scope of his work as 'the art of preventing and correcting deformity in children.' The following pages present chiefly my personal experience of the method.

I have dwelt at some length on certain difficulties and dangers, with the view of enabling others to avoid them Such dangers as there are arise almost entirely from treatment being delayed too long. Part of the book has

appeared in pamphlet form, reprinted chiefly from the *Practitioner*, other portions have appeared in the Transactions of the Clinical Society and in the *Lancet* and other medical journals. The new matter of the present edition comprises an account of a consecutive and inclusive series of forty cases, and also an account of an open operation for cases in which the manipulative method has failed. This operation is based on early anatomical studies, and it is one which, I hope, will enable us to cure a substantial proportion of, if not all, relapsed cases without risk of ankylosis or contracture, which so often followed the earlier modes of open operation.

J. JACKSON CLARKE

LONDON, W.,
December, 1909.

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CONGENITAL DISLOCATION OF THE HIP.

CHAPTER I

INTRODUCTION

THE manipulative method of treatment of congenital dislocation of the hip-joint referred to in the following pages is that of Lorenz.*

There is no doubt, however, that the work of Paci† had much influence in bringing about this great advance in surgery.

It is now universally admitted that the manipulative treatment should be thoroughly tried in every suitable case, and only when this has been tried and has failed is any operation involving arthrotomy justifiable.

It is not merely an operation, but a plan of treatment, that has to be considered; for though the most favourable cases can be left to themselves from four to six weeks after the first retentive apparatus has been removed, and the majority of the patients do well with such care as their mothers can give them, the functional perfec-

* Lorenz, 'Ueber die unblutige Behandlung der angeborenen Hüftverrenkung mittels der functionellen Belastungsmethode,' *Centralbl. für Chirurg.*, No. 33, 1895.

† Paci, *Archiv. di Ortoped.*, August 13, 1896.

tion of the limb is more rapidly restored under skilled supervision for longer periods—on an average, for about six months from the date of leaving off the plaster. This is

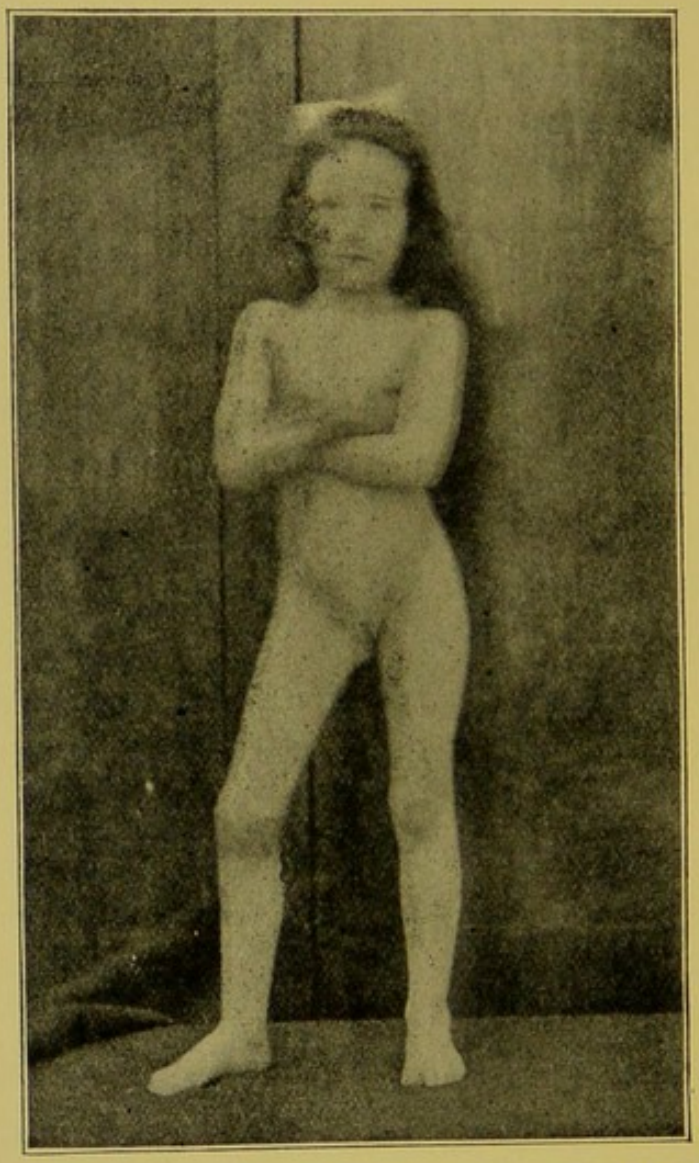


FIG. 1.—A GIRL, AGED SEVEN, AFTER SUCCESSFUL REDUCTION OF CONGENITAL DISLOCATION OF THE RIGHT HIP—AS SHE APPEARED WHEN THE RETENTION APPARATUS WAS REMOVED.

not surprising when we reflect that in an average case of congenital hip dislocation the acetabulum is small and the head of the femur slightly altered in form, so that the cases cannot be compared to reductions of dislocated

normal joints; but in addition a new impulse to development of the acetabulum and other parts has to be induced by the restoration of function to them.

At the period of treatment that follows the removal of the first retention apparatus, those patients who have had a unilateral dislocation successfully reduced have the

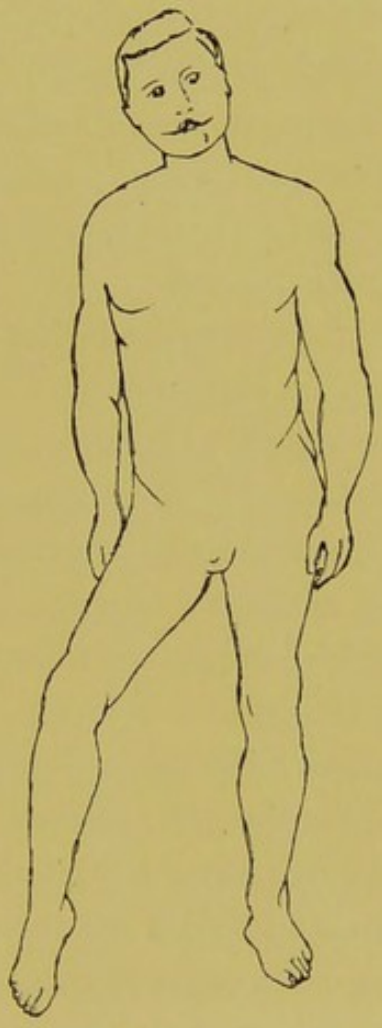


FIG. 2.—A MAN WITH UNREDUCED TRAUMATIC THYROID DISLOCATION OF THE RIGHT HIP.

appearance shown in Fig. 1, which is taken from a photograph of the patient whom I showed at the meeting of the Clinical Society of London on October 28, 1904. At this stage the limb in favourable cases presents a certain degree of rigidity, which gradually passes off with use.

The attitude closely resembles that seen in traumatic dislocation into the thyroid foramen, as shown in Fig. 2, taken from an illustration given by Gross * (Nancy). Indeed, the alteration of the position of the head of the femur is similar in the two cases—a downward and forward displacement. But how different in the two conditions is the anatomical structure of the new bed in which the femoral head rests! In the thyroid dislocation it rests upon muscular and fibrous tissue and on bone, and an uncomfortable nearthrosis results; after Lorenz's operation it rests on articular tissues, and the stiffness disappears to leave a perfect joint.

Whilst we cannot be surprised that persons without surgical knowledge and experience are apt to mistake for signs of failure the rigidity, abduction, and some prominence of the femoral head in the groin, the very proofs of the treatment being permanently successful, it is less easy to understand how surgeons of experience can express themselves as though so important a part of the body as a hip-joint could be reconstituted in as short a time as is required for a normal joint to recover from an ordinary sprain. In some cases the patients walk without stiffness in a week or two after the first retention apparatus is removed, the reposition being none the less firmly established; but in most cases some stiffness and limitation of adduction are helpful towards producing a firm new joint.

It must not be thought that the patients are invalid during the period of after-treatment. In unilateral cases they are confined to bed for a few days only, and in bilateral cases for about two weeks; after this time they

* *Revue d'Orthopédie*, May, 1904.

are encouraged to walk or in cases of double dislocation to crawl, to climb upstairs, or to push themselves on a wheeled stool.

The operative part of Lorenz's treatment was done by myself in this country for some years before he showed us his methods in detail. Thus in 1899 I recorded* a case of double dislocation which I treated in this way. From the description I gather that I actually reduced the dislocation, but from a photograph that I have of the patient after the application of the plaster of Paris bandages, it is evident that the position of the limbs was incorrect. It is, I think, impossible for any surgeon who has not worked with Lorenz, or with someone who has learned directly from him the correct method of carrying out his manipulative operation, to perform the operation and subsequent fixation and after-treatment properly; and hence any conclusions based on operations done merely from verbal or written descriptions are to be disregarded, even though they may have been expressed with some semblance of authority.

It is not natural that no further improvements will be made in the details of the treatment, but that its aims and principle are right I have been convinced since I dissected an example of congenital dislocation of the hip fifteen years ago. Indeed, the experience of numerous cases that I have treated during the past two years has convinced me that only by adhering closely to the principles that Lorenz has established is danger to be avoided and success obtained. By this I would not be thought to imply that any fixed routine of procedure is to be followed; on the contrary, every case is to be studied individually and treated on its own merits.

* *Clinical Journal*, 1899.

As to the dangers of the operation, they are due either to too much being attempted, or to inexperience on the part of the operator. If a patient approaches the age limit—about eight years for double dislocation or about ten years in single dislocations—the danger of too extensive laceration of muscles or injury to bones can be entirely removed by a course of preliminary treatment; *e.g.*, the adductor longus and hamstring tendons and the tensor fasciæ femoris may be divided, a weight-extension applied, the legs being fully abducted, and, after some days, the manipulation for stretching the muscles practised daily for a week or two before the operation, which will then be found to be an easy matter in practised hands—and it is only by practice that the safe degree of force to use in the operation can be learned. It may be asked why this preparatory treatment should not be adopted in every case, in order to diminish the gravity of the actual operation. To this it may be answered that a certain amount of reaction that is set up by stretching resistant muscles and ligaments, and by tension between the replaced head of the femur and the previously empty acetabulum, is required for the making of a firm new joint. Another question is, whether the plaster of Paris apparatus that takes so long to apply, and, it may be added, requires some skill and much practice to apply properly, might not be replaced by some simple retentive apparatus. My own experience of such appliances is not satisfactory. The apparatus requires readjustment at times, and this necessitates alterations in the relative position of the bones and interferes with the stability of the joint when the instruments are removed. I have heard of bed-sores occurring after the application of a plaster case, but no such untoward result

will occur if the bandages are applied according to Lorenz's teaching, and if the nurse has had experience of similar cases.

Some rumours have reached me of suppuration following Lorenz's manipulative operation. This is a most unlikely disaster if the following precautions are taken: first, to prepare the patient's skin and the surgeon's hands as if for an open operation; second, in performing the percutaneous myorrhexis, to use the fleshy palmar aspect of the inner border of the hand, and not its bony dorsal aspect (in this way the skin escapes being bruised, though the tense muscular fibres give way); third, if any cracks appear in the skin, to sponge them with 1 in 40 carbolic lotion and put on a dressing of cyanide gauze before the bandages are applied.

In this book the term 'manipulative' is used instead of the term 'bloodless.'

CHAPTER II

PATHOLOGICAL ANATOMY

It is not intended that this small work should include more than an outline of the anatomy and pathology of congenital dislocation of the hip.

Observers from Hippocrates to Dupuytren have been at one in recognizing the congenital origin of the affection,

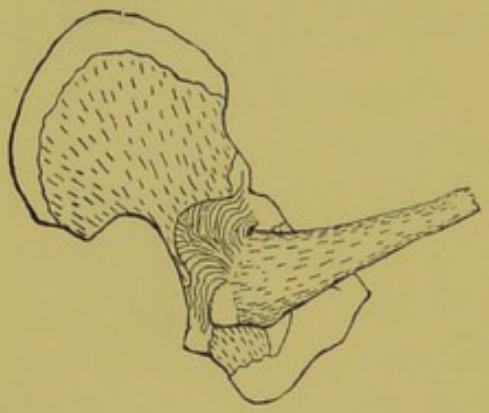


Fig. 3.—The Hip of a Still-Born Child, showing Congenital Dislocation.

The upper part of the capsule is thinned out and dilated by the displaced head of the femur.

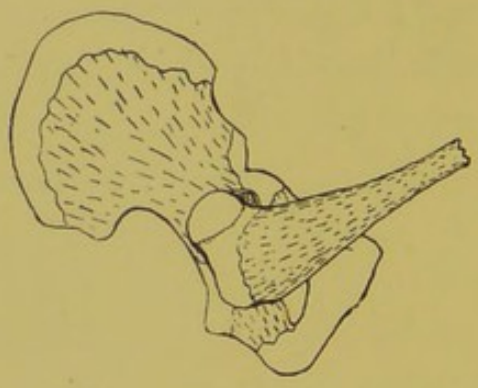


Fig. 4.—The Same: the Capsule removed.

though occasionally a case of traumatic dislocation at birth, or a pathological condition arising after birth, may be included with true congenital cases.

Dissection of still-born fœtuses affords an insight into

the early anatomical state. I will therefore give an account of one such specimen.

The accompanying figures* are taken from a specimen

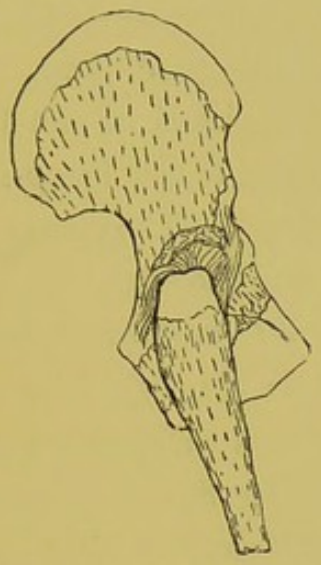


FIG. 5.—THE SAME: THE DISLOCATION REDUCED AND THE THIGH EXTENDED.

FIG. 6.—THE SAME: THE HEAD OF THE FEMUR AND THE LIGAMENTUM TERES FROM BEHIND.

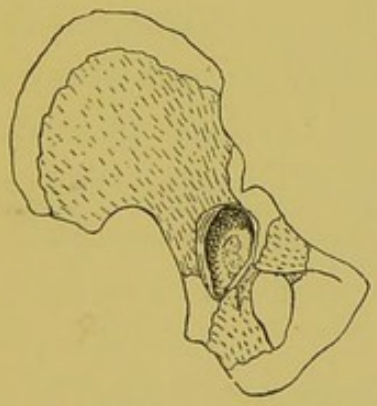


FIG. 7.—THE SAME: THE OS INNOMINATUM AND THE ACETABULUM.

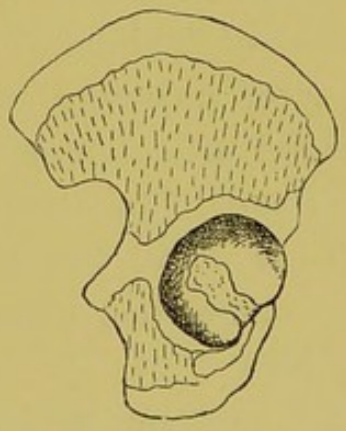


FIG. 8.—NORMAL OS INNOMINATUM AT BIRTH, FOR COMPARISON.

which I dissected in 1895. The head of the bone lay above, but close to, the shallow acetabulum. The disloca-

* From the author's 'Surgical Pathology,' by kind permission of Messrs. Longmans, Green and Co.

tion was easily reduced by inward rotation of the limb (Figs. 3 and 4). When this reduction had been effected and the limb extended, the front part of the capsule was tense, whilst the upper part became folded above the head and neck of the bone (Fig. 5). In this case, then, a true reduction was easily produced. The head of the femur was somewhat flattened posteriorly, and the ligamentum teres was flattened and elongated (Fig. 6). The whole os innominatum was abnormal in form, and the acetabulum was narrow and pear-shaped; *the cotyloid ligament was flattened against the upper part of the acetabulum* (Fig. 7).

Soon after birth the presence of this deformity may be inferred from the existence of an overflexed position of the thighs, such as is seen in breech presentations, and a tendency for the child spontaneously to assume that position.

The flattening of the cotyloid ligament against the upper part of the acetabulum is produced by the abnormal position of the head of the femur. It explains the slight degree of resistance to upward displacement sometimes observed after Lorenz's operation has been successfully carried out. The cotyloid ligament may become thickened, so that it almost completely fills the shallow acetabulum. This feature was present in a specimen described by Openshaw.*

The anatomy of these joints in older persons was described by the late William Adams, among others. The capsule is drawn out in an upward and backward direction, and thickened. A glance at Fig. 9 will show that the whole weight of the patient must be borne by the capsule, which is stretched out; its acetabular end, which

* T. H. Openshaw, Clinical Society of London, January 9, 1903.

should be its upper attachment, being far below the femoral end. The pelvis is acutely tilted forward (whence the lordosis), and the acetabulum is undeveloped. The ligamentum teres in this instance had disappeared.

Incomplete dislocation (subluxation) was also described by Adams. The head rests upon the upper acetabular border, which becomes absorbed, giving rise to the *luxation intracotyloidienne* of the French. In many cases the capsule is of an hour-glass shape, and this fact, together with the altered directions of the tendon of the

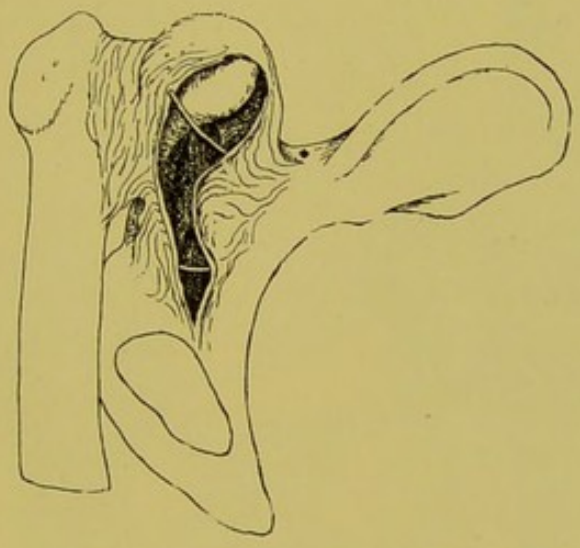


FIG. 9.—DISSECTION OF A CONGENITALLY DISLOCATED HIP.
(After W. Adams.)

psoas muscle, which passes below and behind the narrowed part of the capsule, were formerly thought by Lorenz* himself to make reduction by manipulation impossible.

The progressive changes in the form which the head of the femur undergoes with age are shown in Fig. 10, after Hoffa. The neck of the femur may be more or less

* A. Lorenz, 'Pathologie und Therapie der angeborenen Hüftverrenkungen,' 1895.

anteverted; that is to say, when the head of the bone has been replaced in the acetabulum, the patient's foot, instead of pointing forwards as in the normal individual, points more or less inwards. The extreme limit of this

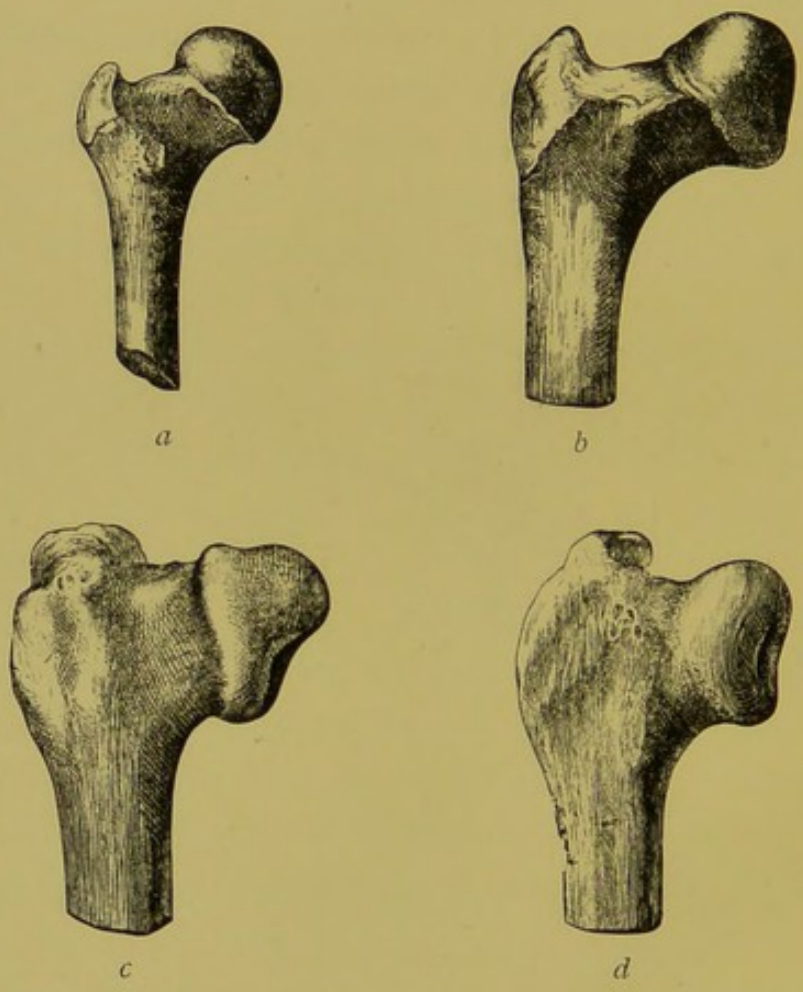


FIG. 10.—A SERIES OF FEMORAL HEADS FROM CASES OF CONGENITAL DISLOCATION. (After Hoffa.)

a at one and a half, *b* at eleven, *c* at fourteen, and *d* at eighteen years.

change is reached when the axis of the neck is parallel to the antero-posterior axis of the foot; in such a condition, if the head of the bone were in its normal relation with the acetabulum, the foot would be turned inwards at an angle of 90°. I must observe here that I have not found

any serious difficulty arise from anteversion of the neck in any of my cases; when extreme, an osteotomy of the femur would correct the inversion of the foot. A flattening of the posterior part of the head of the femur may closely simulate anteversion (Lorenz).

In extremely rare cases absence of the acetabulum has been noted, the cavity being represented by a small circular surface covered with fibrous tissue.

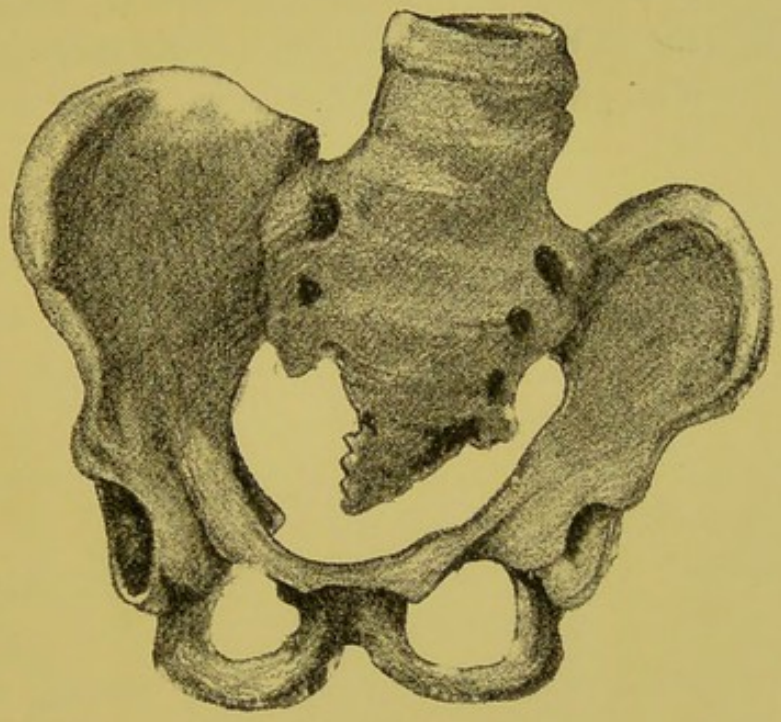


FIG. 11.—THE PELVIS FROM A CASE OF UNILATERAL DISLOCATION. (After Kirmisson.)

Lateral pelvic contraction of marked degree, as far as can be judged clinically and by radiography, is not common. It was seen in the specimen described above, pp. 8 and 9, and in a specimen of Kirmisson's (Fig. 11). I noted it in an instance of double dislocation (see Case 9, Chapter IX.). More frequently the pelvis is said to be increased in its transverse and diminished in its anteroposterior diameter.

Of recent additions to our knowledge of the anatomy of the affection, the most important is, perhaps, Lorenz's observation that the chief pelvi-trochanteric muscles—the obturator externus, the obturator internus and gemelli, the pyriformis, the quadratus, the ilio-psoas, and the smaller glutei, except the posterior parts of the gluteus medius and minimus, and the anterior part of the gluteus maximus—are lengthened : anatomical facts which show the error of dividing those muscles for the purpose of facilitating reduction, the chief obstacle to which is the shortening of the pelvi-crural group of muscles.

CHAPTER III

CLINICAL EXAMINATION AND RADIOGRAPHIC STUDY

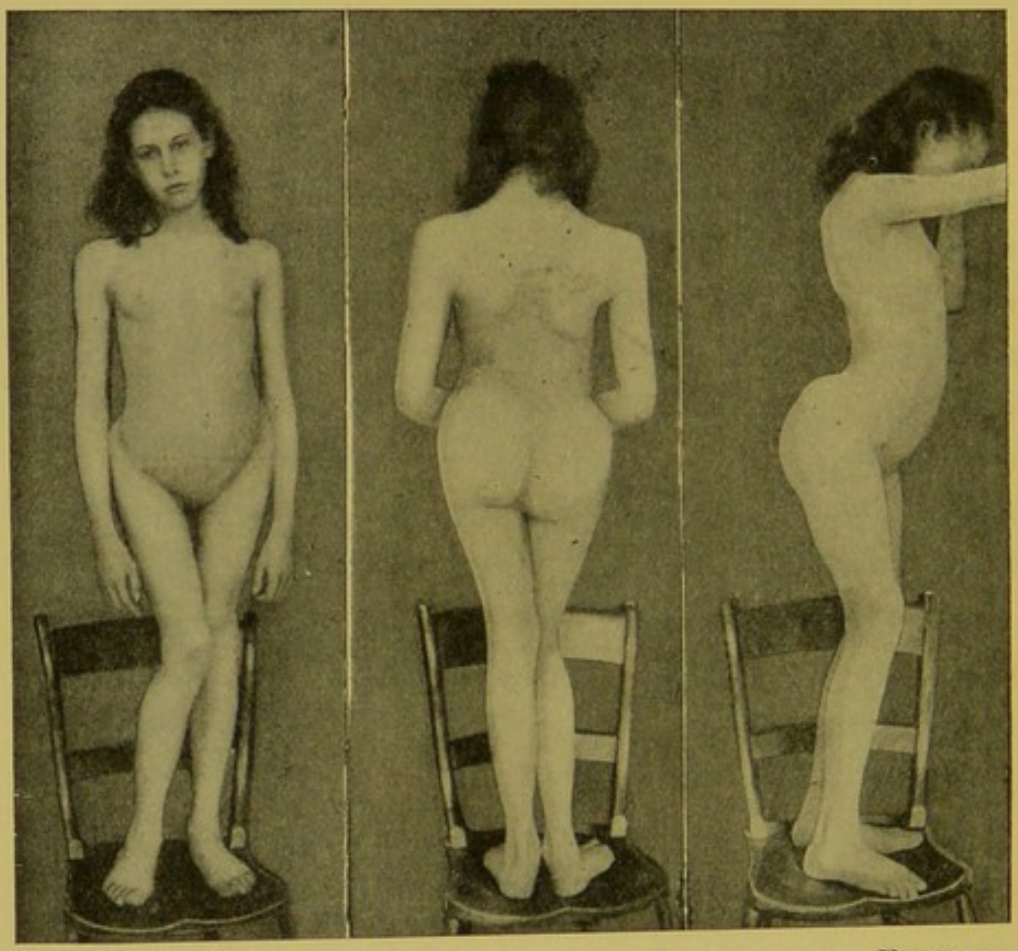
THE appearance of a typical case of double congenital dislocation is shown in Figs. 12, 13, 14, taken from a girl aged fifteen. The trochanters are far above Nélaton's line, and the thighs are adducted so much that the patient can only separate the knees by a few inches. A considerable gap is seen between the upper parts of the thighs. There is marked lordosis; the patient walks with the usual rolling movement, and is easily tired.

In young infants walking is delayed, generally to about the second year, and the gait is waddling. The secondary deformities may begin soon after the child walks (see Fig. 15).

Such patients are severely handicapped for life, even after everything possible in the way of palliative treatment has been carried out. It is inadvisable for them to marry. They are regarded as invalids in a family. They are debarred from most athletic pursuits, though some can ride and dance. Towards middle age the lordosis tends to increase and the spine to become painful, a condition which may require mechanical support.

When the displacement is unilateral, though it is not so piteous, the degree of crippling becomes in time very serious in the great majority of cases—those in which the

head of the femur lies above and behind the acetabulum. An example is shown in Fig. 16, from a girl, aged thirteen years, who always walked with a limp. At that age she was distinctly lame; walking even for short distances caused pain in the right hip-joint. She had been advised a high



FIGS. 12, 13, AND 14.—THREE VIEWS OF A PATIENT, AGED FIFTEEN, WITH UNTREATED BILATERAL CONGENITAL DISLOCATION OF THE HIPS.*

boot, but when she was wearing it she experienced even greater fatigue than when she was without it. On examination marked lordosis and the usual local signs were found.

* For these figures I am indebted to the kindness of Messrs. Rose and Carless and to Messrs. Baillière, Tindall and Cox. They were taken from a patient under my care.

The upper end of the femur was displaced upwards and backwards; there was a hollow at the upper and outer part of Scarpa's triangle; abduction of the limb was limited. A skiagram (Fig. 17) shows that the head of the bone was displaced far above the acetabulum. The right lower limb was 2½ inches shorter than the left.

FIG. 15.—A PATIENT, AGED FOUR, WITH DOUBLE DISLOCATION (CASE 40).

These cases illustrate the average condition when congenital dislocation of the hip is left untreated. In a few cases the head of the femur is firmly lodged below the anterior superior spine of the ilium. In one such case I performed the manipulative operation without improving matters.

Differential Diagnosis, etc.—Besides taking the history

FIG. 16.—AN EXAMPLE OF AN ORDINARY CASE OF UNILATERAL DISLOCATION.

of the patient and noting the kind of lameness, a careful inspection of the limb is necessary. In this way the distinction from serious nerve affections, such as hereditary ataxy, pseudo-hypertrophic muscular paralysis, and other muscular dystrophies, and from infantile paralysis

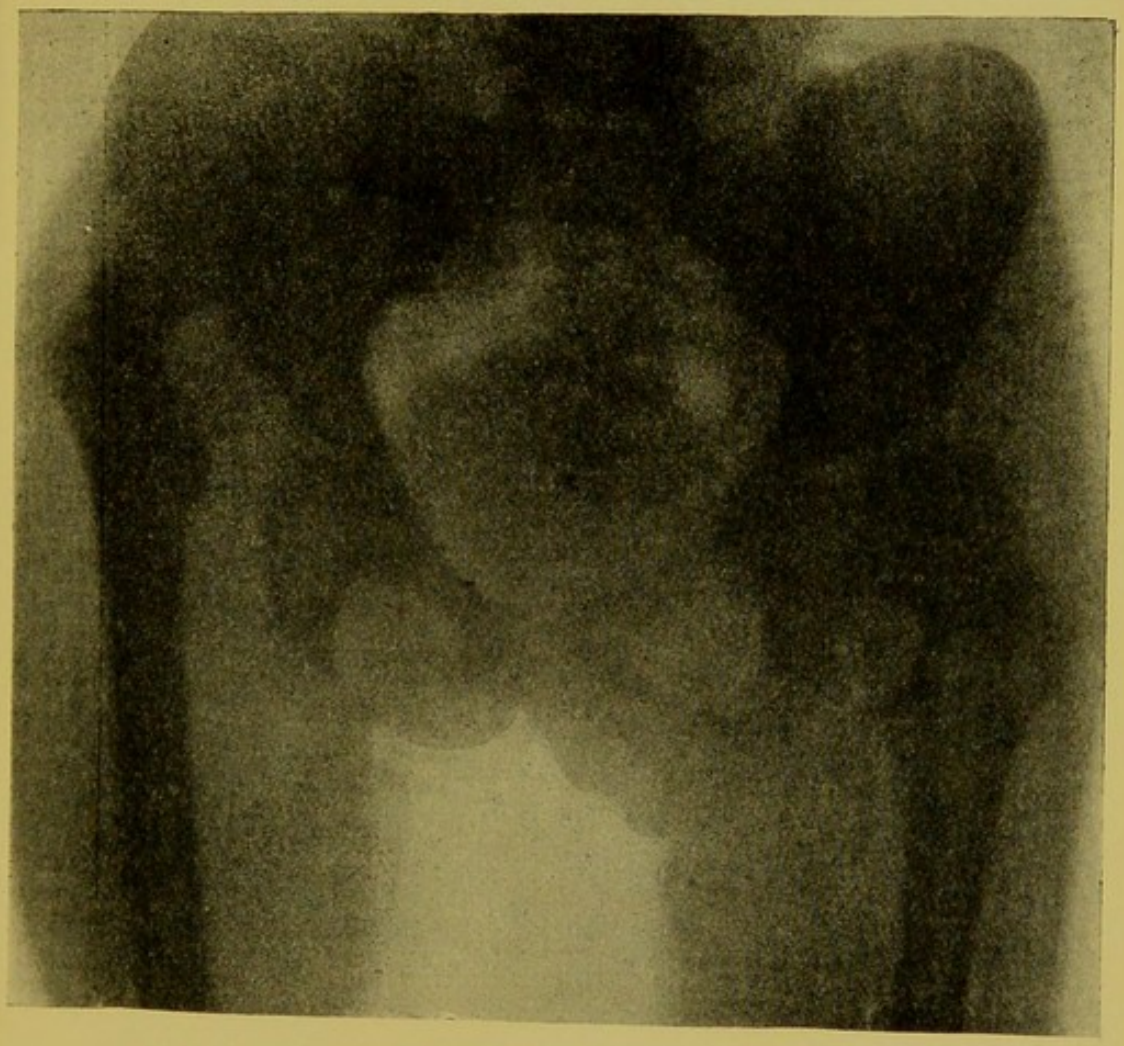


FIG. 17.—SKIAGRAM FROM PATIENT SHOWN IN FIG. 16.

and tuberculous disease, will be made. A good skiagram is desirable in most cases; only in this way can some cases of coxa vara in fat babies be eliminated, though in older children the absence of telescopic movement in coxa vara is a distinguishing feature.

The fact that the great majority of cases of congenital

dislocation of the hip give satisfactory X-ray pictures only when the limb is inverted has been pointed out by many observers—*e.g.*, by Mr. Robert Jones, in a collection of skiagrams made for him by Dr. David Morgan. It proves that in the majority of these cases the head of the bone is directed forwards and not backwards, as once was held to be the case.

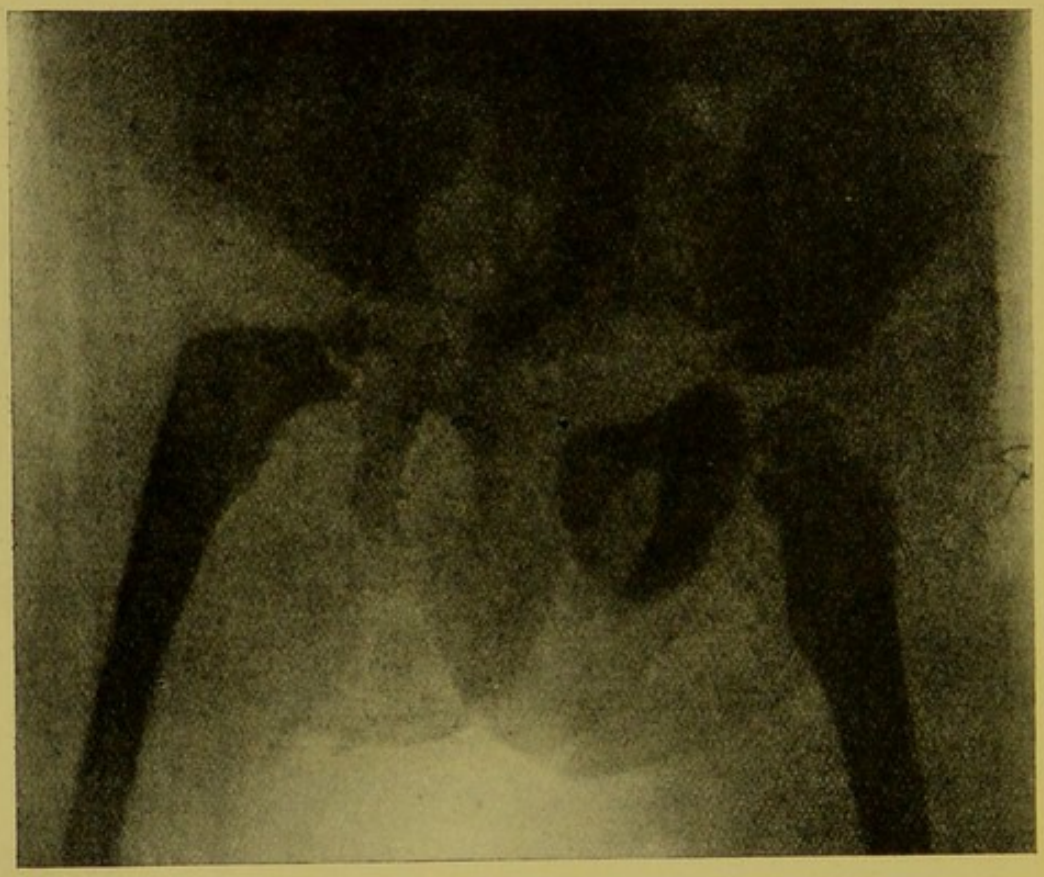


FIG. 18.—SKIAGRAM OF CONGENITAL COXA VARA.

As an instance of the utility of radiography in differential diagnosis, I may mention the case of a girl, aged two years, with congenital coxa vara.*

The patient was sent to me as a case of congenital dislocation of the hip. She had never attempted to walk, and the parents had been given to understand that she

* *British Journal of Children's Diseases*, June, 1904.

never could be made to walk. On examination many of the characteristic features of congenital hip dislocation were present. Thus (1) the great trochanter was elevated to the level of the anterior superior iliac spine; (2) abduction of the limb was limited, the abductors becom-

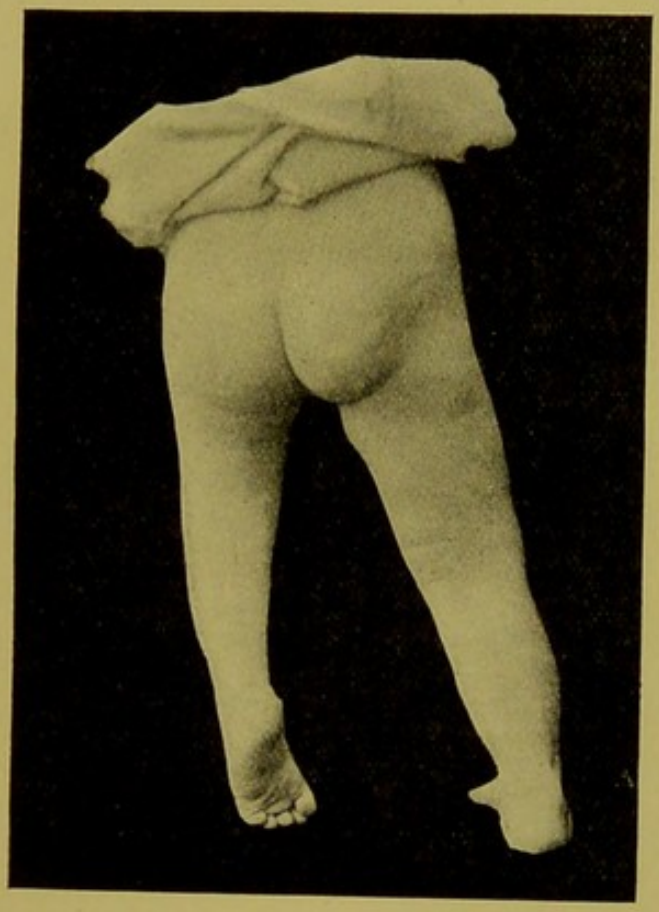


FIG. 19.—CONGENITAL COXA VARA, WITH FLEXION OF THE KNEE AND CLUB-FOOT.

ing tense when the thigh was brought to the line of the trunk; and (3) there was an unnatural hollowness of Scarpa's triangle. I could not, however, feel the head of the femur on the dorsum ilii, as is usual in a dislocation associated with inversion of the limb, such as was present in this instance, nor could I obtain any gliding movement of the trochanter on alternately pushing up and

drawing down the limb. Any doubt that remained was put at rest by the skiagram (Fig. 18). Before concluding that the coxa vara was a congenital one, the possibility of its being due to rickets had to be considered. The child had fairly well-marked rickets: among other signs the fontanelle was still fairly large, and the dentition delayed. The position of the limbs was, however, noticed at birth, and

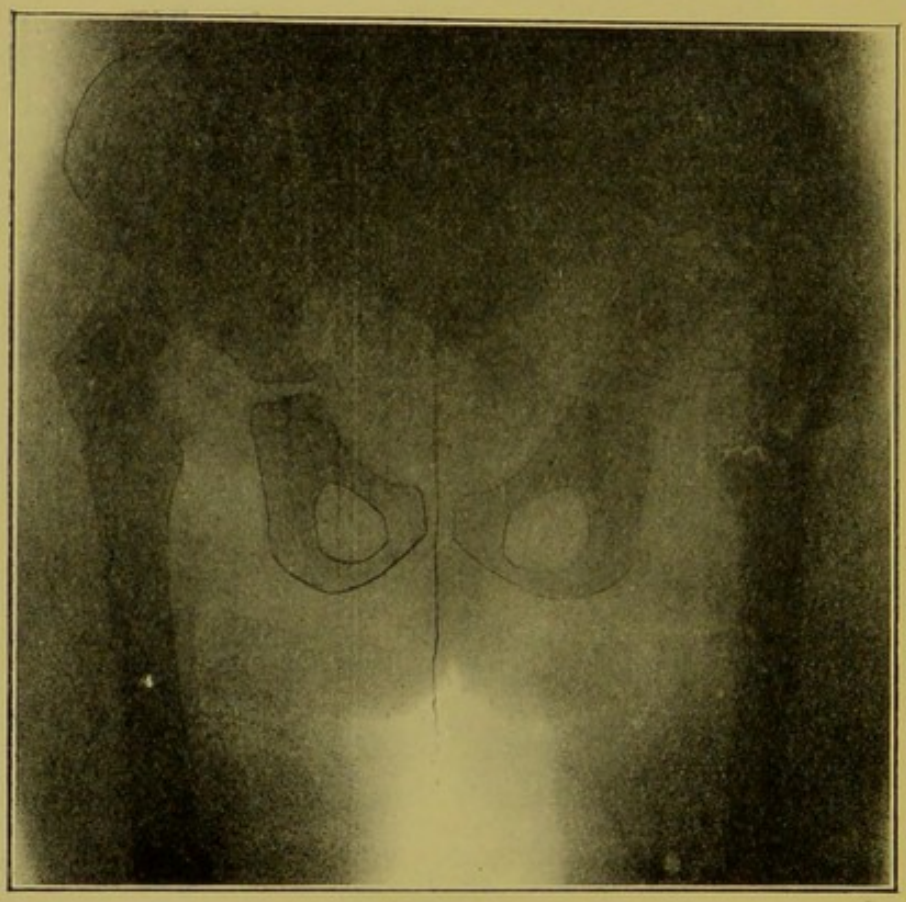


FIG. 20.—SKIAGRAPH OF A CASE OF BILATERAL DISLOCATION.

the associated deformities of the pelvis as seen in the skiagram tell conclusively in favour of the congenital origin of the coxa vara.

In taking the skiagram, Fig. 20, the limbs of the patient, a girl aged 6, were not inverted, and hence the length of the necks of the femora is not shown; but the fact that there is a double dislocation is plainly seen.

The pelvis of the same patient as shown by X rays after reduction of the dislocations is shown in Fig. 21.

Two skiagrams, Figs. 22 and 23, were taken from a patient with a right dislocation, before and two years after operation* respectively, and a recent photograph of the same patient is given below, Fig. 44, p. 62, together with a recent skiagram (see Case 6).

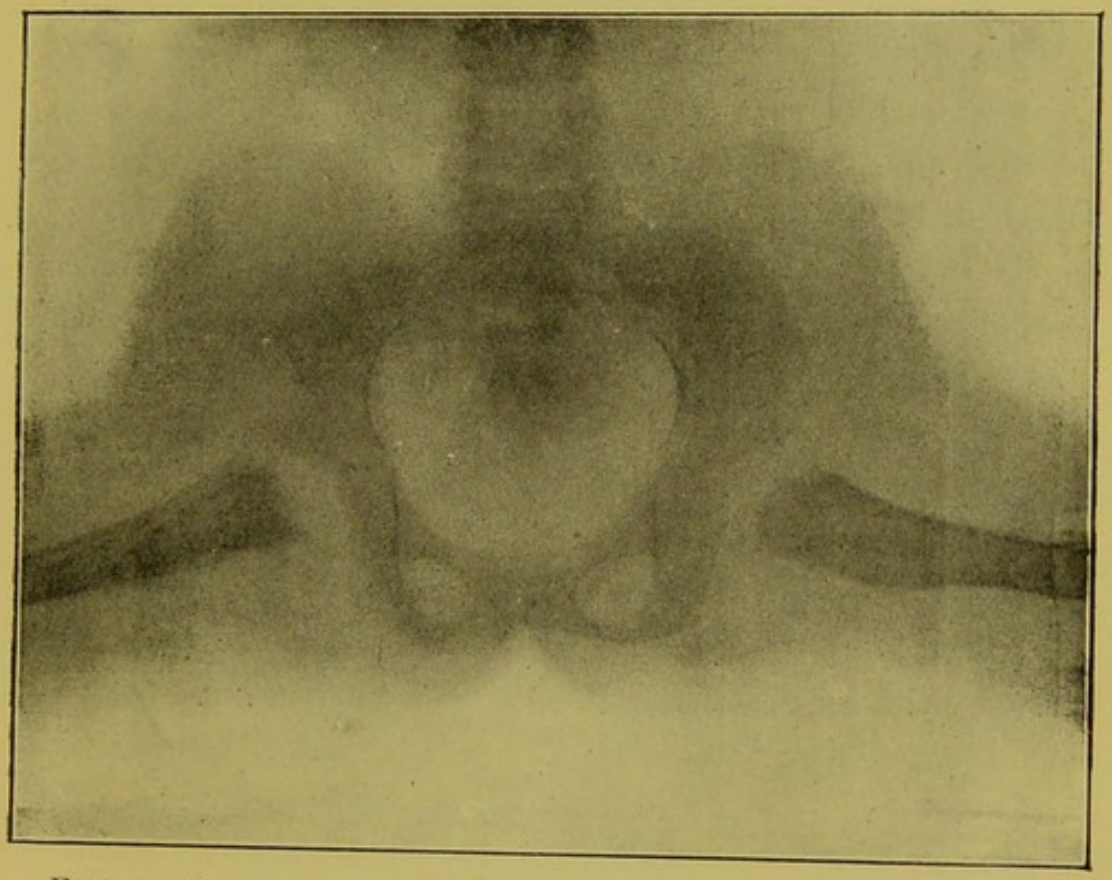


FIG. 21.—SKIAGRAM IN THE SAME CASE AS FIG. 20, SEVEN MONTHS AFTER OPERATION, THE LIMBS BEING SLIGHTLY INVERTED.

As an indication of the probable success of Lorenz's operation in any given case, it is important to note whether the neck of the femur is well developed. This can be judged by noting the degree of prominence of the great trochanter when the limb is inverted, or by

* See *British Medical Journal*, September, 1905.

having a good skiagram made with the limb in that position.

The femoral neck is generally longest in those cases in which the limitation of movement is greatest, and hence, as a rule, the cases in which reduction is difficult are more likely to be permanently cured than those in which there is a short femoral neck, and reduction is easy.

Exceptional complications are to be looked for and carefully weighed before giving a prognosis. A case in point is that of a boy, aged seven years, who had severe congenital club-foot, and knee flexion on both sides, and a left congenital hip dislocation. He had never walked, and his muscles were totally undeveloped. Under an anæsthetic I attempted reduction, but there was not sufficient yielding of the muscles to allow the manipulations to be done. This case is the only one which I have omitted from the consecutive series, it being one in which the hip affection was only a minor part of a complex deformity.

As in the case of every operation of choice, it is wise to inquire as to hæmophilia, which I have once experienced in a girl after an operation for club-foot.

Preliminary Preparation.—The patients must be properly prepared for a general anæsthetic, and I prefer them to have at least two days for this purpose, a dose of castor-oil being given two hours after the midday meal the day but one before operation; and after that the child has a light diet, and the aperient dose is repeated at the same time the next day. On the day of operation no food is taken except beef-tea or broth, and none of that within four and a half hours before operation. The skin over Scarpa's triangle and the popliteal space is sterilized in the usual way in case tenotomies, etc., may be required.

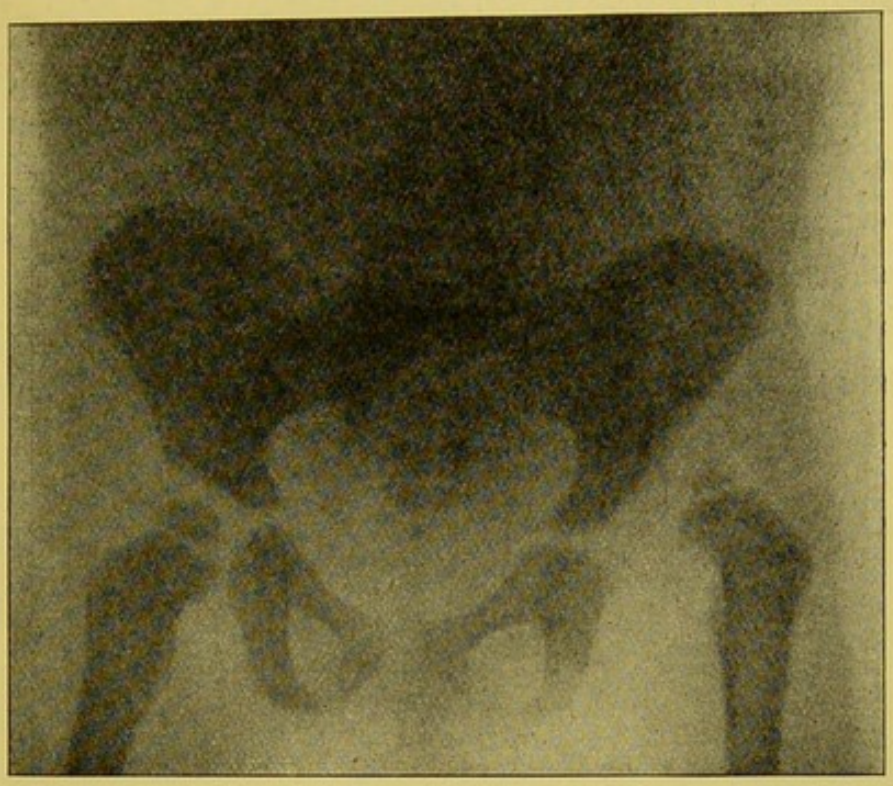


FIG. 22.—SKIAGRAM OF THE PELVIS OF A PATIENT WITH A RIGHT DISLOCATION, BEFORE OPERATION.

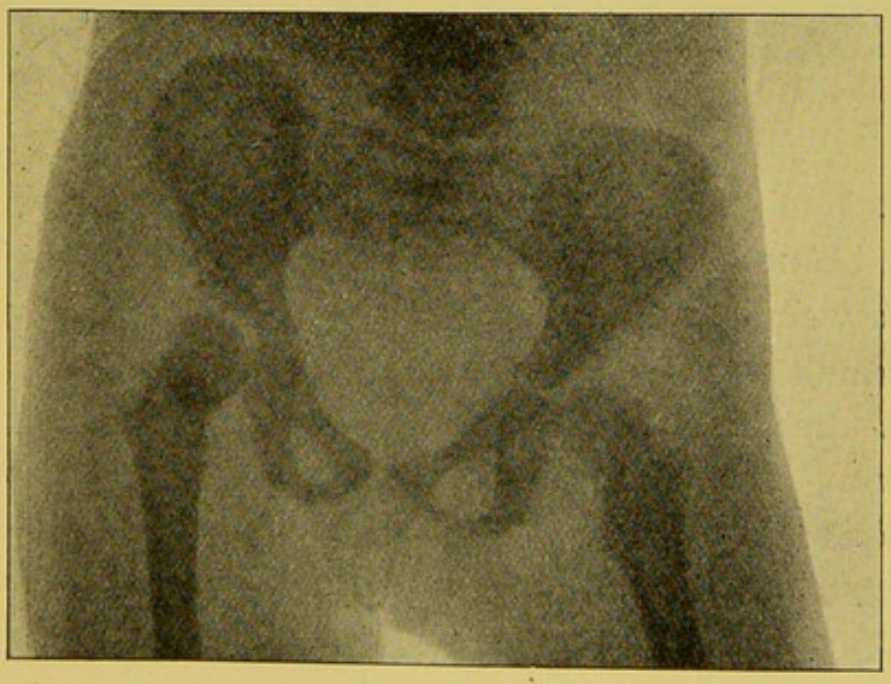


FIG. 23.—SKIAGRAM OF THE SAME PATIENT TWO YEARS AFTER OPERATION.

Dr. G. A. H. Barton informs me that he has found no special difficulty in keeping my patients at the stages of anæsthesia required by the different periods of the operation. When unusual resistance to reduction is to be expected—*e.g.*, in children over seven who have firm muscles and a good deal of limitation of movement at the joint—a preparatory course of treatment is desirable. Examples will be given in the illustrative cases; an enumeration of the chief points will here suffice:

FIG. 24.—SCREW-EXTENSION APPARATUS.

1. Manipulation under anæsthesia, including downward traction on the limb, followed by one or two weeks in bed with weight-extension, which is removed twice a day for manipulations.

2. Preliminary tenotomy—*e.g.*, of adductor longus tendon, or of the tensor fasciæ femoris below the anterior superior spine, or open division of the hamstrings at the knee, This is followed by fourteen days' weight-extension, and if reduction is not easy at the end of this time recourse may be had to manipulation under

anæsthesia, and careful application of the screw-extension apparatus shown in Fig. 24. The force is applied by means of two strong roller towels, one fixed by a 'clove-hitch' above the knee; the other being passed round the tuber ischii of the same side. A layer of cotton-wool is placed between the towel and the patiens's skin. The patient is then put to bed for another fourteen days, and weight-extension applied and daily manipulations carried out. By these means and good judgment serious post-operative complications, such as extensive paralysis, will be avoided.

CHAPTER IV

THE MANIPULATIVE OPERATION

The Operation.—Manipulation and manual force only are required in most cases.

Stage 1.—The first step after the patient is anæsthetized is to overcome the resistance of the adductor muscles of the thigh. For this purpose the operator forcibly abducts the limb whilst an assistant steadies the pelvis ; this causes the inner edge and tendon of the adductor longus to stand out like a bowstring close under the skin. Keeping the parts thus on the stretch, the operator, by repeated 'hacking' strokes made with the ulnar border of the hand at a point a little below the attachment of the muscles to the pelvis, produces a subcutaneous division, not only of the whole of the adductor longus, but also of parts of the deeper-lying adductors. In children of two or three years a deep massage of the adductors sometimes suffices. At the completion of this stage of the operation the adductors no longer project under the skin ; even in complete abduction there is no longer any muscular ridge, but instead of this a flat surface of muscle over which an empty fold of skin can readily be pinched up.

Stage 2.—The contracted muscles on the posterior aspect of the joint are stretched by forcibly flexing the hip. In

doing this the knee is kept extended, and the limb is bent upon the trunk with intermittent movements of a swinging character, the range of which is carefully increased until the foot can be carried nearly or quite up to the shoulder.

At this stage there is danger of causing separation of the lower epiphysis of the femur if the movements are not carefully graduated.

Stage 3.—The patient is now turned over, and the muscles on the front of the hip-joint are forcibly stretched by producing successive movements of hyperextension of the hip with the knee fully flexed. *Rupture of the psoas muscle may occur at this poiut* (see Case 36). At the end of this stage the heel can be made to touch the buttocks. All these movements are repeated in turn until complete flaccidity of the muscles is effected. In order to test whether sufficient stretching has been produced, downward traction is made on the limb to see if the head of the bone comes down to the proper degree, as evidenced by the trochanter being brought to the level of, or below, Nélaton's line.

Stage 4: *Reduction of the Dislocation.*—This important step, for which the previous stages are preparatory, is begun by completely flexing the hip, the knee being bent to a right angle, and the thigh slightly rotated inwards. The flexed limb is then fully abducted, being moved into the position shown in Figs. 27 and 28; *i.e.*, the thigh forms nearly a right angle with the side of the trunk, and the knee lies posterior to the mesial frontal plane (see Fig. 29). As this movement is being concluded, a sensation can, in nearly every case, be felt by the operator as the head of the femur clears an obstacle; this is the moment of 'reduction,' when the head passes forwards over the posterior

border of the acetabulum. A sound of reduction of varying loudness is also usually heard. Before the reduction there is an unnatural hollowness of Scarpa's triangle, but as soon as reduction has been accomplished, the head of the femur occupies its normal position, and pushes forward the psoas and other soft parts, thus filling up the hollow. Another valuable sign consists in a rigid flexion of the knee which appears when the head of the bone passes into or upon the acetabulum, and disappears when the

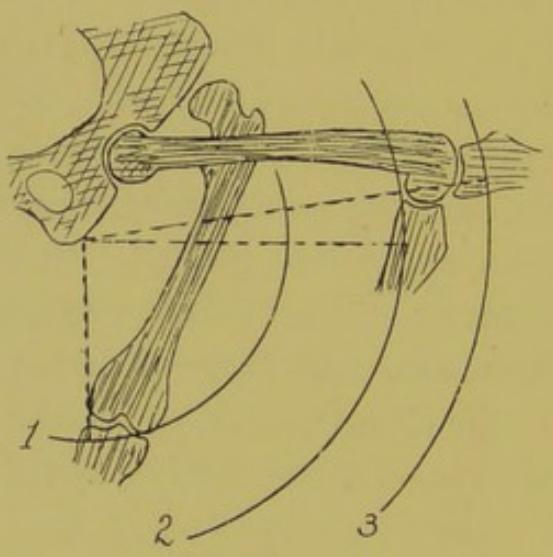


FIG. 25.—A DIAGRAM SHOWING BY THE RADII OF THE CIRCLES—AT 1, THE LENGTH OF THE HAMSTRING MUSCLES BEFORE OPERATION; AT 2, THE LENGTH OF THE SAME IMMEDIATELY AFTER OPERATION; AND AT 3, THE LENGTH WHEN THE POWER OF EXTENDING THE KNEE HAS BEEN REGAINED BY REGULAR EXERCISES.

dislocation is reproduced by adducting the limb. The accompanying diagram, Fig. 25, shows the cause of this flexion of the knee. *The actual reduction is brought about by forced hyperextension in the abducted position.* Lorenz's padded wedge, Fig. 26, may be placed behind the joint to act as a fulcrum to force the head forward at the completion of the movement. It must be observed that the head

of the bone does not always, or even usually, pass forward to the acetabulum at the first outward sweep of the limb. On the contrary, the movement must be repeated as often as may be necessary to stretch the shortened tissues, and the operator completes the reduction only when he feels that the resistance has been so far diminished that he can do so without risk of fracturing the neck of the femur. It is better to defer the reduction to another time if the tissues do not relax sufficiently. In this connection experience is of the greatest service.

It is at this stage that separation of the epiphysial head of the femur is to be guarded against.

Stage 5.—The next procedure aims at stretching the anterior fibres of the capsular ligament. For this purpose the pelvis is raised on a support—*e.g.*, a sand-bag or the padded pelvic rest (Fig. 26)—and held firm, whilst the operator intermittently strains the abducted limb into a marked degree of hyperextension. The hamstrings may also be stretched before the patient recovers consciousness, by carefully graduated extension movements at the knee. In older children, where there is great resistance and danger of injury to nerves, this must be done with great care, and the operator must judge whether the movements should stop short of full extension. When both joints have been operated on, the parts have then the appearance shown in Fig. 27, the outer surfaces of the knees being posterior to the surface of the patient's back. When once the reduction has been effected, the tension of the muscles and other soft parts assists in retaining the head of the femur in its place and in deepening the acetabulum.

Stage 6.—The application of the plaster of Paris

apparatus follows. This proceeding is very nearly as important as the operation. I now usually defer it for a week, when it can be done without an anæsthetic. This saves the patient about one-half the time otherwise required for anæsthesia, and so diminishes shock. It also diminishes the degree of œdema after the operation.

The first step is to raise the patient, whose sacrum rests

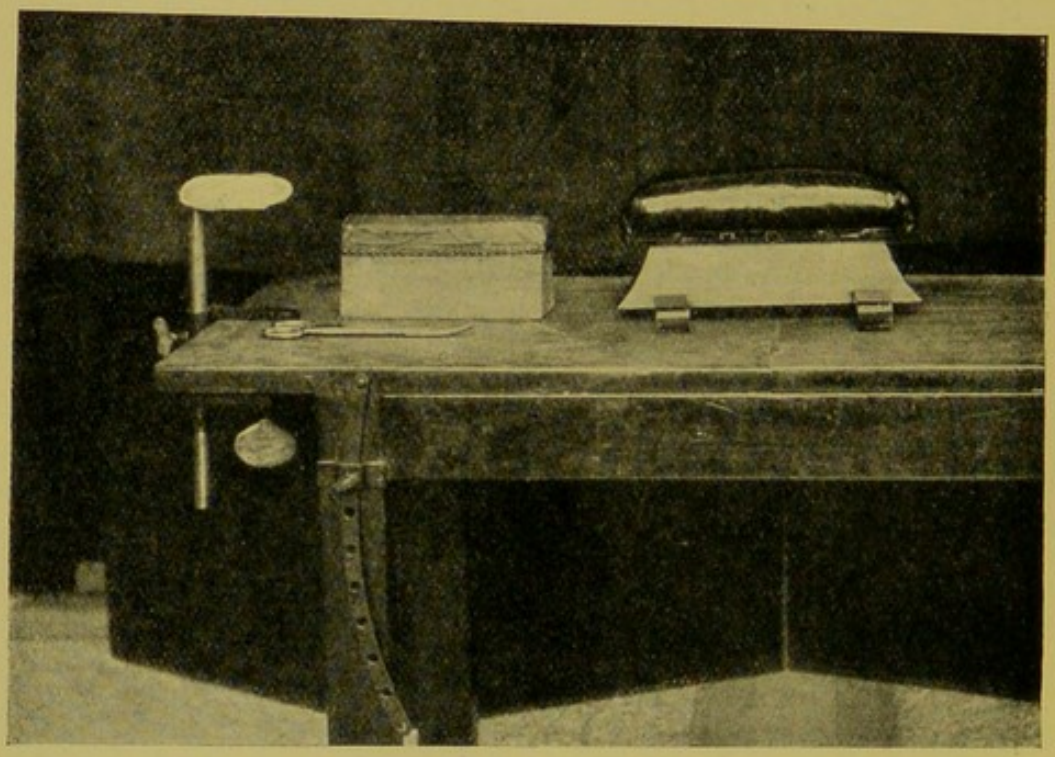


FIG. 26.—THE APPARATUS: PELVIC REST, SHOULDER SUPPORT, PADDED WEDGE, AND SCISSORS FOR CUTTING THE COTTON-WOOL IN TRIMMING THE PLASTER CASE.

on a small padded plate supported on a stem about 7 inches high fixed at the end of the table, whilst the shoulders rest on a padded box or other support of about the same height (see Fig. 26). The limb or, if both joints have been operated on, limbs, are held in the position shown in Fig. 27—*i.e.*, completely abducted and hyperextended.* A pair of soft woollen drawers without

* It is not necessary to rotate the limb either inwards or outwards.

buttons are put on, and an ordinary calico bandage is drawn between the skin and the drawers on each side that has been operated on. Next an ample covering of unbleached dressmakers' wadding, cut into bandages, is applied, so as to envelop the lower part of the abdomen and the whole of the pelvic region, and to cover the thigh (or thighs, if both hips have been operated on) to a point below the knee. Separate additional pads of wadding

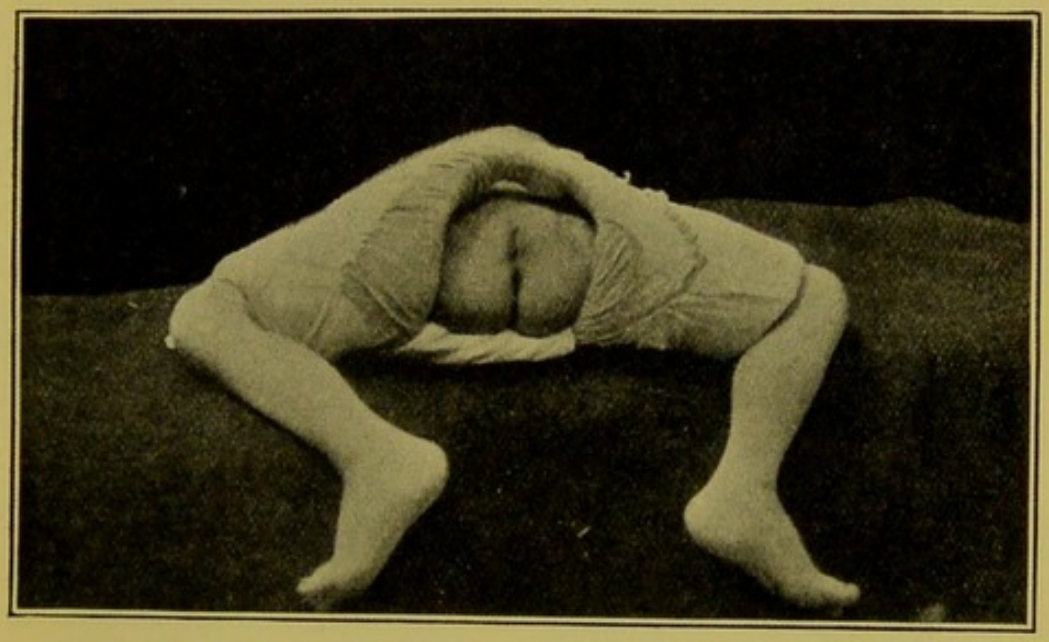


FIG. 27.—A CHILD WITH BILATERAL DISLOCATION AFTER OPERATION BY LORENZ.

are placed below each anterior superior spine, and above each internal femoral condyle. This investment of wadding is then completely and evenly covered in with several layers of calico bandages. The plaster of Paris bandages* are then applied over the whole area

* Lorenz uses an open-meshed, very coarse muslin and artists' modelling plaster. He found the English 'crinoline' bandages unsuitable. The actual manner of laying on the turns can only be learnt by experience, but the greatest thickness is required from the knee to each anterior superior iliac spine and between these spines in front, and over the sacrum at the back.

previously covered by the wadding, etc. About twenty-five bandages, 4 yards long by 4 inches wide, are used for a case of double, and about fourteen for a single, dislocation. Before the plaster has set, the patient is removed

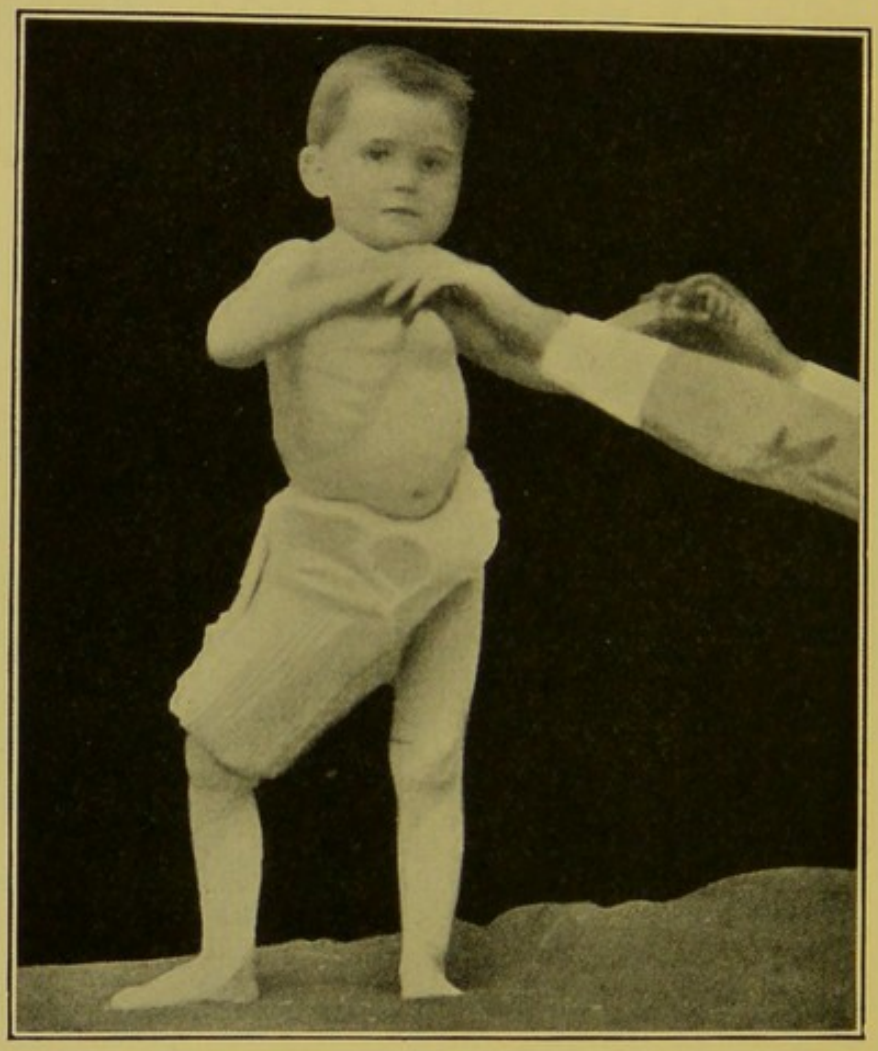


FIG. 28.—A CHILD WITH UNILATERAL CONGENITAL DISLOCATION AFTER OPERATION BY LORENZ.

from the support, and the plaster case is cut down to the shape shown in Figs. 27 and 28. When the plaster is dry, the drawers are cut and turned back to cover the plaster case. The bandages that were placed between the patient's skin and the drawers are used for daily friction of the skin, which can be thus kept clean and

healthy for a long time. A thin towel is placed between the skin and the plaster case in front and behind.

Figs. 27 and 28 are taken from patients operated on by Lorenz; the diagram, Fig. 29, exhibits some of the chief features of the change caused by the manipulation in the position of the limbs.

The extent of the area covered by the plaster of Paris apparatus is much smaller than was formerly thought to be necessary.

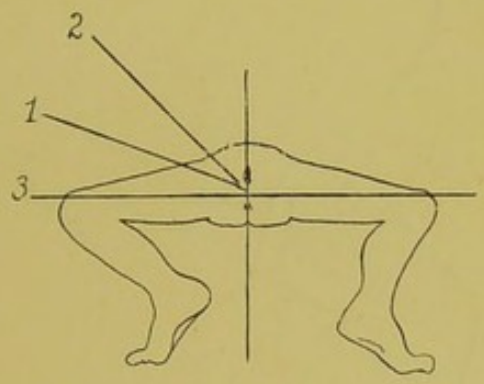


FIG. 29.—OUTLINE OF THE LIMBS TRACED FROM A PHOTOGRAPH OF A PATIENT IMMEDIATELY AFTER OPERATION.

Line 1 shows the degree of separation of the flexed limb that the hip-joints allow in a normal person; line 2, the degree in a case of congenital dislocation of the hip before treatment; and line 3, that after Lorenz's operation. Note that the inner aspect of the knees are just behind the frontal plane, which passes through the middle of the perinæum.

The change in the skiagraphic appearance effected by the operation is shown in Fig. 30. The upper part of the femur before operation is represented by the continuous outline and by the interrupted outline after operation.

The Effect upon the Patients.—The limb is lengthened (see Fig. 25), so that the skin of the groins often shown superficial cracks. The alteration in the relation of the parts is so great that for some days after the operation

the muscular sense is at fault, and if requested to put the hand upon the knees, the child puts the hand where the knees 'ought to be'—*i.e.*, in the middle line.

The immediate Effect of the Operation is to produce a posture which, if it were to be *permanent*, would constitute a deformity worse than the original one. Lorenz has

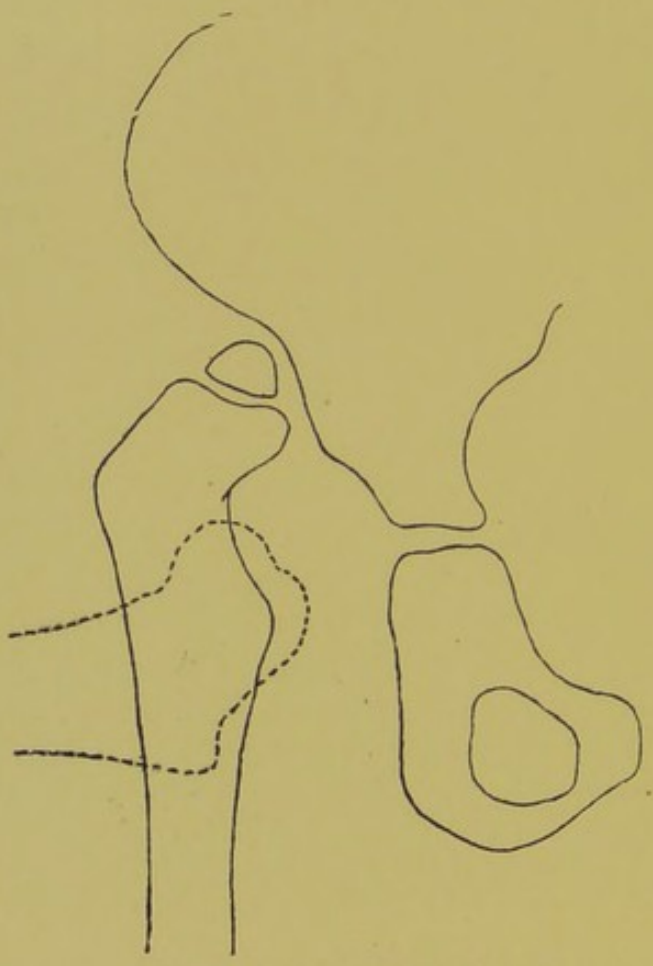


FIG. 30.—OUTLINES FROM SKIAGRAMS. THE INTERRUPTED OUTLINE SHOWS THE POSITION OF THE FEMUR AFTER OPERATION.

described his own impressions of the first case which he treated in this way: 'Is it permitted to put a human being into this shape?' was the question that arose in his mind on contemplating his patient fixed up in the plaster case. Some months later, when the plaster had been

removed, the patient presented a spectacle of deformity—complete abduction of both thighs—worse than at first. 'With sad misgivings,' as far as my memory of Professor Lorenz's words serves me, he sent the child away for a year. The child returned with normal hip-joints and walking in a perfectly normal manner. What satisfaction the surgeon then felt can be imagined.

CHAPTER V

POST-OPERATIVE TREATMENT

The After-Treatment. — Lorenz recommended that the plaster case be left untouched for six months. As a general rule this period may be safely adopted, but in particular cases it may be increased or diminished. Where only one hip has been operated upon, the patient is allowed to walk, the boot on the side of the operation being raised 1½ to 6 inches in order to prevent undue lateral inclination of the trunk (see Fig. 39, p. 56). Where both hips are involved, the patient can stand by holding a staff in both hands, and can hop sideways in either direction, or can sit on a small wheeled seat, which the patient moves by the feet. In both unilateral and bilateral cases daily passive and active extension movements are practised at the knees to overcome the rigid flexion of the knee mentioned above as a sign of reduction of the dislocation.

Care of Patient and Course of Events immediately after Operation.—The patient is put in a bed previously well warmed by hot bottles, which should be removed when the patient is placed in bed. A pillow placed beneath the hips often comforts the patient. The feet are examined to make sure that the circulation is good; if there is marked cyanosis, coldness, or other evidence of blood stasis, the plaster case and bandages must be cut at the groin or

removed, to be reapplied later with diminished abduction and hyperextension. When the application of the plaster case is deferred, the patient may be nursed in either the dorsal or the prone position, a covering of sterilized wool being lightly bandaged over the groin and the buttock. There is no tendency for the dislocation to recur immediately after operation. When the prone position is adopted, the wooden splint (Fig. 38, p. 55) as used by one of my colleagues, Mr. T. H. Openshaw, may be applied. Pain is much diminished by deferring the application of the plaster case. When the plaster case is applied at the same time as reduction is done, slight interference with the venous return and slight swelling of the limb are not uncommon, and generally pass off in from one to three days. In but one of my series of forty cases had the plaster to be cut on one side, but it did not require to be removed. If cases are properly selected and a preparatory course carried out when indicated, and the patients are thoroughly prepared for the anæsthetic, but slight shock is observed. If the operation has been prolonged and the pulse is rapid and weak, brandy or strychnine may be required.

The temperature may rise to 100°; any rise beyond this is probably due to constipation or retention of urine: the latter is uncommon, micturition being as a rule increased in frequency for the first day or two. The child may be held in the sitting position to facilitate the action of bowel and bladder. Peritoneal irritation with tympanites has not occurred in any of my cases, but in Case 36 there was a near approach to it.

Pain.—If the plaster case has been properly applied, with extra pads of wool below the anterior superior iliac spines and above the internal condyles of the femur, and the edges of the case properly cut and everted a little where

they lie over the inner condyles, the pain that follows the operation can only be caused by certain factors: first, effusion of blood from the torn adductors; second, pressure of the head of the femur against the acetabulum; third, the tension of muscles and of the anterior part of the capsule; and fourth, stretching of the skin over Scarpa's triangle. All these factors may be reduced to a minimum by preliminary preparation of the patient, but, as has been explained above, the second and third are desirable within certain limits. The more prominent pains are due to the second cause, and are, like those of hip disease, intermittent, and experienced chiefly at night, causing the patient to wake with a start. In older children they may be reduced by opiates, but these are as a rule unnecessary. After the second night the starting pains rapidly diminish in severity. Carminatives allay them best.

The local swelling about Scarpa's triangle, the vulva, and the buttocks, due to effusion of blood and œdema, increases for twenty-four hours, and after this for the next twenty-four hours an additional œdema may be observed, causing sometimes considerable swelling of the labia or scrotum, and in difficult cases there may be some swelling of the legs. If the latter persists in spite of bandaging over cotton-wool, the plaster case must be opened along the front, and the spica of the underlying calico bandage cut at the groins. This effusion is reduced to a very small amount when the adductors are cut subcutaneously; the blood and serum escape through the puncture made by the tenotome, and are absorbed by an antiseptic dressing. When the swelling has subsided, the integrity of the case can easily be restored by the superposition of a few

plaster bandages. During the first few hours the nurse's hand should chafe the skin over the sacrum frequently, and on the following two or three days she must carefully prevent any wetting of the case, and as soon as the tenderness in the groins has disappeared daily rubbings

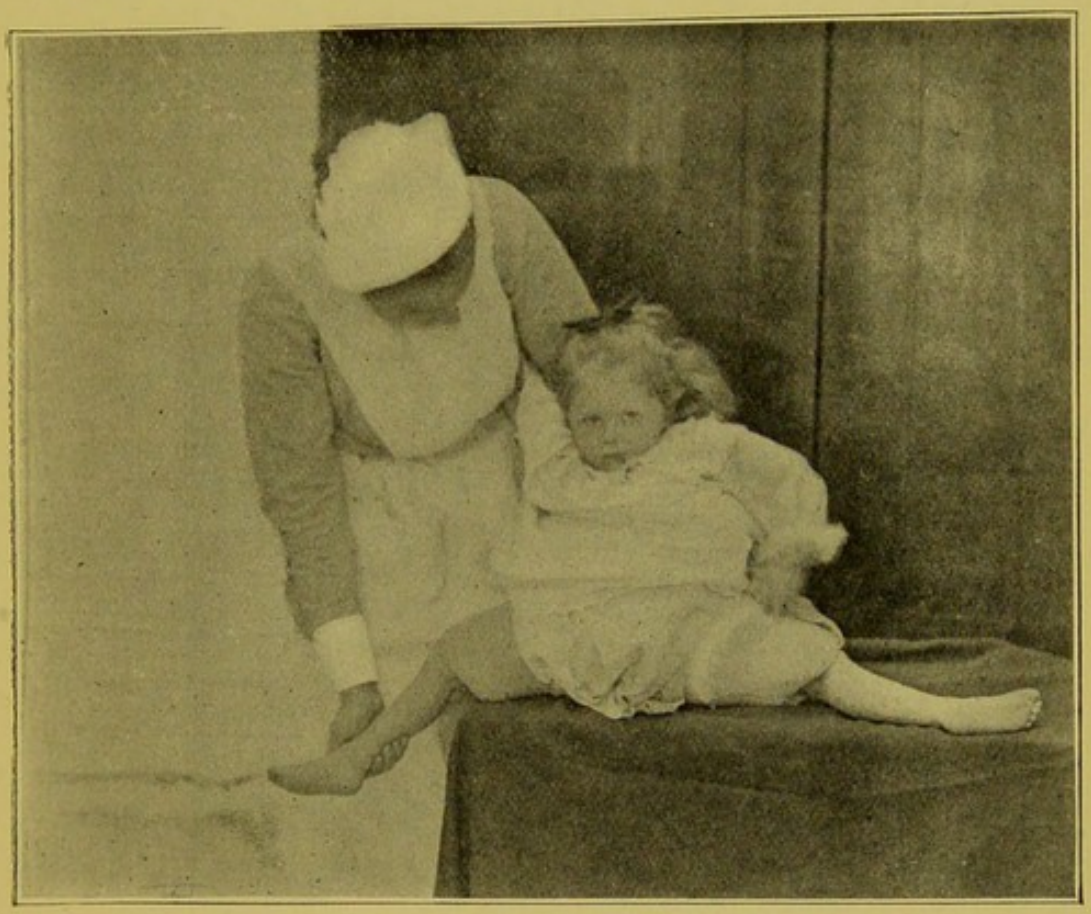


FIG. 31.—STRETCHING THE HAMSTRINGS IN A CASE OF DOUBLE DISLOCATION AFTER OPERATION.

The left limb is kept in the fully extended position by its position on the table, whilst the nurse exercises the right.

with the rubbing-bands can be carried out, a little violet powder being dusted on them. In this way irritation and eczema will be prevented. If from any cause a sensitive area should develop, a hole can be cut in the case, and the skin examined and treated. In unilateral cases walking may be commenced any time after the first week, and in

bilateral cases the patient may sit on a padded box or stool, and after about the tenth day may be taught to stand with the aid of a chair or table, climb upstairs, and so forth.

Stretching the Hamstrings. — One of the marks of a successful reposition is that the knee is flexed, and extension is resisted by the tense hamstrings. It is absolutely necessary that this tension of the hamstrings be overcome by daily exercises before the first plaster is

FIG. 32.—STRETCHING THE HAMSTRINGS.

removed. This task is greatly facilitated if at the completion of the first operation they are thoroughly stretched whilst the patient is still under anæsthesia. If the operation has been difficult, and the tension of the hamstrings is very great, this proceeding should be deferred for a week or longer, when a second anæsthetic may be given, so that they may be thoroughly stretched. Care and judgment must be exercised (see below, Chapter VI.). After the first forcible stretching under anæsthesia, the nurse should perform passive extension at the knee (twelve

to twenty swinging movements) regularly twice daily, and after a time these can be supplemented by active exercises on the part of the patient. The passive movements should not cause pain.

In bilateral cases both limbs should be exercised simultaneously (Fig. 32), or one may be fixed in the fully extended position whilst the other is being exercised as shown in Fig. 31.

After the passive knee-extension movements have become easy, active and resisted knee-extension is practised in addition.

*Massage.**—Gentle superficial stroking may be done between the second and the seventh days, but the deep massage, which is so important in keeping the muscles well nourished whilst the plaster case is worn, must be deferred until the swelling and pain have subsided, towards the end of the first week. In kneading the muscles, care must be taken not to chafe the skin unduly; this can be avoided by keeping the same portion of skin under the fingers and thumb during the kneading of a section of muscle. The nurses or parents must be taught to perform the massage systematically as follows:

1. Patient lying on the back, the pelvis square with the trunk; passive and active movements of the toe, ankle, and knee joints; deep kneading of muscles of the front of the foot and leg; kneading of the upper parts of the

* The massage consists in stroking with the flat hand or finger-tips (*effleurage*), kneading the muscles through the skin between the finger-tips and the thumb or thenar eminence (*pétrissage*), and circular frictions: in doing the latter the finger-tips, placed firmly on the skin, the same portion of which is kept under them, are moved in a circle, pressing the muscles between them and the bone (circular friction). The fingers are thus moved from point to point till the whole area of the buttock has been treated.

adductors and of the muscles of Scarpa's triangle. The nurse's hand is passed under the plaster case in order to massage every accessible part.

2. Patient lying prone, the gluteal muscles are thoroughly massaged by deep circular friction, the nurse's hand being passed well under the case for this purpose.

Active Exercise.—Patient lying on the sound side (in a unilateral case), the limb that has been operated on is allowed to fall towards its fellow; patient raises the limb to the vertical position several times, extending the knee. This exercise requires assistance at first.

Walking Exercises.—As soon as pain and any fever there may be have subsided (from six to ten days), the patient should be placed on the feet and exercised in standing. In unilateral cases patients can walk unassisted after two weeks. The gait is peculiar, owing to the limb that has been operated on being fixed, and to the knee being behind the frontal plane. In 'taking off' with the foot of the side that has been operated upon, the body is propelled by extension of the knee and ankle. In 'taking off' with the sound limb, the pelvis swings round with the body. To facilitate standing and walking, the boot of the operated side must be raised from 1 to 5 inches according to the height of the patient (Fig. 39). The elevation must diminish from heel to toe. A cork sock raised more on the outer than the inner border, and worn inside the boot, is a help to the patient. No stick or crutch should be used, but the patients should be taught to rely on their own efforts; the use of the limb maintains its nutrition and assists in deepening the acetabulum. In bilateral cases the patients may be taught to hop sideways with the help of a single stick; they can also be made to propel themselves to

either side, or forwards and backwards, on a cushioned box provided with wheels. In both single and double cases it is most important to encourage the patients to be on their feet as much as possible. They are not to be treated as invalids.

As soon as a patient can stand, easy exercises in the standing position, similar to those described below for use after removal of the retention apparatus, should be begun. During this period the surgeon from time to time examines the position of the femoral head by palpating in the groin whilst *rotating* the limb, until assured that the corrected position is maintained.

Removal of the Plaster Case.—This is an important stage of the post-operative treatment. A patient after operation for double dislocation has the appearance shown in Fig. 33.

If the rubbing-bands have been regularly used, the skin will be in good condition, and a light inunction of cold cream containing a little zinc oxide applied first to the anterior and then to the posterior aspect of the body, and wiped off with a soft gauze swab, will be all that is required the first day, and after that the ordinary toilette of the nursery may be used. When the first plaster case is removed, the position of the head of the femur must be critically examined as to its position and stability.

Any of the following conditions may be found:

Group 1: *The head of the femur is in the acetabulum.* Three varieties may be distinguished: (*a*) The head of the femur is firm in its new position; (*b*) it is easily re-dislocated; (*c*) it is abnormally rigid.

Group 2: *The head of the femur is in front of and internal to the acetabulum on the horizontal branch of the pubes—pubic*

position. These two groups may be termed the normal results.

Abnormal results due to unfavourable anatomical conditions or imperfections of method in operation fall into three groups:

Group 3: *The head of the femur is above the acetabulum, under the anterior superior iliac spine—the subspinal position.* Want of experience on the part of the operator or his assistant is the chief cause of this result; but it may be produced intentionally in older patients, in whom it would be dangerous to attempt complete reposition. This group often gives good functional results if properly followed up by after-treatment.

Group 4: *The head of the femur is on the ilium either* (*a*) *above or* (*b*) *behind the acetabulum.* Reluxation, due to faulty technique. In Group (*a*) a certain amount of permanent improvement is observed if the after-treatment is well carried out; the cases included in Group (*b*) are failures, and call for a new operation if the age of the patient and the anatomical condition offer a fair chance of success.*

Group 5: One other result may be observed—*The great trochanter may lie in the acetabulum.* This is a very rare event, and arises from insufficient stretching of the muscles during operation, or it may be intentionally produced in older patients, in whom the complete operation is impossible.

Bilateral Cases.—In cases of double dislocation one joint is often anatomically different from its fellow, and therefore the results on the two sides sometimes differ. Thus both femoral heads may be securely replaced; or one only

* See below, Chapter VIII., the author's open operation.

may be secure, whilst the other is either insecure or is in one of the positions 3, 4, or 5; or, again, both may be in one of the latter positions.

After the first plaster case is removed the patient misses its support, but in the great majority of cases, after a few days with massage and exercising, the child can voluntarily reduce the abduction by one-half, and in unilateral cases walks readily in this position. It is a noteworthy result of reposition that in walking the body rises on the corrected limb instead of dropping—*i.e.*, the limb that was the shorter is made actually as long as, and virtually longer

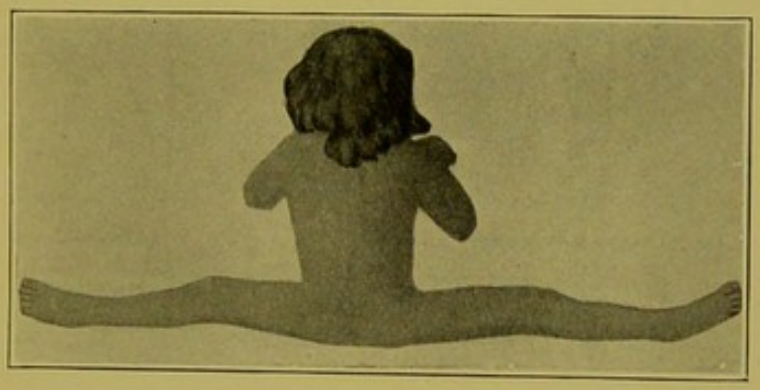


FIG. 33.—THE APPEARANCE OF A PATIENT AFTER REMOVAL OF THE PLASTER IN A CASE OF DOUBLE DISLOCATION.

than, the sound limb by the operation. The new position of the limb requires an altered arrangement of the boots; that of the sound side must be raised from $\frac{3}{4}$ inch to $1\frac{1}{2}$ inches when there is a tendency to too rapid adduction of the corrected limb. This elevation can be gradually diminished to one-half the original amount, which should be retained for from six to nine months.

The night position is the most important of all measures to prevent recurrence of dislocation after the plaster cast has been removed. The patient must sleep for a period of one or two years with the affected limb or

limbs in the primary position—*i.e.*, with the thigh fully abducted and the knee behind the frontal plane of the middle of the body. The simplest way of securing this is by Lorenz's night-pillow. This is rectangular and padded with tow or other firm material, and attached to the limbs by straps, as shown in Fig. 34, as applied in a case of single dislocation. In a double case both limbs are abducted. So long as the limb goes easily into the primary position there can have been no redislocation.

If the patient is taught to sleep face downwards, the knees are more easily kept behind the mid-frontal plane than is the case when sleeping in the dorsal position.

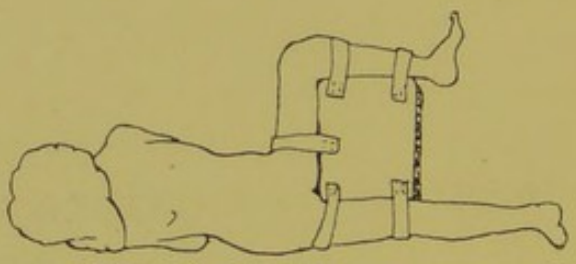


FIG. 34.—THE NIGHT-PILLOW AS APPLIED IN A UNILATERAL CASE.

The above is subject to modification in some cases. Thus, when there is much resistance to diminution of the primary abduction, the knees may be drawn towards each other by an adducting band. In Group 1 (*b*) the laxity is due to insufficient retraction of the pelvi-trochanteric muscles, and calls for refixation, with slightly diminished abduction—about 75°.

Group 1 (*c*).—When, after the usual massage, etc., the reduced joint remains stiff, an anæsthetic may be administered in order to see whether the stiffness is due to muscular tension or to adhesions in the hip-joint. Adhesions are rare and their presence may be

inferred when attempted passive movements at the joint are painful. After carefully moving the joint under an anæsthetic, such a joint may be treated either by a weight-extension in bed or by a secondary fixation apparatus; in either case the limb may be brought to 45° of abduction, and as soon as the sensitive condition has subsided the ordinary exercises (see below) may be begun. Attacks of pain and swelling in the hip-joint have been observed in a few cases after removal of the first retention apparatus. They are more likely to occur in children who have defective digestion. They call for fixation in a second plaster case or a short period of rest in bed, weight-extension, the limb being abducted to about 45°, and a long splint being applied to the sound side.

Group 2: The Pubic Position.—The head of the bone projects in front of the thigh. It is really only a variant of the normal position. This position may be produced intentionally in order to compensate for an unusually shallow acetabulum by obtaining a greater degree of shrinking of the pelvi-trochanteric muscles. Or it may be due to excessive stretching of the front of the capsule. In either case it is readily corrected by inward rotation of the femur. In order to render the correction permanent the limb is fixed in this position, a second plaster case being applied under anæsthesia with reduced abduction and with a varying degree of internal rotation; it may also be necessary to flex the hip slightly before the head of the bone disappears from the groin. The secondary fixation apparatus must be worn from two to six months —*i.e.*, until the head is firm in the acetabulum, when the ordinary exercises are carried out. These cases appear always to give good results.

Group 3: *The Subspinal Position.*—The head of the femur is above the acetabulum. The limb is shortened and the stability of the joint is imperfect, but improves under careful after-treatment, which is carried out on the

FIG. 35.—POSITION OF PATIENT FOR DOING EXERCISES IN THE FRONTAL PLANE ON A TABLE.

The nurse holds the pelvis firm whilst the patient practises abduction and adduction of the limb. The same exercises are done in the prone and, later, in the standing position.

same general plan as in ordinary cases; but special attention must be paid to massage of the glutei, and full abduction with hyperextension must be obtained during the exercises, and kept up at night during the period of after-

treatment. A useful exercise for teaching the patient how to hyperextend the abducted hip is shown in Fig. 43. The patient should also practise dropping the limb over the edge of a table, as shown in Fig. 41. This subspinal or anteverted position occurs less frequently as the operator's experience increases.

Exercises to be used after Removal of the First Retention Apparatus.—In general these are the same as those described above for use before removal of the plaster case;

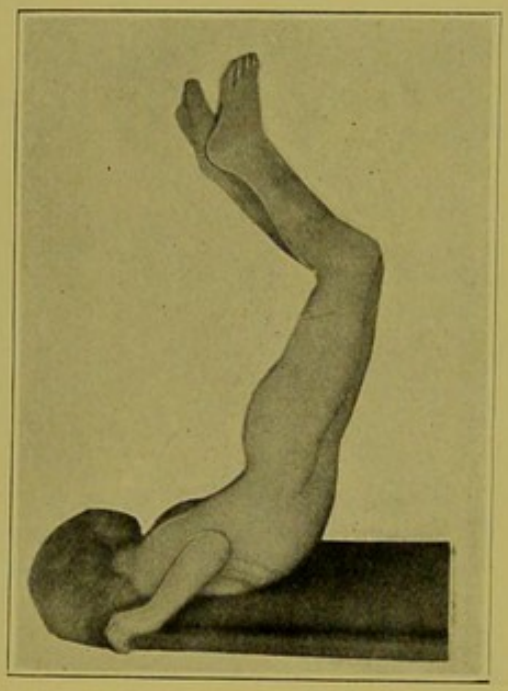


FIG. 36.—EXERCISE FOR THE SPINAL MUSCLES.

the following may be mentioned: (1) The patient lying on the back on a table, the pelvis square, the muscles in front of Scarpa's triangle, the upper part of the adductors and the muscles and the legs, are well kneaded, and the patient abducts and adducts the limbs alternately several times (Fig. 35). In this and all early exercises the knees should be kept back. When the patient has become accustomed to this exercise, and the new joint is found to

be firm, the same movement may be done more vigorously in the prone position, the patient pushing down the legs and the nurse drawing them down simultaneously. (2) Patient lying on sound side (in a unilateral case), legs parallel—*i.e.*, pelvis tilted—patient raises operated limb to the vertical position, bringing the pelvis square with the trunk.

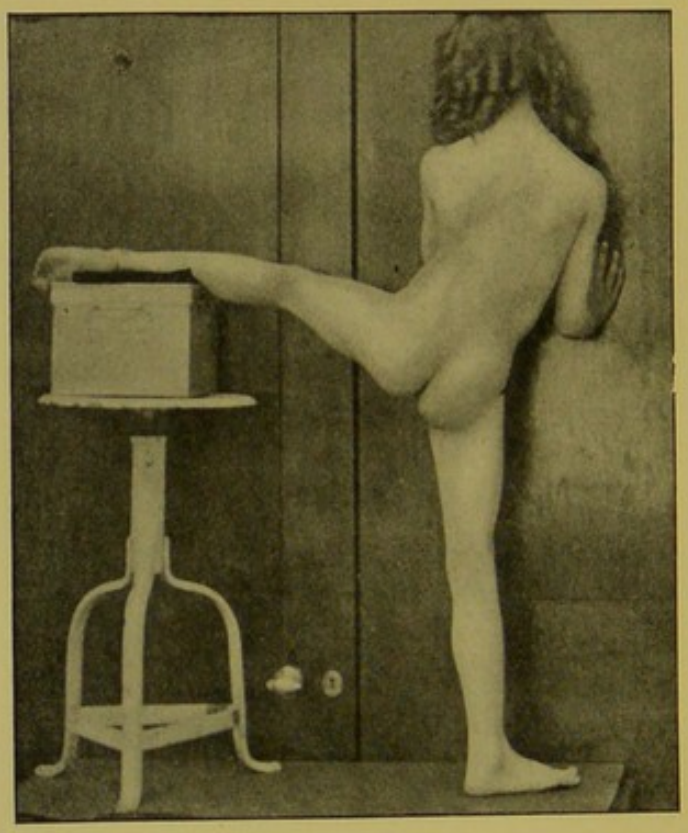


FIG. 37.—A UNILATERAL CASE (RIGHT SIDE), SHOWING THE WEIGHT-BEARING CAPACITY OF THE LIMB AFTER OPERATION.

(3) Patient lying prone, the posterior muscles, especially those of the buttock, are well massaged; patient elevates both lower extremities by hyperextension of spine and hip-joints. This requires assistance at first; in the later period some patients can assume the position shown in Fig. 36. (4) Standing, with the back against a table on which the hands rest, patient raises the limbs alter-

nately to the level of the table.* A patient bearing her weight on the operated limb is shown in Fig. 37.

To correct Flexion at the Hip-Joint.—When there is a tendency to flexion at the hip—*i.e.*, psoas contraction—the patient may with advantage practise two or three times daily the following exercise (Lorenz): The patient lying prone, a firm padded pillow, which may be made with recesses for the thighs, is placed under the lower part of the thighs, and a sand-bag weighing 6 to 10 pounds is placed upon the buttocks. Patient remains in this position from fifteen to twenty minutes. This is Lorenz's 'liege-sack' exercise.

* A full account of Lorenz's exercises is given by Ashley and Müller in the *New York and Philadelphia Medical Journal*, April to September, 1904.

CHAPTER VI

POST-OPERATIVE TREATMENT OF SPECIAL COMPLICATIONS

Nerve Symptoms after Lorenz's Operation.—When it is realized that this operation actually lengthens the affected limb sometimes by as much as 3 inches or even more, it is not to be wondered at that nerve-symptoms have been observed to follow the operation. The commonest of these is paralysis of the external popliteal (or peroneal) nerve. The relative fixity of this nerve as it passes round the neck of the fibula probably accounts for the external popliteal nerve resenting elongation more than the internal does. A more alarming paralysis is one affecting the nerves of the whole lower limb. This can only take place in cases where operation has been delayed beyond the years of safety.

The cause of the paralysis must, I think, be attributed to increased tension on the spinal nerve-roots. Examination of a lower limb that has been avulsed by accident shows that the roots of the sacral nerves, including the posterior spinal ganglia, remain in continuity with the great sciatic nerve. Whenever the degree of shortening and the length of the femoral neck point to an unusual strain on the parts around the hip-joint after reduction, a careful preparatory course, including daily manipulations,

the first of the latter being done under anæsthesia; and weight-extension for at least a fortnight are to be advised. In such cases, instead of forced knee-extension at the time of operation, I use the splint shown to the left of Fig. 38. The broad end is strapped to the upper side of the thigh-piece of the plaster case; the calf rests on the hollow plate, and the strap at the narrow end is adjusted to a slipper worn by the patient. The splint is malleable, and is first applied with the part over the knee bent to a right

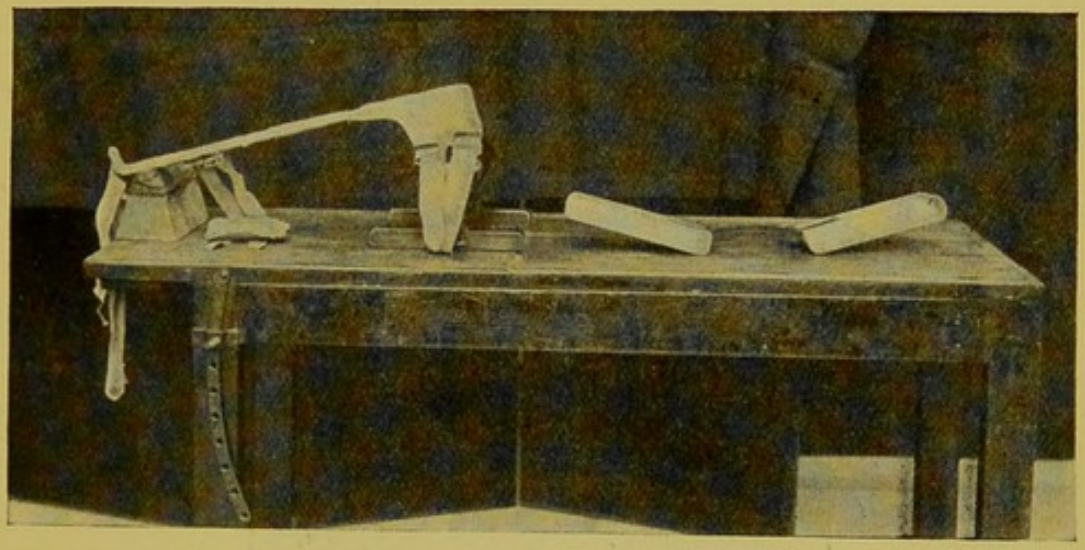


FIG. 38.—ON THE RIGHT, SIMPLE SPLINT TO APPLY IN PLACE OF THE PLASTER CASE IMMEDIATELY AFTER OPERATION; ON THE LEFT, THE METAL SPLINT FOR USE WITH THE PLASTER CASE FOR GRADUAL KNEE-EXTENSION.

angle; the knee part is gradually straightened, daily massage and active exercises being carried out.

Stiffness in the Flexed Position of the Joint.—Sometimes, from tension of the ill-fitting joint-surfaces, spasmodic pains, resembling those of coxitis, occur. They demand rest in bed with weight-extension, followed by gentle manipulation of the limb. I have had one instance of this (Case 3), a patient whom I presented to the Clinical Society on October 28, 1904, and again a year later. One

year and two months after operation the head of the femur was prominent in the groin, the joint was stiff and somewhat painful, and slightly flexed (Fig. 40), the thigh was abducted to 45° (Fig. 1). The patient having done the appropriate exercises when she was shown again to the Society, the head of the femur had receded to its normal

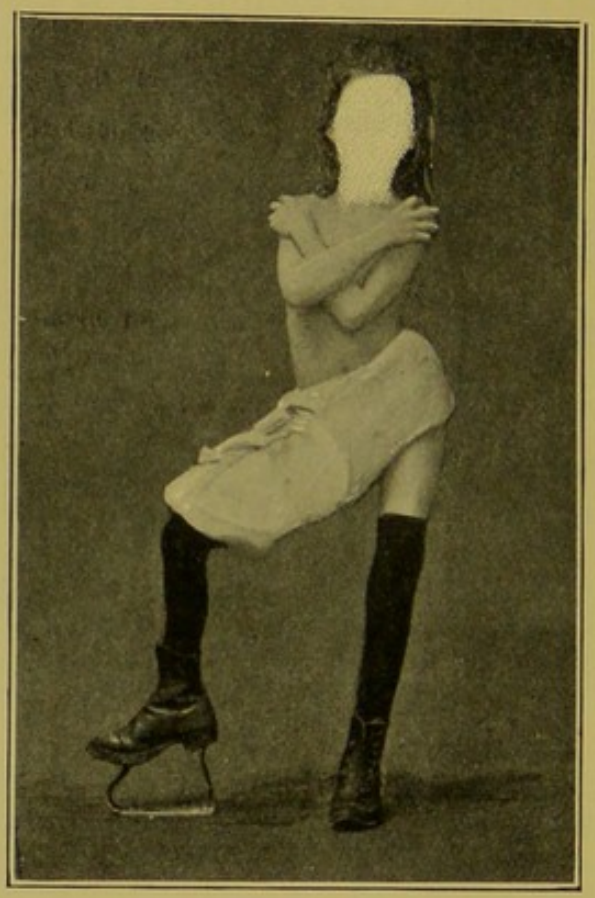


FIG. 39.—PATIENT WEARING PATTEN WHILST IN THE PLASTER CASE.

position, the joint moving freely and without pain, both actively and passively; the flexion had been almost entirely removed, and the abduction reduced to about 10°, beyond which it would not have been wise to reduce it, save gradually by the natural effects of walking. Patient walked well without limping, save that some abduction caused her to *rise* when the affected limb was

used in walking. As the head of the femur receded, the trochanter rose to about ¼ inch above Nélaton's line, This was probably due to some alteration in the form of

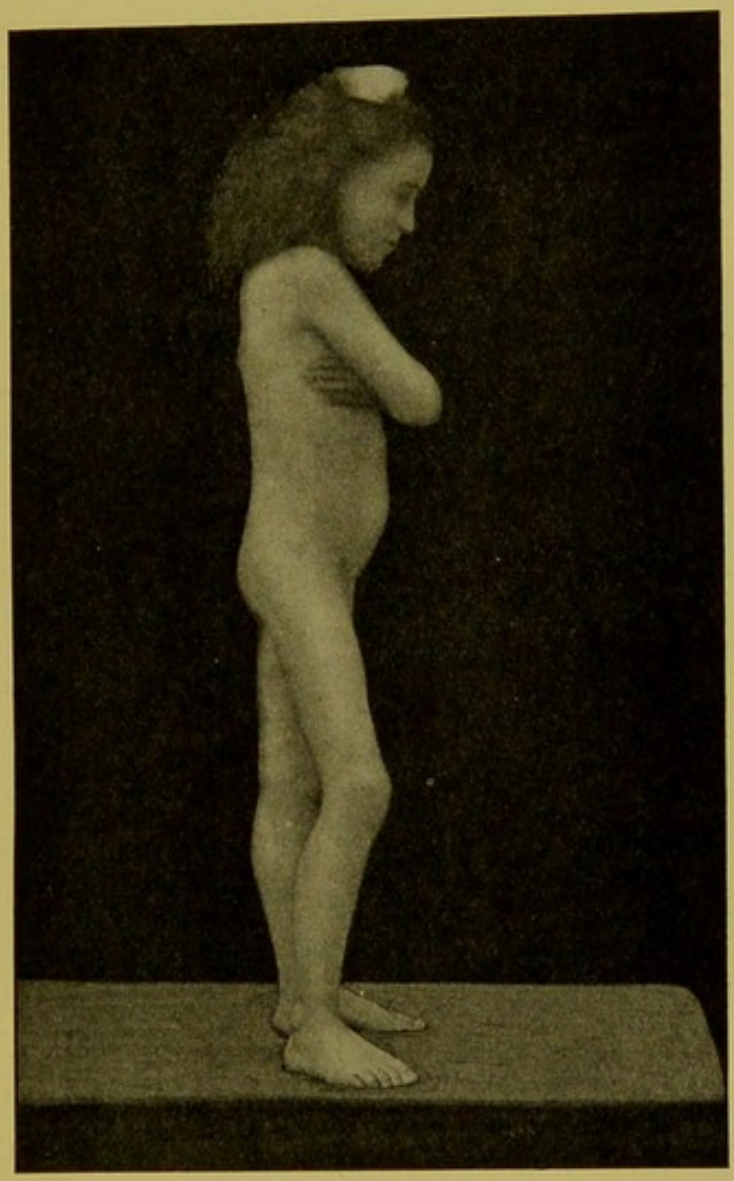


FIG. 40.—SHOWING RIGID FLEXION AT THE HIP: THE SAME PATIENT AS IN FIGS. 1, 41, AND 42.

the acetabulum and of the neck of the femur. The restored joint was quite firm.

In rigidly abducted cases, a special exercise is used as follows: The child lying on the back, a thorough kneading

of the muscles below the anterior superior iliac spine and all round the top of the thigh is done, and then active, passive, and resisted adductions and abductions are done with the knee flexed as well as extended. In rare cases subcutaneous section of the tensor fasciæ femoris is required.

In *pubic cases*—that is, when the head of the femur is very prominent in the groin and well internal to the

FIG. 41.—SHOWING POWER OF EXTENDING THE HIP RESTORED BY EXERCISES.

femoral artery—it is necessary to place the head of the femur in the acetabulum by flexing, and sometimes in addition internally rotating the limb and fixing it in this position in plaster for two months. At the end of this time there is sometimes a contraction of the ilio-psoas, which requires special measures (see also p. 53) : first, the patient lies prone, the knees elevated on a firm padded block and a sand-bag on the buttocks, for twenty minutes

three times a day, in order to overcome flexion at the hip-joint; and, secondly, the patient lies at the edge of a table, the pelvis being held by a nurse and the limb dropped over the edge of the table (Fig. 41). This position allows of both active and passive extension of the hip. If these exercises are persevered in, the worst-looking contracture will be overcome.

Subspinal cases are those in which the head of the bone

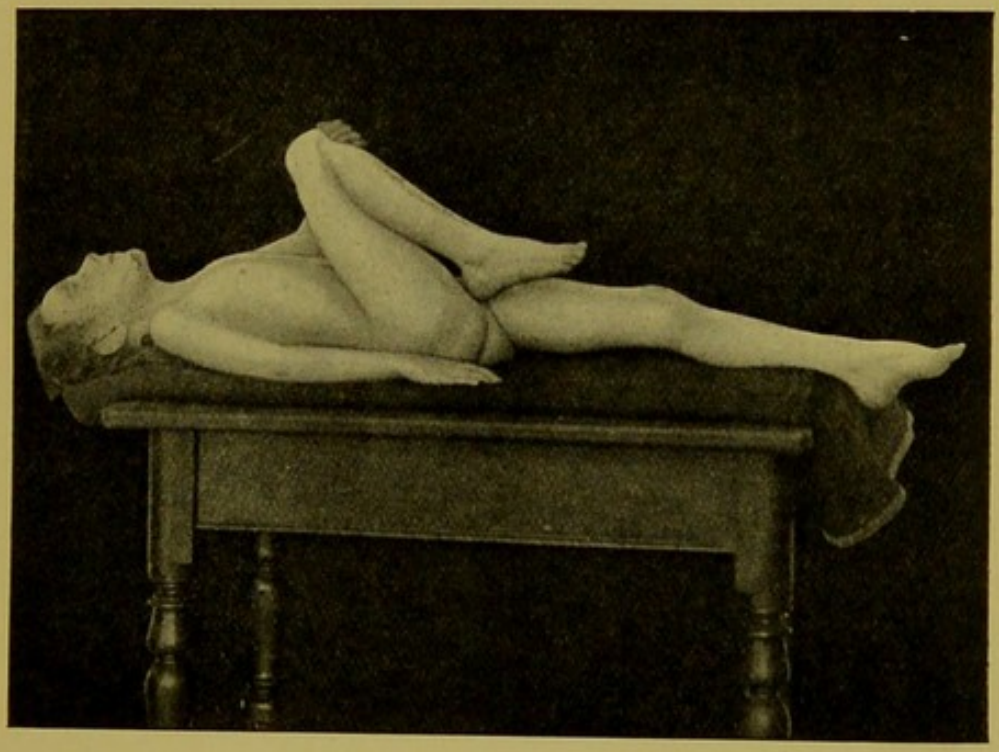


FIG. 42.—SHOWING POWER OF FLEXING THE HIP RESTORED BY EXERCISES.

lies above the acetabulum and below the anterior superior spine. They often give excellent results if the precautions against too early adduction and forward movement of the knees are observed. For this the night-pillow described on p. 48 is required, and also the exercise shown in Fig. 43, where the nurse holds the child's pelvis firm against her knee, and at the same time draws back the patient's knee in the fully abducted position ten to twenty times.

As mentioned under Case 36, excessive hæmorrhage may result from rupture of the psoas muscle, which may be suspected when a sensation as if of soft adhesions giving

FIG. 43.—AN EXERCISE REQUIRED IN SUBSPINAL CASES.

The nurse holds the patient's abducted limb below the knee, which is held back, and steadies the opposite side of the pelvis, then presses her knee at the back of the operated hip, which is thus hyperextended.

way is felt during the manipulation for extending the hip. In such cases the application of the plaster case should be deferred, and the joint and the iliac region bandaged over a thick covering of cotton-wool.

CHAPTER VII

THE ULTIMATE RESULTS OF THE MANIPULATIVE TREATMENT

THESE results, critically verified four or five years or more in carefully observed patients, have proved so much better than our most hopeful expectations that we can hardly read our forecasts made about the time of Lorenz's visit to England (1903) without a sense of pleasure. For instance, in that year, in describing a typical case of anteversion, a colleague wrote:

'This case is a typical example of a large percentage of the results of Lorenz's method of replacing a congenital dislocation of the hip. The head of the bone is not perfectly in joint, and does not rest upon the acetabular cartilage. It is displaced outwards and forwards, so that there is a fulness on the front of and external to the centre of the joint, and a displacement outwards of the whole bone, making the great trochanter more prominent than on the opposite side. The firmness of the joint, however, and the joint movements, are as perfect as can be desired, although the anatomical reformation of the joint is not complete.'

The contrary of this, which was the view of most of us at that time, has proved to be true; the true and

permanent repositions amount to about 75 per cent., and thus greatly outnumber the cases of stable anteversion.

Since that date I have ascertained the present state of my first series of ten consecutive cases, operated on in

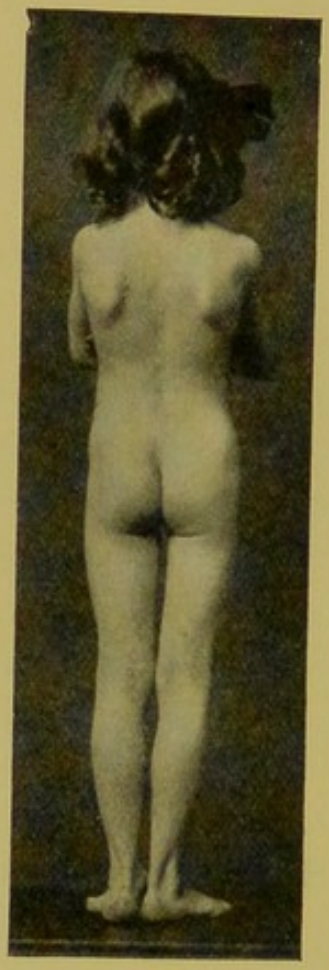


FIG. 44.—REPRODUCTION OF A RECENT PHOTOGRAPH OF A PATIENT WHO WAS OPERATED ON IN 1904 FOR A CONGENITAL DISLOCATION OF THE RIGHT HIP-JOINT.

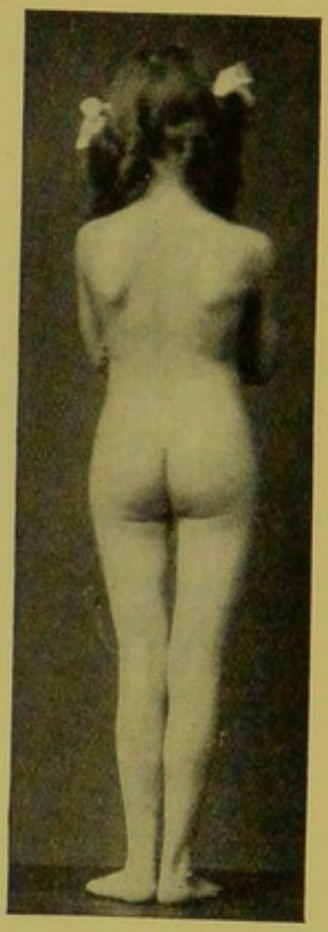


FIG. 45.—REPRODUCTION OF A RECENT PHOTOGRAPH OF A PATIENT WHO WAS OPERATED ON IN 1904 FOR DOUBLE CONGENITAL DISLOCATION OF THE HIP.

1903 and 1904. Five of the patients in question were shown, together with their skiagrams taken before operation, at a meeting of the Royal Society of Medicine in April, 1900. Two of these patients are shown in Figs. 44

and 45. Apart from a slightly smaller muscular development in the right lower limb in Fig. 44, there is in neither

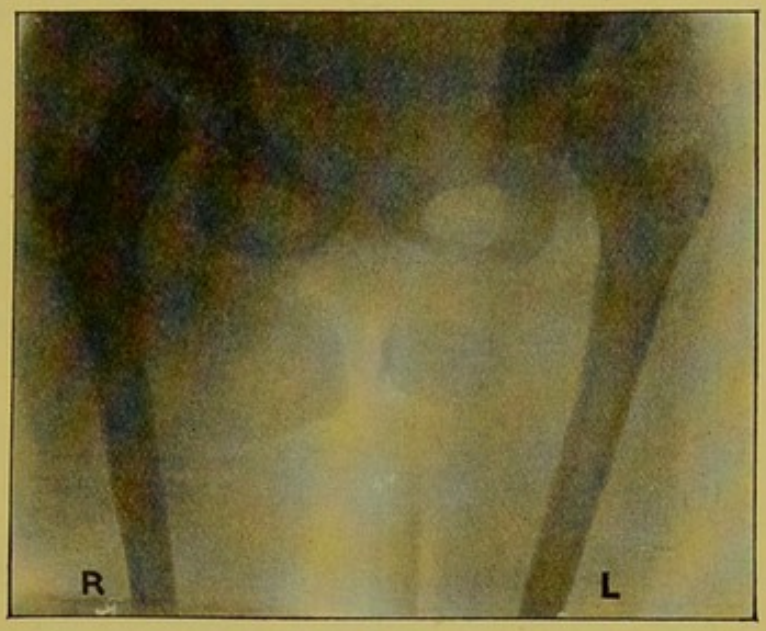


FIG. 46.—SKIAGRAM OF THE HIP-JOINTS OF THE PATIENT SHOWN IN FIG. 44.

FIG. 47.—SKIAGRAM OF THE HIP-JOINTS OF THE PATIENT SHOWN IN FIG. 45.

of these cases any defect whatever, or any clinical evidence of an abnormality in the previously deformed joints. The

same is true of two of the other five patients shown at the meeting. The fifth, Elsie D., now aged thirteen years, I operated on in 1904 for double dislocation; the result is that the right joint is normal, whilst the left is firmly replaced beneath the anterior superior iliac spine (ante-

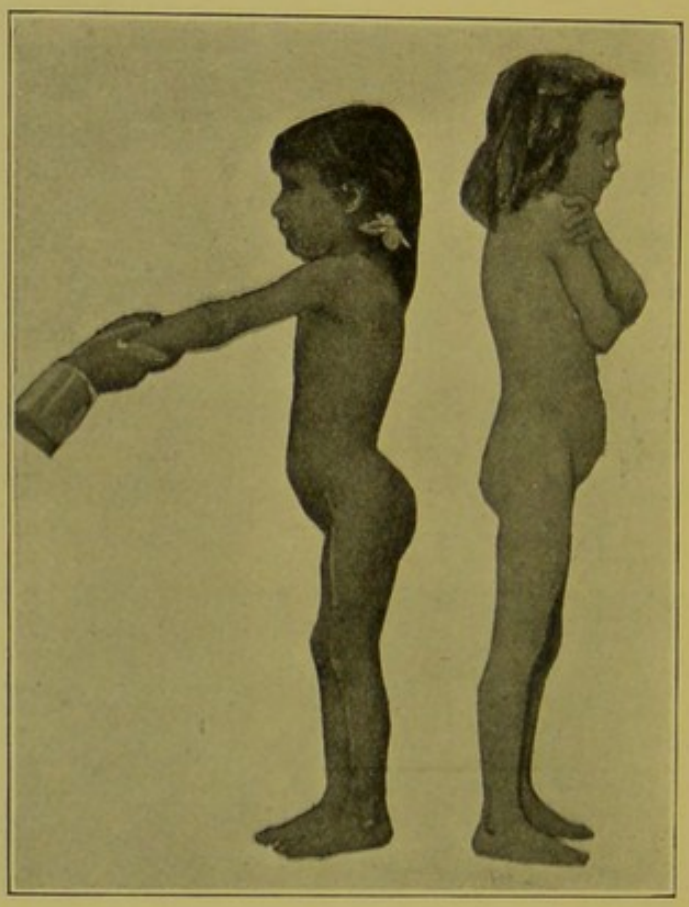


FIG. 48.—TWO ILLUSTRATIONS OF THE SAME CHILD BEFORE AND TWO YEARS AFTER OPERATION FOR DOUBLE CONGENITAL DISLOCATION.

The marked lordosis has been completely removed by the treatment.

verted), and the child walks firmly without any trace of the rolling gait characteristic of this deformity. The range of movement is normal in all the joints. Figs. 46 and 47 are taken from skiagrams by Dr. W. Ironside Bruce, whose report on them reads: 'The head of the

femur is seen to be in excellent relationship to the acetabulum.'

The post-operative treatment lasts about twelve months from the date of operation, and when the condition of the joints has remained unchanged for four years or longer after this period of supervision the results may without risk be looked upon as permanent.

Even when the result is not quite perfect, the permanent improvement may yet be very satisfactory. Fig. 48 shows the condition of Elsie D. (Case 9) before and after operation. Although one hip is merely in the subspinal position, yet the patient walks well and has lost the lordosis.

Other Cases illustrating Results.—Figs. 49 and 50, taken from a boy aged six and three-quarter years, on whom I operated in 1905 for double dislocation. Figs. 51 and 52 show the boy's perfect profile four years after operation. Before operation the limitation of abduction was great; when the boy's knees were separated to their fullest extent, instead of the degree of abduction of each thigh being about 85°, it was 30° on the right, and but 20° on the left side.

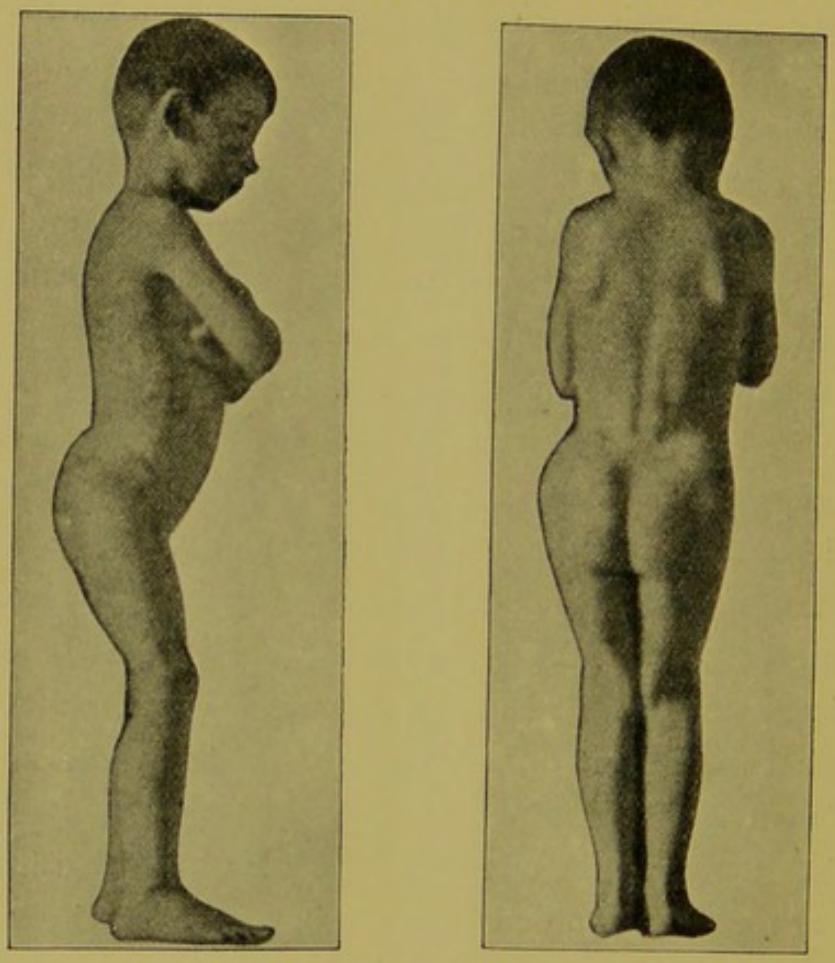
Another example, one that is of some historical interest, being the first recorded instance of a successful operation for congenital dislocation of the hip performed in London, is shown in Figs. 53 and 54, taken from the same patient as the skiagrams shown in Figs. 20 and 21.

The operation was kindly performed by Lorenz, at my request, at the City of London Orthopædic Hospital,* on January 14, 1903. The patient, now aged twelve, is a

* This hospital was amalgamated with the Royal and the National Orthopædic Hospitals in 1907, under the auspices of King Edward's Hospital Fund.

perfectly proportioned girl, completely cured of deformity. She was sent to me by S. A. E. Wilson (Boston).

Of the consecutive and inclusive series of forty cases given below, the results may be considered to be established in the first thirty patients. These presented 39

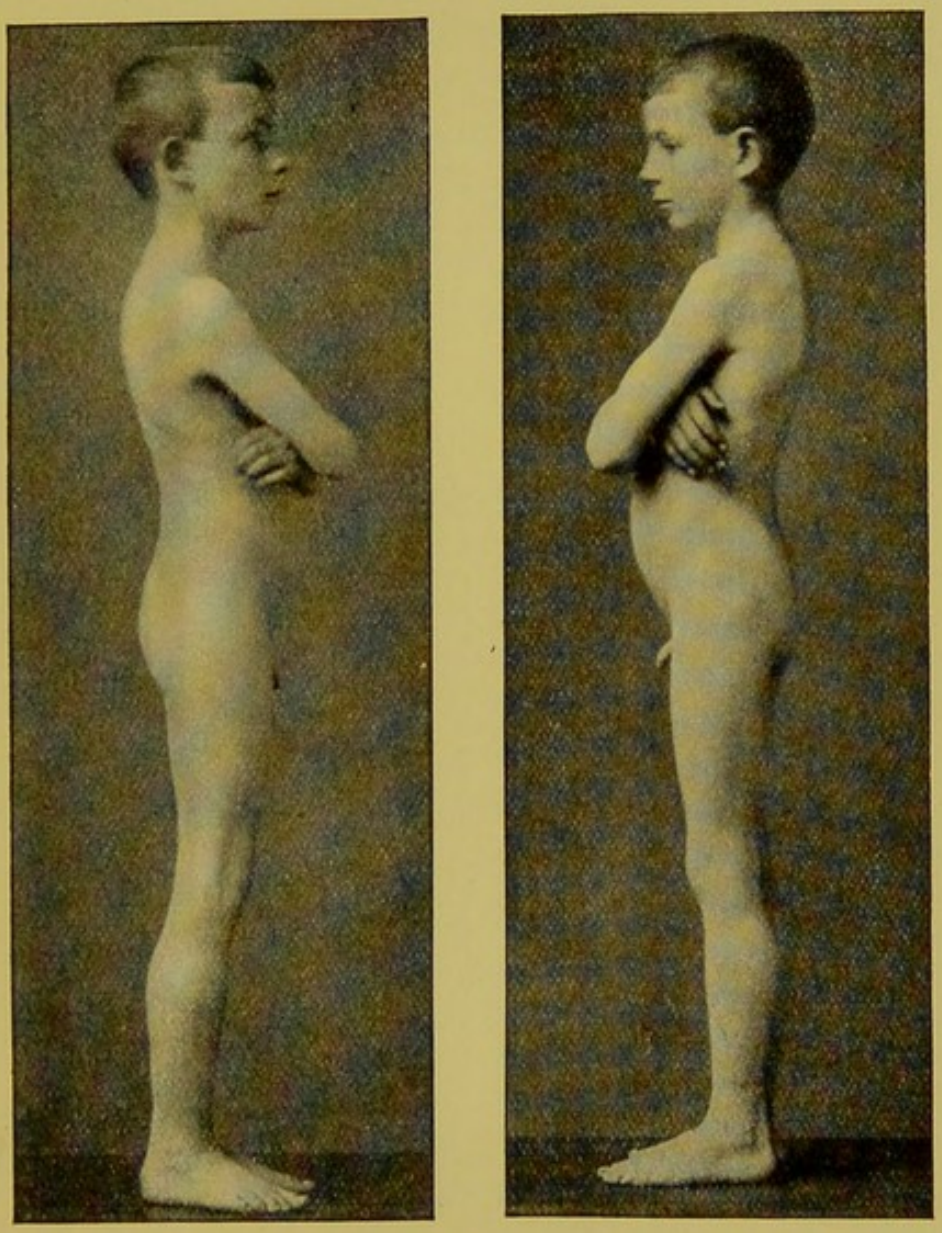


FIGS. 49 AND 50.—TWO VIEWS OF A BOY AGED SIX YEARS AND NINE MONTHS, THE SUBJECT OF BILATERAL DISLOCATION, BEFORE OPERATION, OCTOBER, 1905.

dislocations, of which 18 were double and 21 single; of the 18 double ones, 12 are cured and two are anteverted in a stable position, and 4 failed.

Of the 21 single joints, 17 are cured, 1 is anteverted, and 3 have relapsed; the total being 29 out of 39 cured, 3 stable anteversions, and 7 failed. Of the latter, two

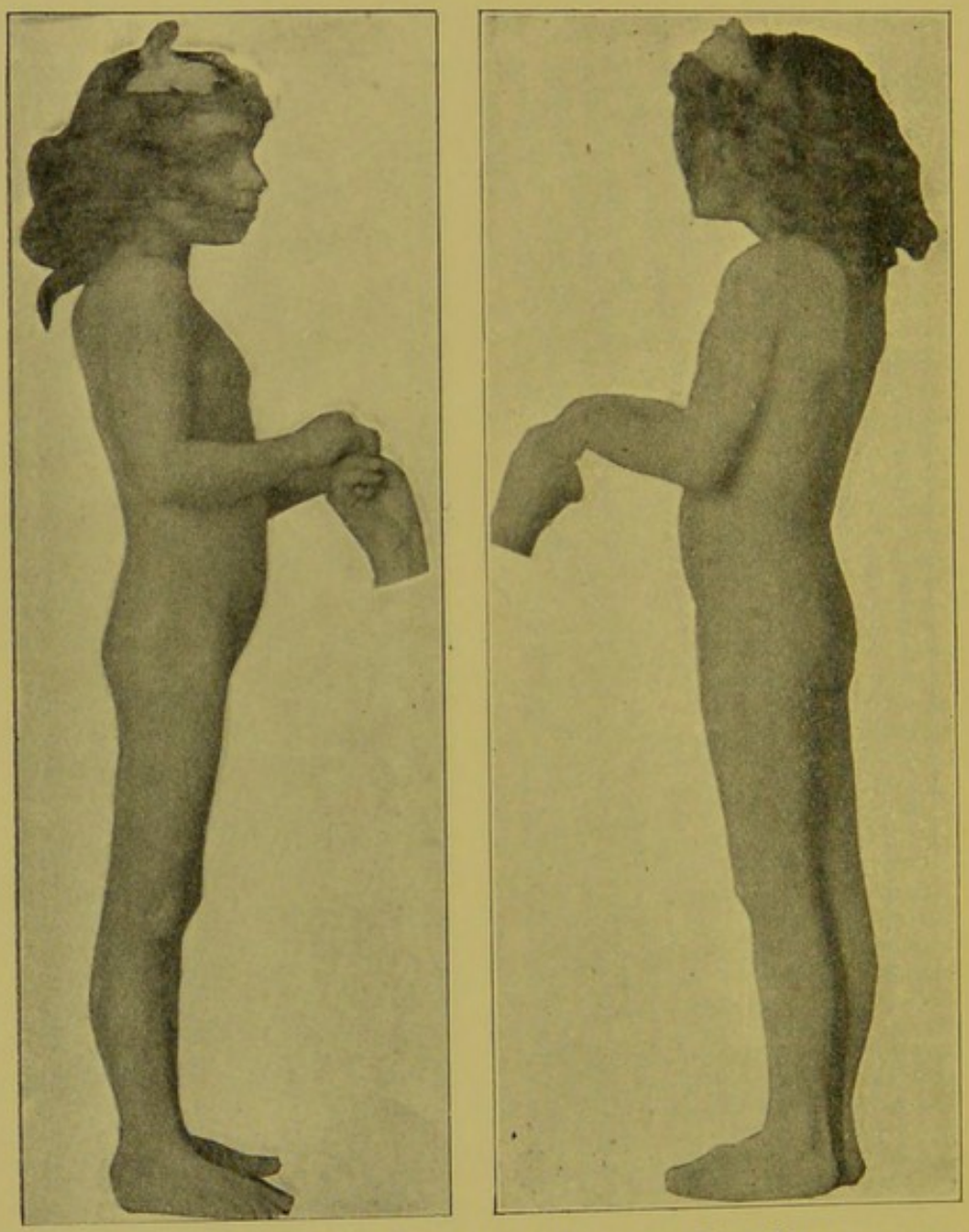
have been subsequently treated by the author's open operation (see below). One of these is cured; in the other instance. the patient being still in plaster, the result is uncertain.



FIGS. 51 AND 52.—SHOWING CONDITION OF THE SAME BOY IN OCTOBER, 1909 (SEE CASE 19).

For the purpose of rendering this a reliable contribution to the statistics of the permanent results of the treatment of congenital dislocation of the hip, I have kept myself

informed of the history of the patients after operation. In one double case (21), however, I have no recent report; those two hips I have numbered among the failures. In



FIGS. 53 AND 54.—TWO VIEWS OF A PATIENT TWO YEARS AFTER OPERATION.

no case has disease been reported after operation. The youngest of the series was aged two years, and the oldest thirteen. Four years I regard as perhaps the best age.

CHAPTER VIII

THE AUTHOR'S OPEN OPERATION FOR CASES IN WHICH THE MANIPULATIVE METHOD HAS BEEN TRIED AND HAS FAILED

In some cases, shortly after removal of the plaster retention apparatus, when it is found that the head of the bone is becoming re-dislocated, a second period of retention, with increased hyperextension, and with the knee elevated somewhat towards the axilla, should be tried. If this has been done without success, or if there is no trace of a raised border to be felt on moving the head of the bone in and out of the acetabulum, I think it is a waste of time to proceed on the 'bloodless' lines; and after carefully considering the pathological anatomy and other open operations that have been tried already, and their results, I have designed and carried out the following plan :*

An incision is made in the outer two-thirds or more of a line from the posterior superior iliac spine to the top of the great trochanter. The skin and fascia being divided, the gluteus maximus is seen, with its fibres lying parallel to the incision; it is divided, and the two portions are held apart by retractors. What is seen at this stage differs from the normal anatomy, and it varies in different cases

* First described in the *Lancet*, April, 1909.

of congenital dislocation. I did the operation for the first time on January 1, 1909 (Case 20). In this instance the whole of the capsule lay immediately beneath the gluteus maximus, the pyriformis not being seen. The capsule was very roomy and rather thin, and the head of the femur occupied only its outer portion. I opened the capsule at the lowest part of its posterior surface, the incision being only large enough to admit a periosteal elevator, Farabœuf's curved rugine; by means of this the periosteum and the cotyloid ligament were detached for about ½ inch at the upper and posterior borders of the acetabulum. Next three stout silk stitches were passed in turn through the periosteum thus raised into the joint cavity under the cotyloid ligament, out of the capsule again and through a fold of the capsule, then once more through the capsule near its femoral attachment, where the two ends were tied. These stitches removed the over-distension of the back of the capsule, and held the cotyloid ligament over the outer part of the head of the femur. The limb was put up in plaster as after the manipulative operation, which must always have preceded this open operation. The post-operative course was free from the swelling seen after the manipulative operation, and there was no evidence of intra-articular adhesions being present when the plaster was removed on June 1.

On July 20 I have a note: 'Patient walks well with the left limb abducted 30°. The trochanter is ½ inch above Nélaton's line. There is no telescopic movement.' At the present time the joint is sound and the patient cured.

On the second occasion on which I did this operation (Case 37), I made a rough sketch (Fig. 55) of the parts from memory immediately the operation was completed.

In this case the pyriformis lay over the lower part of the capsule, and a thin muscular strand, the gluteus minimus, shown cut across and turned aside, lay over the outer part of the capsule, which was very thin where it covered the re-dislocated head, but thick at its inner part where the incision in it is shown. After

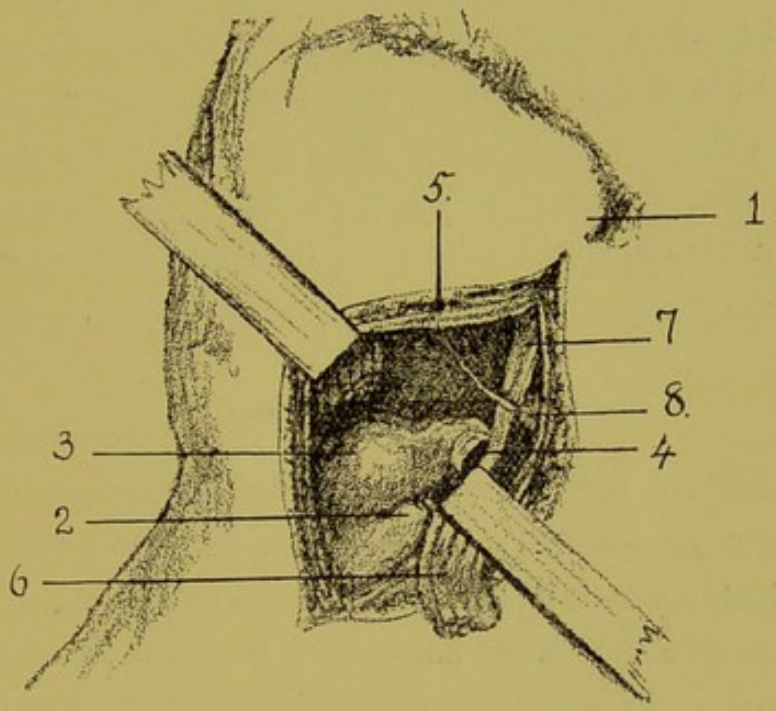


FIG. 55.—THE AUTHOR'S OPEN OPERATION FOR RELAPSED CASES.

1, Posterior superior iliac spine; 2, great trochanter; 3, head of femur, covered by thin distended upper and outer part of capsule; 4, incision in thickened inner and lower part of capsule; 5, gluteus maximus, held back by a retractor; 6, gluteus minimus, cut and turned aside; 7, pyriformis, held down by retractor; 8, great sciatic nerve, giving branch to gluteus maximus.

the periosteum had been raised as described above, I passed a gloved finger through the opening, and felt that the cotyloid ligament was freed from the bone. There was practically no border to the acetabulum. When the limb was placed in full abduction, the head of the femur moved to the inner part of the capsule. Stitches

were passed as in the former case, and the plaster case applied. The immediate post-operative course was uneventful. In this case a strong handled needle was necessary for passing the sutures through the thick capsule. This proceeding differs from the open operations of Hoffa, Lorenz, and others, which involve an excavation of the acetabulum, and, when necessary, a re-shaping of the femoral head through a free opening in the joint capsule.

It is to be noticed that no articular cartilage is removed, and that the anterior part of the capsule is not weakened. I hope that this simple operation will prove capable of giving a strong and useful joint in every case where the manipulative operation has been thoroughly tried and has failed.

The little we can do to relieve the disabilities of those who have passed the age at which operative treatment is applicable hardly merits detailed consideration.

It is easy to say what should *not* be done in unilateral cases, and in those bilateral cases in which the shortening is greater on one side than on the other: *the shortening should never be fully corrected* unless there happens to be an absolutely firm nearthrosis. This one still too frequently finds to have been done, with the result that the limb is habitually adducted, and the femur is encouraged to slide up over the ilium, causing progressively increasing shortening. The treatment falls naturally into two parts: (*a*) the treatment of the limb, and (*b*) the treatment of the spine, if lordosis or lateral curvature have supervened. The shortening of the limb I deal with, first, by abduction exercises; second, by incomplete compensation—*e.g.*, by raising the boot two-thirds the amount of the shortening;

third, by instrumental support. The latter is usually in the form of a strong pelvic band, fitted with a perineal strap on the sound side. The weight of the limb is communicated to the band by a hip-piece on the outer aspect of the limb, where there is a flexion-extension joint, and below it an abduction joint, the adduction movement being arrested by a stop. Two uprights fit into the boot below, and are jointed with a catch-joint at the knee, the inner upright terminating in a perineal crutch above.

CHAPTER IX

A SERIES OF FORTY CONSECUTIVE CASES

CASE 1.—Florence ——, aged eight. Diagnosis: Left dislocation. Result: Relapsed. Clinical notes: Treated by high boot at a children's hospital when four. Treatment: Manipulative operation, March 17, 1903, with subcutaneous division of adductor longus tendon. The temperature rose to 100·8° F. next evening, and patient complained of some pain on the 20th and the 23rd, but not after. There was slight catarrhal vulvitis from 19th to 21st. Left hospital on fourteenth day. Plaster removed September 26, 1905. The head of femur was not felt in the groin, and the trochanter was above Nélaton's line.

CASE 2.—Phyllis ——, aged six and a half. Diagnosis: Right dislocation; 1¼ inches shortening; telescopic movement marked. Result: Cured. Clinical notes: Never walked properly; attended general hospital three years, wearing a high boot. Treatment: August 1, 1903, manipulative operation, reduction easy; afterwards head of femur felt internal to femoral artery.

This patient was shown at Royal Society of Medicine, April 30, 1909. See Fig. 37.

CASE 3.—Amy ——, aged five. Diagnosis: Right dislocation. Result: Cured. Clinical notes: Mother said patient was always feverish, so she was watched three

weeks, but no evidence of tubercle found; temperature regularly 1° above normal. Patient had vulvitis on admission. Treatment: Manipulative reduction. The night after operation patient was restless. Pulse irregular; temperature rose to 101° F. on the fourth day, then fell to 99°, normal for this patient. For details of after-treatment, see Chapter VI., p. 55.

CASE 4.—Dorothy ——, aged three. Diagnosis: Left dislocation. Result: Relapse. Clinical notes: Patient small for age. Treatment: April 22, 1904, manipulative operation.

May 3.—Patient walking in plaster case; the head of the femur could not be felt in the groin, showing that the dislocation had recurred; patient was readmitted and the limb was put up in plaster again.

This second plaster was removed October 2, 1904; the head of the femur was then internal to the femoral artery, and the trochanter was in Nélaton's line. The dislocation recurred a few months later. Open operation recommended, but declined by mother.

CASE 5.—Ethel ——, age nine. Diagnosis: Right dislocation. Result: Cured. Treatment: May 27, 1904, manipulative operation, with subcutaneous tenotomy of adductor longus.

June 3, 1904.—Left hospital. Right boot raised 2½ inches.

December 6, 1904.—Plaster removed; patient walked home. In this case there was a good deal of stiffness —*i.e.*, resistance to diminishing abduction—owing to irregularity of the head of the femur, which was noted in the skiagraph.

May 1, 1905.—Movement at the joint was more extensive and painless.

Patient readmitted for subcutaneous section of the tensor fasciæ femoris, July 1, 1905.

September 1, 1905.—The abduction was still 45°.

April 30, 1909.—Patient shown at Royal Society of Medicine.

CASE 6.—Beatrice ——, aged six. Diagnosis: Right dislocation. Result: Cured. Clinical notes: Mother first noticed deformity when patient began to walk, May 27, 1900.

June 17, 1904.—Manipulative operation. Patient can stand without support.

June 28, 1904.—Discharged.

April 30, 1909.—Shown at Royal Society of Medicine. See Figs. 44 and 47.

CASE 7.—Jessie ——, aged seven. Diagnosis: Left dislocation. Result: Relapse. Treatment: July 16, 1904, manipulative operation. Patient left hospital three weeks later; left boot raised 3 inches.

January 24, 1905.—Plaster removed; head of femur prominent below and internal to iliac spine; femoral artery over innermost part of head of femur.

CASE 8.—Lily P——, aged three. Diagnosis: Double dislocation. Result: Cured. Clinical notes: First noticed on beginning to walk. Treatment: Manipulative reduction, October 21, 1904; next day a good deal of swelling, but no trouble with urination.

November 18, 1904.—Hamstrings stretched under ethyl chloride.

June 27, 1905.—Right hip adducts to 45°, left pubic position.

October 27, 1905.—Left hip refixed in plaster; 30° flexion, slight abduction, and neutral rotation.

December 20, 1905.—Plaster removed; head of left femur in normal position; patient can stand alone; left hip not stiff or painful.

April 30, 1909.—Patient shown at Royal Society of Medicine. See Fig. 45.

CASE 9.—Elsie D——, aged eight. Diagnosis: Double dislocation. Result: Right, cured; left, stable anteversion. Clinical notes: Was operated on by J. J. C. when three years old, but relapsed from insufficient abduction. Delicate; severe rickets; temperature always 1° above normal.

November 11, 1904.—Manipulative reduction; right, good shock; left, slight shock. Put up in plaster same time. Night of operation, discoloration and some swelling over adductors; circulation—right foot, good; left, some cyanosis. Pulse, 116. Brandy, 2 drachms; patient slept at intervals during night; sick once. Circulation of left foot improved later.

November 12, 1904.—Swelling in right increased, becoming more than in left for a time; later left swelled equal to right. Left circulation still further improved; temperature 100° F. Slept at night with one interval of half an hour, and asked to be nursed.

November 13, 1904.—Swelling ceased; skin discoloured, but not tense. Pulse-rate increased to 160; tongue furred; temperature 99·2° F. Takes cold milk every hour. Says legs do not hurt; slept well after carminative.

November 14, 1904.—Some œdema, left leg and foot; the plaster case was cut below Scarpa's triangle on that side, and leg wrapped in wool. Pulse 130, weak; brandy, 2 drachms, by mouth. Patient asked for mince at dinner.

November 15, 1904. — Marked improvement in all symptoms.

December 9, 1904.—Hamstrings stretched under anæsthetic.

December 27, 1904.—Patient left hospital.

Patient's general health markedly improved. Muscles of both legs improved in size by massage. Plaster removed; both femoral heads prominent and internal to arteries, January 31, 1905.

February 28, 1905.—Head of left farther out than right.

July 4, 1905.—Walks easily; both hips adduct to 45°. After this rapid improvement.

April 30, 1909.—Patient shown at Royal Society of Medicine. See Fig. 48.

CASE 10.—Tom ——, aged seven. Diagnosis: Right dislocation. Result: Cured. Clinical notes: Delicate boy; prematurely born; had fits as child. Muscles of right thigh wasted; typical dislocation, with much gliding, right. Trochanter above Nélaton's line on left shown by X rays to be caused by coxa vara.

November 4, 1904.—Manipulative operation. Fair shock (showing a fair acetabulum); head of femur prominent in groin.

May 22, 1905.—Plaster removed. Pubic position. Patient walks well.

September 21, 1905.—The head of the femur being still prominent, the limb was fixed in plaster with 35° flexion, 15° abduction, and neutral rotation, the head of the femur receding.

For a few nights patient woke up with a start, but walked easily.

November 20, 1905.—Plaster removed; joint firm; moves well.

August 23, 1908.—Patient walks well. Reduction maintained; slight coxa vara both sides.

CASE 11.—Hilda ——, aged twelve. Diagnosis: Left dislocation. Result: Improved. Clinical notes: 2½ inches shortening. Patient had been treated by extension by Dr. Brook, who sent her to me. The shortening had been reduced to ½ inch, when patient fell and redislocated the joint.

December 16, 1904.—Manipulative operation: adductor longus tendons divided subcutaneously. Instead of the usual shock being felt at the moment of reduction, a sharp crack was heard; this a skiagraph showed to be due to separation of the epiphyseal head.* The result of a case† of traumatic separation after removal of the epiphysis from the acetabulum having proved satisfactory, I decided to put the limb up in plaster in the usual way—*i.e.*, in full abduction.

July 21, 1905.—Patient, a very nervous subject, having resisted the knee-stretching, there was still 45° of flexion at the knee; for this the hamstrings were divided at the knee; temporary paralysis similar to that described under Case 31 followed. After the paralysis had passed away, a talipes equinus remained, and tenotomy of the tendo Achillis was done to correct it.

September 10, 1909.—Dr. W. H. B. Brook (Lincoln), who sent this patient to me, reports: 'The hip moves very freely; flexion 40°; extension very little, 5°. Abduction 45°; adduction to the middle line. The knee is well extended, and when patient walks the hip moves perfectly

* With my present experience, I should give such a patient a fortnight's preparatory treatment, and so avoid any risk of this accident.

† See *Lancet*, October 27, 1900.

in the antero-posterior plane. The chief trouble is a marked condition of pes cavus with some equinus.

CASE 12.—Irene ——, aged two. Diagnosis: Right dislocation. Result: Cured. Clinical notes: At birth patient's right foot lay on right shoulder.

January 6, 1905.—Manipulative operation; good sound, and shock quite like reduction of ordinary dislocation. Post-operative course comfortable.

October 2, 1906.—Operated limb normal.

May 28, 1907.—Condition unchanged.

CASE 13.—Agnes Mary ——, aged 5. Diagnosis: Double dislocation. Result: Cured. Clinical notes: Patient never walked properly; abduction not more than 30° either side. Telescopic movement: Right, $1\frac{1}{4}$ inches; left, $1\frac{3}{4}$ inches. Manipulative operation, March 10, 1905. Both femoral heads internal to arteries. October 10, 1905, right adducts to 30°, left to 35°; left artery lies over middle of femoral head; right outside it.

February 12, 1907.—Patient runs and walks perfectly.

CASE 14.—Lizzie ——, aged 9. Diagnosis: Right dislocation. Result: Cured. Clinical notes: Right leg 2 inches short. Some sliding and lordosis. Patient had attended a children's hospital five years, wearing a high boot.

June 2, 1905.—Preliminary operation: adductor longus subcutaneous tenotomy and manipulation of all structures.

June 23, 1905.—Manipulative operation; reduction somewhat difficult. Screw-extension applied, and subcutaneous section of tensor fasciæ femoris done; a fillet was passed round the top of the thigh, and downward traction made while marked adduction and inversion were being made.

The post-operative course of events was smooth, some vaginitis being the only trouble.

July 11, 1905.—Patient left hospital, wearing high boot.

October 10, 1905.—Patient does exercises well; the head of the femur internal to artery.

June 1, 1907.—Patient walks without any limp; great trochanter in Nélaton's line.

CASE 15.—Charlotte ——, aged three. Diagnosis: Right dislocation. Result: Cured. Clinical notes: Both patient and her mother were very anxious, and the latter insisted on taking the patient from London to Lincoln fourteen days after operation; and although she had been instructed to keep the patient face down (the upper edge of the plaster pressed upon the sacrum except in this position), a bed-sore formed, which gave Dr. Green much trouble. This was the only instance of pressure-sore that I have experienced.

June 23, 1905.—Manipulative operation; reduction and redislocation alike easy.

Two years later Dr. Green (Lincoln), who sent patient to me, reported the result to be perfect.

CASE 16.—Beatrice ——, aged two and three-quarters. Diagnosis: Right dislocation. Result: Cured. Clinical notes: Patient had marked rickets and left coxa vara; she was undersized and neglected.

June 30, 1905.—Manipulative operation; good acetabulum.

July 8, 1905.—Left hospital wearing patten.

October 12, 1906.—Examined under anæsthetic; firm reduction found.

CASE 17.—Doris W——, aged three and a half. Diagnosis: Double dislocation. Result: Cured. Clinical

notes: Patient walked badly, both trochanters being above the level of anterior superior iliac spines.

July 7, 1905.—Manipulative operation: both reduced with good shock; acetabula fairly deep. Patient had a restless night, but no vomiting. Liq. opii sed. 2 minims.

July 8, 1905.—No vaginitis. Temperature 99·8° F.; pulse 132; respirations 40. Patient passed no urine from 4 p.m. to 11 a.m. (very hot weather).

July 9, 1905.—Restless night; urine passed once only.

July 10, 1905.—Much better night; taking food better; passed urine twice in twenty-four hours; complained of pain in front of abdomen and left hip.

July 11, 1905.—Fair night; eating well. Temperature 99·2°. Patient still crying at intervals.

July 14, 1905.—Knee-stretching begun.

July 15, 1905.—Child in excellent spirits, playing.

November 7, 1905.—Patient can rise to standing knee-bent position.

July 7, 1906.—Patient walks well; limbs nearly parallel. Skiagram shows complete reduction.

September 25, 1906.—Patient runs well; hips normal.

CASE 18.—Ernest ——, aged four. Diagnosis: Right dislocation. Result: Cured. Clinical notes: September 28, 1905, marked shortening and sliding; rickets.

September 28, 1905.—Manipulative operation; plaster removed; relapsed.

May 11, 1906.—Manipulative operation repeated.

March 7, 1908.—Patient examined; walks well; trochanter in Nélaton's line.

CASE 19.—Sidney ——, aged six and three-quarters. Diagnosis: Double dislocation. Clinical notes: Patient was sent to me by Dr. Temple, Weston-super-Mare; was

shown by me at a meeting of the Harveian Society, October 12, 1905, as a typical example of double dislocation. Measurement showed the following points:

1. Patient lying down, left great trochanter 1½ inches above Nélaton's line.

2. Patient standing, left great trochanter 2 inches above Nélaton's line.

3. Patient lying down, right great trochanter 2 inches above Nélaton's line.

4. Patient standing, right great trochanter 2½ inches above Nélaton's line.

The maximal abduction was 30° right, 20° left. On account of the shortening being great in proportion to the degree of gliding movement, I decided to do the operation in two stages at an interval of a fortnight. On October 16, 1905, I divided the hamstring tendons behind each knee, and the tensor fasciæ femoris below each anterior superior iliac spine. I then manipulated the joints (as described above, p. 26) under anæsthesia, and, when the patient had been put to bed, applied a weight-extension of 4 pounds, increased in four days to 7 pounds. At the end of the fourteen days reduction was easily effected, and the presence of a fair posterior and upper border of the acetabulum on each side was established. The usual spica of plaster was then applied. At the end of another fortnight the patient was sent home, his father bringing him up to London to see me about once in three months.

The progress was somewhat slower than usual, owing to the patient living so far from London. Thus a year after operation there was still about 45° of abduction at each hip-joint. In June, 1907, Dr. Temple showed the

patient at a meeting of the Bristol Medico-Chirurgical Society, and in June of the present year (1909) Dr. Temple kindly traced the patient, whose father had left Weston, and asked him to bring the boy to me. The photographs (Figs. 51, 52) show the patient's present condition. One cannot but be struck with the perfection of proportion in the boy's profile. Both trochanters are in Nélaton's line, and the hamstring tendons have re-formed at the knees. The boy holds his own in games, and, beyond ordering him an exercise to increase abduction of the left hip, there is nothing to be desired.

The case is one in which the after-treatment had to be carried out chiefly by the patient's father, and yet the result is very good.

CASE 20.—Doris D——, aged two. Diagnosis: Left dislocation. Result: Cured. Clinical notes: Sister to Elsie ——, Case 9; relapsed twice after the manipulative operation (November 3, 1905, and again December 1, 1907). I next (January 1, 1909) carried out the open operation described above, Chapter VIII., p. 69.

CASE 21.—Winifred ——, aged four and three-quarters. Diagnosis: Double dislocation. Result: (?) Failed. Clinical notes: Some abnormality of hips was noticed soon after birth.

November 10, 1905.—Manipulative operation, right hip; very shallow acetabulum.

June 1, 1906.—Reduction appeared sound.

September 10, 1906.—Right hip has been painful; it is stiff and slightly flexed, evidently relapsing.

October 1, 1906.—Manipulative operation repeated on both hips; on the left side the acetabular border was absent altogether.

May 1, 1907.—Patient seen; both femoral heads prominent in groins; they are felt to be deformed.

October 30, 1907 (one year after last operation).—Patient's back quite straight; heads of femurs felt in the groins, irregular in shape. This patient's doctor having left the district, I have no recent report.

CASE 22.—Mary ——, aged seven. Diagnosis: Double dislocation. Result: Relapsed. Patient sent by Dr. Squire (Paddington Infirmary). April 27, 1906, manipulative operation: after subcutaneous section of both adductor longus tendons, reduction fairly easily affected; very slight posterior border to acetabula. This case, though carefully watched, relapsed even after being put up asecond time; the open operation (p. 69) should now be tried.

CASE 23.—Martha ——, aged ten. Diagnosis: Left dislocation. Result: Cured. Clinical notes: Born with left leg short. Patient fell two years ago; left hip painful since.

January 12, 1906.—Manipulation under ether; weight-extension applied for one week.

February 23, 1906.—Manipulative operation.

October 9, 1906.—Plaster removed; normal result.

June 28, 1907.—Trochanter in Nélaton's line. Patient walks well.

CASE 24.—Clara ——, aged eight. Diagnosis: Double dislocation. Result: Right, cured; left, firm anteversion. Clinical notes: Had been treated for scoliosis.

July 6, 1906.—Hamstrings, adductors, and tensor fasciæ femoris, divided on both sides.

July 20, 1906.—Manipulative operation; left more difficult to reduce than right.

July 1, 1909.—Patient examined: Right, normal; left, firm anteversion.

CASE 25.—Doris R——, aged six. Diagnosis: Left dislocation. Result: Cured. Clinical notes: Patient had been treated at hospitals and by a bone-setter. Her parents had been told that the risks of the manipulative operation were too great.

September 14, 1906.—Manipulative operation; reduction after subcutaneous section of adductor longus tendon; fair acetabular border.

November 20, 1906.—Head of femur fairly prominent in groin, internal to artery. Patient walks well.

CASE 26.—B. M. (female), aged 5. Diagnosis: Right dislocation. Result: Cured. Clinical notes: Patient sent by Dr. Wylie, Balham. Two inches shortening.

May 31, 1907.—Manipulative operation; reduction easy after section of adductor; good border to acetabulum.

June 1, 1908.—Patient sent to Australia; hip normal.

CASE 27.—Aurival ——, aged seven. Diagnosis: Left dislocation. Result: Cured. Clinical notes: Patient is daughter of a medical man, and it is worth mentioning that the mother searched and read all the medical journals that she had access to for seven years, to see if there might be any new treatment for congenital dislocation of the hip.

September 11, 1907.—Manipulative operation; good acetabulum.

May 12, 1909.—Patient runs, walks, and dances, well; hip normal.

CASE 28.—Winifred M——, aged three. Diagnosis: Left dislocation. Result: Cure probable. Clinical notes: The patient is diminutive, with small bones.

September 13, 1907.—Manipulative operation; uppe border of acetabulum shallow; posterior slightly better.

June 22, 1908.—Head of femur easily slips in and out of acetabulum.

July 24, 1908.—Manipulative operation repeated; plaster applied in hyperextension.

September 1, 1909.—Patient walks well; bone in pubic position, which remains unchanged at present date.

CASE 29.—Agnes ——, aged eight. Diagnosis: Right dislocation. Result: Cured. Clinical notes: Tenotomy of adductors and hamstrings, January 16, 1908.

February 7, 1908.—Manipulative operation and fixation in plaster.

September 15, 1908.—Plaster removed; trochanter in Nélaton's line.

January 1, 1909.—Trochanter in Nélaton's line; patient walks well.

CASE 30.—Bessie ——, aged four. Diagnosis: Double dislocation. Result: Cured. Clinical notes: Typical case; marked shortening and lordosis. Patient has constipation and rickets; is very heavy and unathletic.

July 16, 1908.—Manipulative operation: left acetabulum, good; right, fair. Patient was slower in beginning to walk than any of the others had been, but by May 27, 1909, she could walk with one hand held, and on July 9, 1909, she could walk without assistance. Although both great trochanters were in Nélaton's line, the patient walked with much lordosis, owing to flexion of the hip-joints, maintained by the shortened tensor fasciæ femoris and psoas muscles. Exercises (Liegesack) and muscle-hacking were ordered. Patient's health has much improved since the commencement of treatment.

CASE 31.—Dulce ——, aged ten and a half. Diagnosis: Right dislocation. Result: Cured. Clinical notes:

Patient was late in walking, and walked lame from the first; 2½ inches shortening.

December 22, 1908.—Manipulative operation: the adductor longus and tensor fasciæ femoris divided subcutaneously, and hamstrings openly. Reduction effected without undue difficulty. Patient, a nervous and delicate girl, required 5 minims of liq. opii sed., a single dose, for seven nights, on account of restlessness; indeed, she continued to complain of discomfort until January 6.

February 5, 1909.—Patient anæsthetized in order to carry out passive knee extensions, the knee being flexed to a right angle, and the internal popliteal nerve very prominent at the back of the knee.

February 6, 1909.—Patient had a good deal of continuous pain, referred to the front of the knee. There was sensory paralysis of the inner part of the foot, and of the dorsum above the cleft of the first and second toes; also paresis of all muscles below the knee.

February 16, 1909.—Sensory paralysis disappearing; some flexion power returning.

February 22, 1909.—Sensation still defective above first cleft; still no power of dorsiflexion; otherwise patient improved all round. About this date the apparatus shown in Fig. 38 was designed and applied. By the aid of this simple splint the flexion of the knee rapidly diminished, and Dr. Gray (Newmarket) reported, June 9, 1909, that patient was able to dorsiflex the ankle quite well.

July 15, 1909.—Plaster removed; 45° of abduction at hip; hamstring tendons have re-formed.

November 23, 1909.—Patient walks well. Hip normal save for slight abduction.

CASE 32.—Elsie ——, aged seven. Diagnosis: Right dislocation. Clinical notes: Patient walks with limp; right leg 1 inch short; pelvis tilted; secondary spinal curves.

July 20, 1908.—Manipulative operation.

October 10, 1908.—Plaster removed; skiagram taken. Radiographer (Dr. Ironside Bruce) reports head in good position.

June 22, 1909.—Patient walls well; trochanter in Nélaton's line.

CASE 33.—Dorothy ——, aged six. Diagnosis: Left dislocation. Clinical notes: Much shortening—2½ inches.

September 24, 1908.—Manipulative operation; reduction fairly easy; acetabulum shallow.

September 20, 1909.—Plaster removed; no rigidity; trochanter in Nélaton's line; anteversion.

CASE 34.—Doris K——, aged thirteen. Diagnosis: Right dislocation. Clinical notes: Right leg everted, 3 inches shorter than left; movements fair; great trochanter from 2½ to 3 inches above Nélaton's line.

October 23, 1908.—Subcutaneous tenotomy of adductors and open division of hamstring tendons; manipulations for stretching all muscles around the hip.

November 13, 1908.—Manipulated for three-quarters of an hour under ether, but reduction not effected. A good deal of swelling followed.

November 27, 1908.—Under ether, with counterextension made round the right tuber ischii, the right limb was slowly stretched from above the knee by screw-extension apparatus (see Fig. 24). The great trochanter was thus brought to the level of Nélaton's line, and then the hip was easily reduced. Patient was put to bed with the limb

in the position of least tension short of causing the femoral head to slip out of the acetabulum.

November 30, 1908.—Some pain and swelling all round hip; over Scarpa's triangle the skin was tense. Fomentations ordered to relieve tension.

December 1, 1908.—Tenseness of skin less. Patient moves leg well. No paralysis. Anterior and posterior tibial pulses normal.

December 19, 1908.—Limb put up in plaster.

February 5, 1909.—The right tendo Achillis elongated by plastic operation, the right foot having dropped into equinus. Head of femur easily felt.

November 20, 1909.—Joint firm. Movements good.

Case 35.—William ——, aged eleven. Diagnosis: Right dislocation. Clinical notes: Patient had been operated on by Lorenz's method some two years previously. The joint was firm, but the great trochanter was 1 inch above Nélaton's line.

A skiagram showed that the head of the femur was placed above the acetabulum; the neck of the femur was very short.

July 16, 1909.—The joint was exposed from behind, with a view to seeing whether the shortening of the limb could be remedied. The head of the femur was found firmly lodged above the acetabulum. The deep muscles at the back of the joint were all present in this case, and the articulation firm, so the wound was closed. Patient left hospital with boot raised, walking well, three weeks later.

Case 36.—Florence ——, aged five and a half. Diagnosis: Double dislocation. Clinical notes: Patient walks with typical waddle; shortening, adduction, and internal rotation all marked.

February 26, 1909.—Manipulative operation: in carrying out the extension movement (drawing the thigh backward) on both sides a sensation as of soft adhesions tearing was felt. Subsequent events led me to think that this was due to some muscular tissue—probably the psoas—being torn. Reduction was effected without difficulty after subcutaneous section of both adductor tendons. Patient had much pain (temperature, 103° F.), and was delirious during night. Liq. opii sed. did not relieve until administered in 4 to 5 minim doses the third night. The ecchymosis was worse than I have seen in any other case. In this case the unusual feature mentioned above—the sensation of soft adhesions giving way—was probably associated with the exceptionally severe post-operative symptoms. In future in such a case I shall, after completing the manipulations—*i.e.*, before attempting reduction—surround the joint or joints with wool, and bandage over this, leaving reduction till fourteen days later.

Present condition: Both joints promise perfect result.

CASE 37.—Cicely K——, aged seven and a half, sister Case 34. Diagnosis: Left dislocation. Clinical notes: Two inches of shortening; sliding marked.

January 1, 1909.—Reduction easily effected after subcutaneous section of adductor longus tendon. Patient put to bed with limb well abducted and supported on sand-bags.

January 5, 1909.—Plaster applied.

February 10, 1909.—Patient left hospital.

Relapse occurred, and open operation was done (see above, p. 70).

CASE 38.—Ray ——, aged two and three-quarters. Diagnosis: Double dislocation. Clinical notes: Average case; lordosis commencing; the heads of both femurs

were felt slightly below and external to the anterior superior spines.

March 5, 1909.—Manipulative operation; both acetabula shallow, especially the right.

October 1, 1909.—Plaster removed.

A month later both dislocations had recurred. Open operation declined by the parents.

CASE 39. — Kathleen ——, aged two and a half. Diagnosis: Left dislocation. Clinical notes: Adduction and circumduction limited.

April 30, 1909.—Manipulative operation.

CASE 40.—Hilda S——, aged four years and ten months. Diagnosis: Double dislocation. Clinical notes: Patient always walked badly; marked lordosis; trochanters 1½ inches above Nélaton's line. Circumduction very limited, abduction also.

July 7, 1909.—Manipulative operation: tenotomy of tensor fasciæ femoris on both sides. Reduction rather difficult on both sides. Limbs bandaged to splint (see Fig. 38).

May 21, 1909.—Plaster applied without anæsthetic.

September 14, 1909.—Plaster removed. Heads prominent in groins.

September 28, 1909.—Patient can stand and jump, holding on to sofa.

Comments: In this case the plaster was removed at the end of four months, and everything at the date of writing —December 8, 1909—points to a permanent cure.

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