CONGENITAL DISLOCATION OF HIPS.[1]

WITH REPORT OF CASES AND DESCRIPTION OF A PELVIS OBTAINED THREE YEARS AFTER SUCCESSFUL REDUCTION BY THE LORENZ METHOD.

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It is not my purpose to go into a long historical sketch. A history of all the more important work done on this subject can be found in the classical monograph of Lorenz and other articles enumerated in the appended references. Neither do I wish to waste any time on the question of priority, and yet I cannot pass the matter by without the observation that, after having made a rather careful study of the whole matter, it would seem to me that an entirely unprejudiced outsider could scarcely help being impressed with two facts, namely, (1) That Lorenz was the first to accomplish reduction and reposition in one sitting under deep narcosis by careful and intelligent manipulation instead of employing long continued extension or the action of an unintelligent machine. (2) That he was the first to make use of the muscles extending from the pelvis to the femur, and the weight of the body in retaining the head in the acetabulum, and developing an acetabulum in the normal location, which later would become practically perfect functionally and anatomically.

In the early part of the year 1896 it was my good fortune to be present at a meeting of the Vienna Medical Society, when

[1] Read before the Chicago Surgical Society, June 2, 1902.

Professor A. Lorenz exhibited his first series of cases successfully treated by his "Bloodless Functional Weight Method." Later in the year I was granted the privilege of witnessing one of the first and most enthusiastic followers of Lorenz, Dr. Kuemmel, of Hamburg, successfully treat a number of cases of congenital dislocation of the hip.

To witness the work of such masters naturally aroused my interest in the subject, and led me to attempt reduction in the cases that have since come under my care. A detailed report of these cases will be found later in this paper.

Frequency.—In reference to the relative frequency of congenital dislocation of the hip in proportion to population or even to other affections, it is very difficult to obtain definite information. There are various factors which make such statistics quite unreliable. In the first place, many of these cases have gone undiagnosed and are still overlooked. I have been able to find but two articles in which the author tried to establish the relative frequency of this affection to population. At the Paris Maternity, in 23,292 new-born, this affection was observed only once. Of course, it must always remain a question as to how carefully it was looked for in the other 23,291 cases. One observer noted the condition three times in 332 autopsies on new-born. In the Hospital for Ruptured and Crippled, New York City, it was observed twenty times among 9000 patients treated during the year 1890. Dallinger, among 859 orthopædic patients, observed the condition nine times, or in 1.1 per cent. Hoffa, in 1444 orthopædic cases, seven times, or in 0.49 per cent. At the Augustana Hospital, between May 1, 1897, and May 1, 1902, among 6296 patients, I observed four cases. One observer states that it is the most common congenital dislocation, being about nine times as frequent as all others combined; another states that it is more common than club-foot.

Though the above figures vary greatly—as they necessarily must, according to the reputation the various surgeons have developed—they all agree in the one fact: That the con-

dition is not at all uncommon; in fact, much more frequent than most of us have hitherto been inclined to believe.

Etiology.—As far as I am able to ascertain, but little is known about the etiology of this condition. The following causes are the ones most usually given:

(1) Injury to the mother during pregnancy, thus injuring fœtus in utero.

(2) Abnormally small amount of liquor amnii, and consequent forced abduction and flexion of thighs during a long period of intra-uterine life.

(3) Injury at time of birth.

(4) Retardation of growth of the acetabulum.

The last is simply begging the question. The third is not probable, because it has been demonstrated over and over again that it is easier to produce a fracture at the neck of the femur than a dislocation of the hip at time of birth. The correctness of the first and second has so far been neither absolutely proven nor disproven; but that there must be some yet unknown factor at work is almost positive, because none of the above enumerated causes give us any clue as to why the condition should occur about seven times as often in girls as in boys.

Pathology.—All observers seem to agree that when present the acetabulum is always in the right place, and the most experienced state that, however rudimentary the acetabulum may be, it is always present. If the patient is old, and the dislocation consequently of long standing, the acetabulum is always more or less completely filled with cartilaginous, fibrous, or fatty substance. The head is usually of normal, or nearly normal, size, and consequently it is always disproportionately large. The neck is usually short and thick, and often placed at an abnormal angle to the shaft. Sometimes the angle is greater and sometimes less than normal. The ligamentum teres may be absent, or it may be drawn out into a long, thin band. At times it is even hypertrophied. It is more often absent in double than in single dislocations. The capsule is necessarily greatly elongated, and often has an hour-glass constriction at its middle. This constriction may be almost

imperceptible, or it may be so pronounced as to nearly completely divide the capsule into two distinct halves. The capsule may be adherent to all or a part of the circumference of the rim of the acetabulum. In double dislocations the pelvis hangs on the femora by the drawn-out capsule instead of resting upon and being directly supported by the heads of the femora. The pelvifemoral and pelvicrural muscles are shortened, while the pelvitrochanteric muscles may be lengthened in extreme cases.

Signs and Symptoms.—The signs and symptoms differ somewhat according to whether the dislocation is single or double. For convenience I have divided them into three groups.

Group one comprises those common to both forms of dislocations; Group two, those which are found only in double dislocations; and Group three, those which are found only in single dislocations.

Group 1.—Prominence of the buttocks. This is sometimes very marked, having the appearance of a lipomatous tumor. The upper border of the great trochanter projects well above Nélaton's line. The head can be felt on the posterior surface of the acetabulum, and there is a depression instead of a prominence in the groin just external to the femoral vessels. If the pelvis is grasped firmly and traction is made on the thigh, the head can be felt to move downward without imparting the motion to the pelvis, *i. e.*, undue passive motion at hip, though active motion is usually about normal. The patients learn to walk late, fall easily at first, are easily fatigued, and when they become very tired often experience a dull, aching pain at the hip and knee. A good skiagraph always shows the dislocation.

Group 2.—Waddling, duck-like gait; more or less marked lordosis; prominence of abdomen; squat figure. The last can be determined by careful measurements. It can always be demonstrated that there is a disproportion between the distance from the anterior superior spines of the ilium to the internal malleoli and the height of the body. This can be seen from the case reported below in detail.

Group 3.—Marked limp; pronounced scoliosis; shortening of affected limb as determined by measuring from anterior superior spine to internal malleolus.

Diagnosis.—If in each individual case of deformity of the hip or back we will but remember the possibility of its being a congenital dislocation of the hip, and recall the above enumerated signs and symptoms, the diagnosis is usually easy, as in each case all or nearly all of them can be found. In the past a goodly number of these cases have been diagnosed coxitis, simple spinal curvature, infantile paralysis, rickets, or Pott's disease. One of the cases reported below had been diagnosed as infantile paralysis by several specialists, while another had been diagnosed coxitis.

Until the advent of the X-ray quite a number of cases of coxa vara had been diagnosed as congenital dislocation of the hip.

Although these errors have undoubtedly often been made in the past, and are still occasionally made, they need not be made by those who in any way have had the subject called to their attention.

Treatment.—In order not to make the paper too long, I have decided to confine myself exclusively to a consideration of the "Bloodless Functional Weight Method" of Lorenz. Evidently, for the sake of convenience and clearness, this author has described his procedure as occurring in four distinct acts, namely, reduction, reposition, formation of acetabulum and restitution of function. This ultra-schemetic arrangement gave me some trouble when I tried to adapt it to an actual case in practice. I gained the impression from my reading that these different acts should follow each other in regular order; but I soon found that some of them at least occur more or less simultaneously, as will readily be seen from the following:

Reduction is accomplished by traction upon the affected limb. In small children manual traction may suffice. The first important condition required is general anæsthesia pushed to complete relaxation of the muscles. This accomplished, the pelvis is held firmly, while even, continuous, steady traction is

applied to the limb, grasping it either a little above the ankle or a little above the knee. The pulling must continue until the upper border of the great trochanter is well down to the level of Nélaton's line. In older children a tackle and windlass arrangement becomes necessary unless one has several well trained assistants, and even then I think I should prefer tackle and windlass, as the amount of force applied can be more accurately gauged.

The perineum is placed against a firm, well-padded support. For this purpose I have found an inflated Barnes's bag the most satisfactory. A piece of cotton is now placed about the limb just above the ankle, and a skein of wool is tied about this with a surgical knot, so as to avoid constriction and impairment of circulation. The skein of wool is then fastened to one of the pulleys of the pulley and tackle arrangement, while the other pulley is fastened to spring scales and the scales to a fixed point in the room. The rope is fastened to the windlass, and this is now slowly set in motion. The scales are read every half minute by one assistant, while another announces the frequency and character of the pulse every two minutes, and oftener if there is a sudden change.

If the reduction is very difficult, it is necessary to interrupt the traction at intervals not to exceed ten minutes. As soon as the upper border of the great trochanter is well down to Nélaton's line we may consider this part of the work accomplished and proceed to the next step, which consists of placing the head into the acetabulum. This is often the most difficult part of the procedure, and upon its accomplishment depends the future of the case. If we fail in this the case may be looked upon as one not suited for this method of treatment. If it succeed, we may have reasonable hope of ultimate success. The chief causes of failure seem to be: (1) The shortening of the adductor muscles. (2) Hour-glass constriction of the capsule. (3) Adhesions of the anterior portion of the capsule to the rim of the acetabulum. The first naturally interferes with abduction, which is so necessary in making the head slip over the posterior rim of the acetabulum. This difficulty is

usually overcome by steady moulding manipulations. If one be but persistent, one can in a short time abduct the thigh to a right angle. Sudden jerks must be avoided, as these are very prone to cause fracture of the neck. If abduction to a right angle cannot be accomplished, subcutaneous or open tenotomy of the abductors must usually be resorted to. As soon as the required degree of abduction has once been accomplished, the pelvis is steadied by an assistant, the thigh is flexed to a right angle and rotated inwardly slightly. While one hand of the operator presses on the trochanter, the other hand makes strong, steady traction forward, and at the same time attempts slow abduction. The head slowly creeps up over the posterior border of the acetabulum, and suddenly slips over the rim, bounds into the acetabulum with a distinct thud, which sometimes can be heard at a considerable distance, and a vibration of the patient's body, which is always transmitted to the operator, and sometimes even to the table and to those who may be in contact with it.

The other symptoms of an accomplished reposition are: Distinct lengthening of the thigh; the development of a fulness in the groin, and the disappearance of the head on the posterior surface of the ilium; and the sudden tenseness of the hamstring tendons characterized by inability to extend the knee. The object of the inward rotation is to overcome the second and third great difficulties, namely, to loosen the capsule from the rim of the acetabulum and to utilize the head of the femur as a wedge to open up the hour-glass constriction in the capsule. Reposition having been accomplished, we must now make every effort that this be rendered stable. This is secured, first by a boring motion. The thigh is rotated outward, and with a boring motion the anterior capsule is stretched and the acetabulum deepened; second, the tense pelvifemoral and pelvicrural muscles will help to deepen and enlarge the acetabulum; and, finally, third, the weight of the body in walking will greatly aid the formation of a satisfactory joint in removing the deposits in the acetabulum and securing the development of a broad cotyloid ligament. In order to fully utilize this important prin-

ciple, a cast must be very carefully applied. It is best applied over a pair of tightly fitting wool trousers, and should include the whole thigh and the trunk to the level of the navel. In order to avoid backward dislocation until the acetabulum has had a chance to develop, the cast is applied with the thigh slightly over-extended, and a degree of abduction sufficiently great to secure against the possibility of the head slipping out of the rudimentary acetabulum. Usually about ninety degrees of abduction are required.

In single dislocations a high sole is now placed under the shoe of the operated leg, and the child is allowed to walk just as soon as it wishes. It will usually attempt to walk when the pain caused by the treatment has subsided. This will vary from one to two weeks. In double dislocation, where one hip is reduced at a time, exactly the same line of treatment is followed. The second hip can be reduced about a year after the first. If both reductions can be made at the same sitting, a small stool is made for the child, on which it can sit astride comfortably and still bear some weight on the feet. The first cast is left in place for from four to five months, when it is removed, and the extremities are brought down to about forty-five degrees of abduction with slight flexion. This cast is left in place for about six to seven months, when the child can usually be allowed to go without any appliances. During most of this time the child has been up and about. This form of ambulating treatment fulfils a threefold purpose: It develops a stable joint, secures normal motion in this joint, and during the entire course of treatment the patient will secure enough exercise to keep in a healthy condition.

The treatment just outlined is the typical method which should first be attempted, and which will be found successful in a considerable proportion of cases. Sometimes recourse to slight modifications must be taken, but a detailed description of these would make the article too long.

Prognosis.—If untreated, the prognosis is always quite bad. There remains an unsightly deformity which persists throughout life. That in itself is a serious affliction, especially

for girls, who are the most frequent sufferers. But this is by no means all. The power of endurance is nearly always somewhat, often greatly, reduced. The older the patient becomes, the less the endurance. Besides, there is no way of telling at the age of five, for instance, which child will get along fairly well and which one will be a great sufferer in later years. Lorenz quoted Halsted as stating that 31 per cent. of all patients suffer pain, especially severe when fatigued. The pain may be slight, or it may be so severe as to incapacitate the patient for all work requiring walking or standing; or it may remind one of coxitis, as in Case I of our series reported below, which had been repeatedly so diagnosed. Bradford reports five cases in women in his own practice who suffered severe pain when they tried to walk a mile at a stretch. If the patient is submitted to the bloodless operation before the age of six in double and ten in single dislocations, the prognosis is very much better. In 212 carefully observed cases treated before January 1, 1899, Lorenz reports 108 anatomically and functionally perfect results, 102 anatomically imperfect, but functionally good results. Julius Wolf up to January 1, 1899, had treated 103 patients with 145 dislocations. Of these he reduced 115 joints in ninety-six patients successfully by the Lorenz method.

In 450 attempted reductions, Lorenz had one gangrene of thigh, one death from chloroform, two from combined shock and chloroform, and eleven fractures of neck of femur. This looks like a rather discouraging array, but we must not forget that all these accidents occurred in patients beyond the age limits above given and during the developmental period of this method of treatment. It must impress us with the necessity of great caution when the patient is older, and the duty we owe these patients in urging the reductions before the age limit is reached.

Within the proper age limit only the following minor accidents occurred: One fracture of the horizontal part of os pubis, one fracture of crista ilii, three peroneus paralysis. All of these subsided spontaneously. There are still a few

surgeons who deny the possibility of a bloodless reduction; yes, one or two who scoff at the idea. There are a greater number who, although admitting the possibility of a bloodless reduction, doubt the permanency of the cure. In order to do my mite in convincing these, I take the liberty of describing in detail a pelvis obtained from a patient who died on November 27, 1901, upon whom I had done the Lorenz bloodless reduction on the hips about three years previously.

In order that I may illustrate some statements made above, and in order that the report may be complete, I will briefly rehearse the cases that have come under my care. For the sake of convenience, I will report the first case last. The others appear in the order in which I saw them.

CASE I.—Single lady, thirty-five years of age. Always lame in left hip. Being of poor parents and later a servant girl, no special attention was paid to the condition. For the past few years has suffered a great deal of pain in hip, especially after severe exertion. Came to hospital with diagnosis of coxitis. Typical congenital dislocation of left hip as determined by all above-enumerated signs and symptoms, including skiagraph. Rest in bed with Buck's extension. Pains subsided in about two weeks. Have not seen her since she left the hospital.

CASE II.—Well-developed, healthy girl, ten years of age. Typical congenital dislocation of left hip. Though repeatedly examined, a diagnosis had not previously been made. Three attempts at reduction and reposition were made at intervals of a week, extension applied up to eighty pounds, but unable to bring great trochanter down to Nélaton's line. Patient was subjected to this treatment eighteen months ago. No more discomfort now than before the attempted reduction.

CASE III.—Well-developed, healthy girl, six years old. Typical dislocation of both hips. Child very easily fatigued, and when fatigued suffers considerable pain in both hips. Repeated efforts had been made by parents to ascertain the nature of the trouble, but up to date no diagnosis had been made. Two attempts at reduction, September 20, 1901, and October 10, 1901, respectively. Both failed. Unable to get great trochanter down to Nélaton's line, though seventy-five pounds of extension were applied for as

long a time as the patient's pulse seemed to warrant. No worse than before, since attempted reduction. Both of the above cases were just about at the age limit when the attempts at reduction were made.

CASE IV.—Well-developed girl, four years old, with double congenital dislocation of hips. No special inconvenience. Marked deformity and waddling gait. Seen only a few weeks ago. No attempt at reduction made as yet.

CASE V.—Well-developed, healthy girl, seven years old. Congenital dislocation of left hip. No special discomfort except limp. Seen one week ago. No attempt at reduction made as yet.

CASE VI.—On October 24, 1898, a little girl, four years and three months of age, presented herself for examination, and for treatment, if in our opinion it seemed possible to give her parents any encouragement in the matter. At that time I elicited the ensuing history and noted the following conditions: Family history very good. No history of similar trouble or of any deformity among the members of the family or of any of the ancestors or relatives. Born at term, labor very easy, but mother noticed that there was much less liquor amnii than with former pregnancies. Weighed six pounds at time of birth, apparently perfectly healthy. No history of injury to mother during pregnancy or to child after birth. Mother had been very weak during the pregnancy, as this was the third child in three years, and she nursed the previous one until five months before this one was born. Mother had not noticed anything unusual during this pregnancy, except that she thought she had not "felt as much life" as during the two previous pregnancies. During the first three months the baby had two very severe attacks of cholera infantum. Mother noticed nothing peculiar about child except the hips seemed rather prominent. The child did not attempt to walk until she was two years old, and when she did she began by walking on all fours, and continued this for a long time, especially when in a hurry. Later, when attempting to walk erect, sne was very unsteady and fell very easily. She was two and one-half years old before she could walk the length of the room without falling. She had always been very easily fatigued.

On examination I found a well-nourished child, rather small for her age, only 87 centimetres tall, with the distance from the anterior superior spines of the ilia to internal malleolus of each

side 39 centimetres. Heart, lungs, and abdomen negative. Digestive and excretory functions normal. On directing her to walk, the prominence of the hips, the marked lordosis, the protrusion of the abdomen, and waddling gait immediately attracted my attention. On closer examination, the upper borders of the great trochanters were found 5 centimetres above Nélaton's lines; the heads could be felt on the posterior surfaces of ilia instead of in

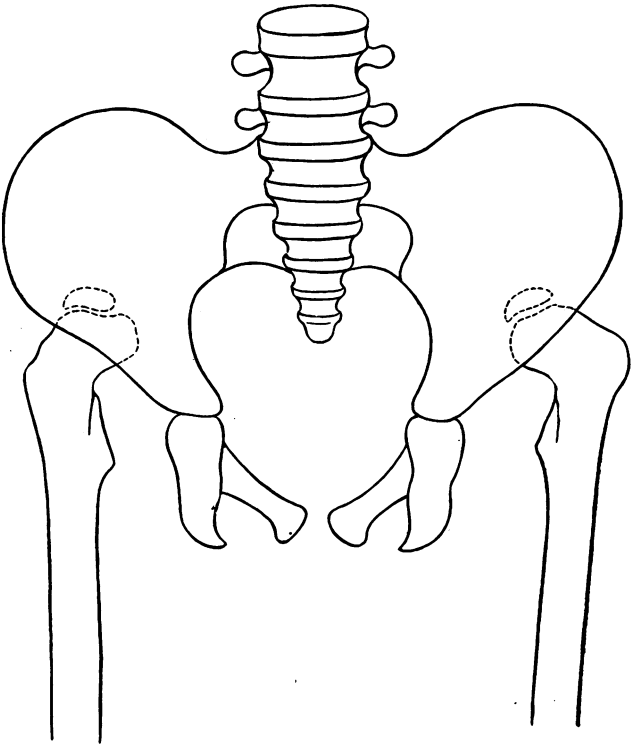

FIG. 1.

the groin; there was hypermobility of the heads of the femora and of the thighs.

On these findings and this history, we of course immediately made a diagnosis of double congenital dislocation of the hips, as a more typical case could scarcely be found. In order to make doubly sure, and in order to get an idea of the condition of the upper ends of the femora and the acetabula, and hence as to probable prognosis,—for at that time it was still thought that the

X-ray could give valuable information on this point,—we had the skiagraph taken of which Fig. 1 is a pen sketch. On close observation we note that the heads are about half-way between the anterior superior and the anterior inferior spires of the ilia instead of being opposite the Y cartilages, which are shown by lighter lines in the skiagraph. Heads and necks appear well formed and the acetabula fairly well developed.

The degree of displacement becomes more evident when we compare Fig. 1 with a skiagraph of the pelvis of a normal child of about the same age, or with Fig. 5, an exact pen sketch of the skiagraph taken after complete recovery.

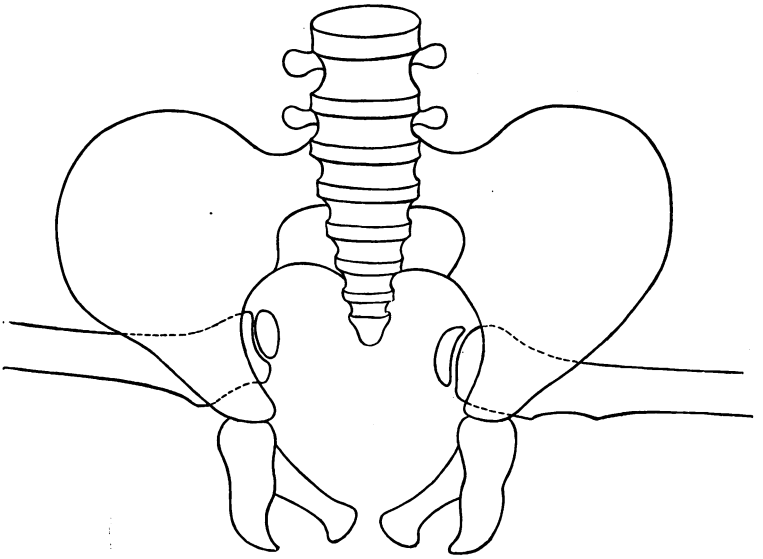

FIG. 2.

We now proceeded to treatment, and we tried to follow the directions of Lorenz as closely as possible. At that time he still advised Buck's extension for a short period. We accordingly applied this for five days, when we anæsthetized the little patient, placed a skein of wool over the perineum and tied the ends to the upper end of the table. Another skein of wool was fastened around the left ankle. The latter was now attached to a tackle and windlass arrangement, which was then slowly put in motion, and under careful watching of the pulse and respiration and with repeated intermissions, in the course of about twenty-five minutes

the left lower extremity was brought down until the upper border of the great trochanter was slightly below Nélaton's line. The force applied never exceeded fifty pounds, as tested by spring scales.

The extension was now relieved, the thigh was carefully abducted to a right angle by slow, steady, moulding manipulations. The thigh was now flexed to a right angle, and while

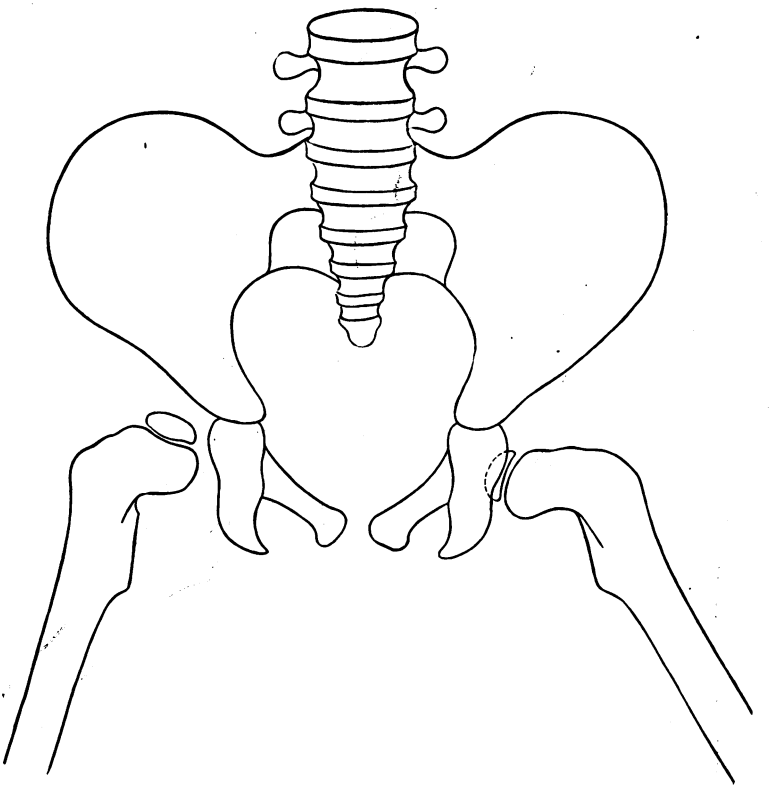

FIG. 3.

traction was made in this direction with the left hand, pressure was made on the great trochanter with the right and the thigh was slowly abducted and over-extended. At this point the head was felt to slide over the posterior ridge of the acetabulum, and with a dull thud and a plainly felt shock or vibration the head slipped into the acetabulum and the reduction was accomplished. This was accompanied with a noticeable lengthening of the left

thigh, the appearance of a fulness in the left groin, and the disappearance of the head on the posterior surface of the ilium. On attempting to reduce the angle of abduction, reluxation immediately took place. Reduction was easily accomplished with the same characteristic signs. With a boring motion an attempt was now made to enlarge the acetabulum and to stretch the anterior portion of the capsular ligament by pressing the head forcibly

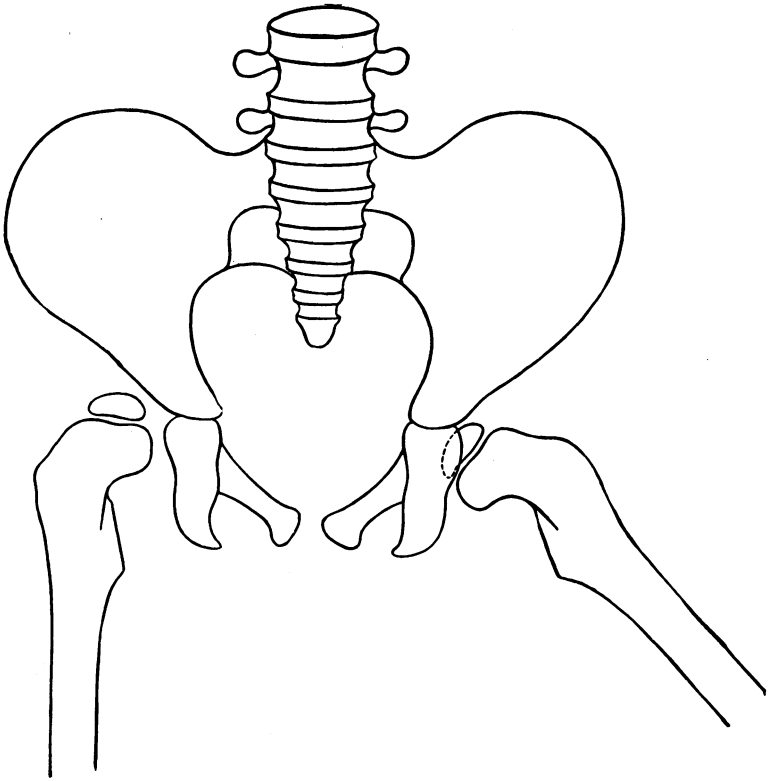

FIG. 4.

against it, hoping in this way to secure greater stability. The left thigh and the trunk to the level of the ribs were now incased in a thin layer of cotton and a plaster-of-Paris cast applied with the left thigh abducted to ninety degrees in slight over-extension. No attempt was made to further test the stability or to reduce the angle of abduction. One week later the cast was removed, and the right reduction accomplished in the same manner and with

the same unmistakable signs. Both thighs and trunk up to the ribs were then incased in cotton and a cast applied.

I now had a skiagraph taken through the cast, which, though somewhat blurred, showed the heads in excellent position and evidently reduced. This negative, with several others, was unfortunately broken, and I am unable to give a sketch of it.

The patient was allowed to return to her home on the 10th

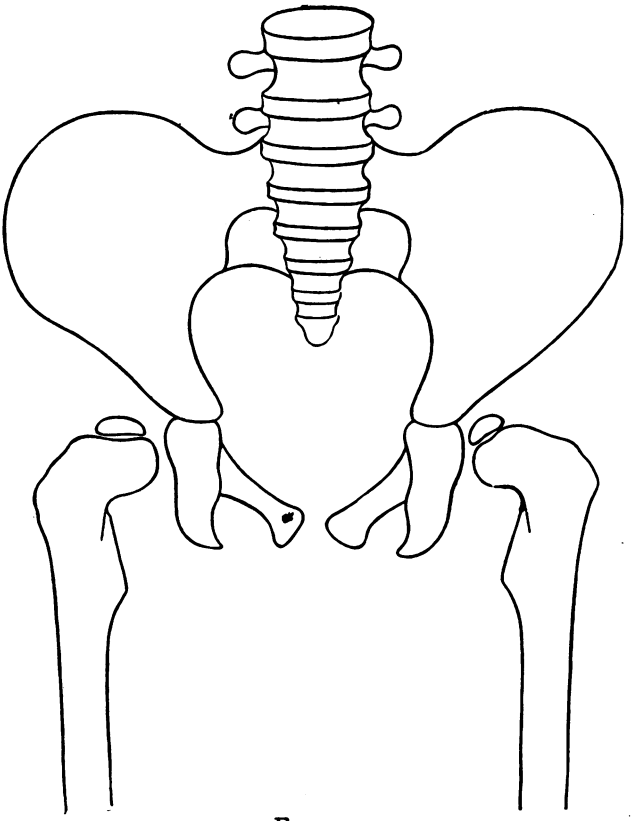

FIG. 5.

of November, with directions to return in about a month. With this request she complied by returning on December 12. The cast was now removed, and the depression instead of the fulness in the groins was immediately noticed. The heads could again be felt on the posterior surfaces of the ilia. The skiagraph confirmed my fear that a backward redislocation had taken place. Fig. 2

represents the condition found at the time and shows the position in which the cast has been applied. The following day the patient was again anæsthetized; both dislocations were reduced with but little difficulty and with the same characteristic phenomena. The cast was again applied with the legs in the same position, but with greater care. The child was allowed to go

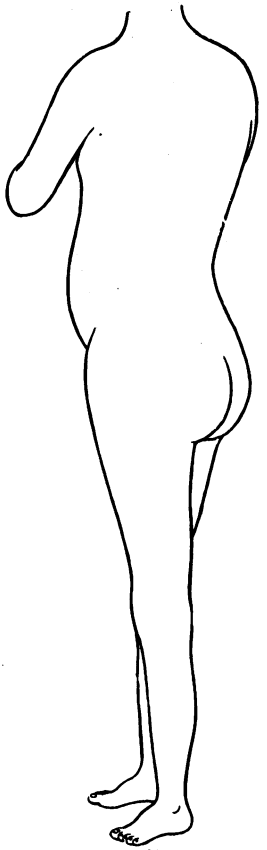

FIG. 6.

home on December 17, 1898, and returned to the hospital on January 16, 1899. At this time I again found that reluxation had taken place. Once more the patient was anæsthetized and reduction accomplished as on the previous occasions. I had seen Kümmel use felt under his plaster of Paris, and when I began the treatment of this case I tried to procure this material, but for

some reason was unable to do so. I now concluded that the cotton, which could not be absolutely uniformly applied, and which would yield to any sudden jar, must be the cause of the reluxations. In the absence of felt, I procured some medium weight, snugly fitting, all-wool drawers and applied the cast over these with both thighs abducted to ninety degrees and slightly over-extended. The patient went to her home on January 25 and returned on February 27, and to my great satisfaction the physical findings indicated that the heads were in place, though the skiagraph was not per-

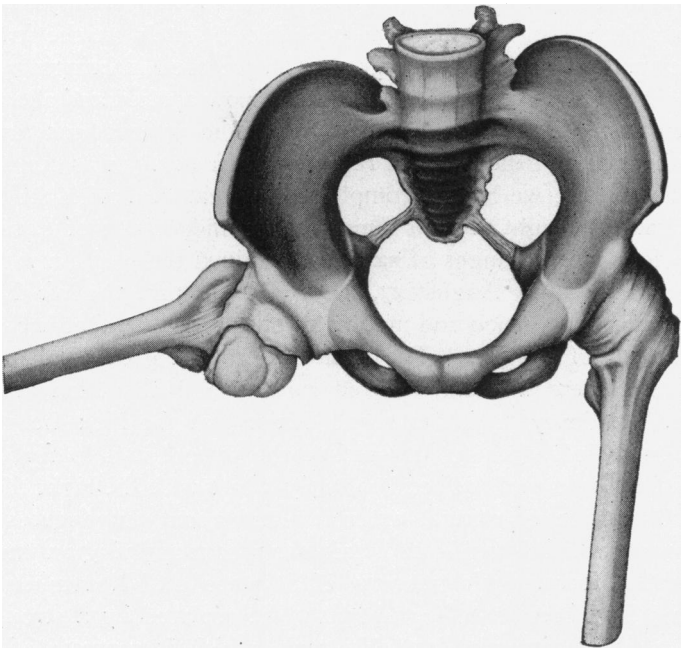

FIG. 7.

fectly satisfactory, as it left us in some doubt. We concluded, however, that the heads were in place, and future developments have proven the correctness of this belief.

The difficulty about the ordinary skiagraph is that it does not give us perspective, and in congenital dislocation of the hips, especially when the limbs are held at ninety degrees abduction, lateral views are manifestly impossible. If we at that time had had stereopticon views, I am confident it would have cleared up all doubt.

This negative was also broken, and I regret greatly that I cannot produce a sketch showing the heads in place at this time.

The child was now allowed to sit up on her little stool and to play around at her pleasure. With two changes of cast, the limbs were left in approximately this same position until August 2, 1899, when the patient was again anæsthetized and an attempt made to bring the thighs down into the midposition of Lorenz, namely, abduction of about forty-five degrees, with very slight flexion. This was accomplished quite readily on the left side, but the right side offered great, and at first apparently insurmountable, resistance, the head seeming to catch on the lower border or lip of the acetabulum, and I succeeded in bringing the limb down only a very little. A cast was now applied and allowed to remain until January 1, 1900, when the patient was again anæsthetized and the position represented in Fig. 3 was secured. In this you see we have accomplished a great deal with the left thigh, and the right thigh is almost in the midposition of Lorenz. With four more changes of casts we obtained the position represented in Fig. 4 by August 27, 1900. By this time the left thigh was in normal position and motion all but perfect, so that it could be left out of the cast. The right one gave a great deal more trouble. There was still marked rigidity and abduction and a decided tendency to contracture (flexion) at the hip; hence I was compelled again to anæsthetize the patient and to forcibly overcome the contracture and to apply a cast with the right thigh in the position of normal extension and about ten degrees of abduction, which I could not overcome without applying an undue amount of force. This cast was left in place until November 10, when it had become soft, and had to be replaced by a stronger one. At this time the last skiagraph, which is represented by Fig. 5, was taken. This shows the heads in their normal position opposite the Y ligaments, well below the anterior inferior spines of the ilia. January 1 the cast was removed for a day, when there seemed to be a tendency to contracture of the right hip, and the same cast was reapplied, and removed only for half an hour daily. This time it was gradually lengthened, and February 15, 1901, the cast was permanently discarded.

By this time the muscles of the left thigh had developed nicely, and now, with exercise and gentle massage, the muscles of the right thigh also developed rapidly, so that October 2, 1901,

I received the following letter from the mother, the patient having removed to Colorado in the meantime. The mother states: "The child is the picture of health and walks beautifully. The stiffness is almost entirely gone from the right hip, and you would be surprised to see how nearly perfect her walk is. . . . She is the greatest mountain-climber in the family, as she never gets short of breath and never complains of her limbs being tired."

Subsequently I was told that she had learned to skip rope of her own accord and to sit tailor-fashion without difficulty. At about this time I had a profile photograph taken, of which Fig. 6 is a pen sketch. Though the patient is leaning forward a little, there is not a trace of the former lordosis, the curve of the back is perfectly normal, there is no prominence of the hips nor any abdominal protrusion whatsoever.

I had hoped that at this time I would be able to describe the patient's condition from personal observation, in order to prove that a perfect functional result can at times be obtained without operative interference; but this was not to be, for on November 27, 1901, she was suddenly taken ill with some acute intestinal disturbance, and on November 29 she died in convulsions. I am, however, in a position to do that which from a scientific standpoint is more important and more convincing than description of the patient or the exhibition of skiagraphs, namely, a description and illustration of the pelvis, which I removed at post-mortem, December 1, 1901.

Before giving a detailed description of the joints, I wish to give the notes Dr. Espy, of Trinidad, Colorado, kindly took down for me at the time I made the autopsy.

Total length of body, 109 centimetres.

Right anterior superior spine to right internal malleolus, 52½ centimetres. Left same.

Greatest circumference right thigh, 27½ centimetres.

Greatest circumference left thigh, 28½ centimetres.

Greatest circumference right calf, 19 centimetres.

Greatest circumference left calf, 19 centimetres.

Right hip easily flexed to 85°, extended to 180°, and abducted to 40°, and adducted so as to place leg readily on left knee.

Left hip easily flexed to 70°, extended to 180°, abducted to 45°, and adducted same as right.

Some rigor mortis. Abdomen not distended. Intestines,

spleen, kidneys normal. Considerable glairy mucus in the stomach.

Having promised to do nothing which might later interfere with the easy management of the corpse, I had to limit my investigation to a superficial examination of the thoracic viscera through an incision in the diaphragm and to an examination of the hip-joints. In order to do the latter more thoroughly at my leisure, and to have the specimen as proof positive of the possibility of a reduction, I persuaded the parents to permit me to remove the pelvis and the femora. In removing these, I examined the muscles and tendons about the hip-joints, and so far as I could tell they were perfectly normal. There was no evidence of healed lacerations.

On examining the specimen, of which Fig. 7 is an accurate reproduction, we note the following facts: The pelvis is well formed and apparently of normal size. The individual bones of which it is composed are held together firmly by strong ligaments. The capsular ligaments are well developed and hold the heads firmly in the acetabula. No abnormal sliding motion possible. The heads of the femora are opposite the Y cartilages. A straight line drawn through the two Y cartilages passes apparently directly through the centre of the heads and about one-half centimetre below the upper borders of the great trochanters. The upper borders of the heads are well below the anterior inferior spines of the ilia. The lower borders of the heads project fully one-half centimetre below the level of the iliopectineal eminences. So far this description tallies almost perfectly with that of a normal pelvis which I obtained from a female patient of about the same age. In the latter the Y cartilages seem to be relatively a little nearer to the anterior inferior spines.

In order to determine the condition of the reduced joint itself, I opened the right one by a semilunar incision, severing the capsular ligament for about the lower half of its extent. The neck is strong, of about normal length; the angle between it and the shaft may be a trifle less than that of the ordinary femur. The head is a little larger than normal, not perfectly globular, but on its anterior inferior and mesial surface it has the appearance as though a shell of a small sphere had been superimposed. The whole articular surface is covered by a perfectly smooth layer of cartilage. The capsular ligament is strong and hugs the head

and neck closely. The acetabulum is well developed, almost, if not quite, as deep as normal. It has a well-formed solid rim. The cotyloid ligament is present and apparently normal. The articular surface is perfectly smooth. There is no definite ligamentum teres to be found.

At the bottom of the acetabulum I found a thin, paper-like structure about four millimetres wide and 1.5 centimetres long, one end attached at the place the ligamentum teres is normally inserted in the acetabulum, and the other end free. Whether this may be looked upon as the remnant of the ligamentum teres, I am unable to say.

The most interesting and wonderful feature of the specimen, to my mind, is the way in which the capsule has adjusted itself to the new conditions. When we again turn to Fig. 1, it must be plain that at the beginning of the treatment the capsule must have been drawn out in the form of a long tube, which now has retracted to the normal shape. This is simply an additional proof of the wonderful power nature has to adjust matters, and the inherent tendency of the individual members of the human body to attain to a certain normal status.

In conclusion, let me observe that from the very beginning of treatment I considered this a rather favorable case. A strong, healthy child, with apparently well-developed femora, and fairly well-developed acetabula, who was at the proper age for such treatment. Those who are most competent to offer an opinion in this matter agree that the third and fourth years of life are the most favorable.

The errors which I made were, first, in using the cotton under the plaster. I am convinced that this was the cause of the two reluxations, as the cotton between the cast and the body permitted of too much motion, and did not hold the parts permanently in the proper relative positions. The error was, however, practically overcome by the exceptionally good sense of both the mother and the child, who were anxious and willing to try again each time as long as I thought it desirable and was able to give them encouragement.

My second error was in changing the cast too frequently and in employing anæsthesia too often; but this, I think, was

excusable, and not to be wondered at, when you consider the fact that the first two times on removing the cast I found a reluxation each time. After all, this was not nearly as great a mistake as if I had left the cast on six months the first time while the hip was not in place.

I did not make as full use of the body weight as I should have done, but at that time I did not fully comprehend how far this could be carried. I may have been a little too careful in bringing the thigh down to the normal position, but I am sure even now that this is much the better side on which to err. To wear a cast a few months longer than is absolutely necessary is no special hardship to a child, especially when the child can be about. In fact, the last few months of treatment this little patient went to school wearing the cast, and experienced no discomfort from it.

I have given this history thus in detail, knowing that these patients have been the bugbear of physicians and surgeons for centuries because of their inability to successfully treat them. Until recently these poor patients and their deeply concerned parents have been put off with a shrug of the shoulder by even the most learned members of our profession, and as most people are not satisfied with a negative answer, they have gone from place to place, and have become an easy prey to charlatans and quacks, who promise to cure all cases for a consideration paid in advance. It thus manifestly becomes our duty to report such cases with the greatest possible detail.

Here I believe we have a specimen which will convince even the most sceptical that we have obtained an almost perfect anatomical result, a joint which would always have been stable, which would have supported the weight of the body under all ordinary circumstances, and one which would permanently have insured a perfect functional result.

REFERENCES.

Bradford, E. H.: Transactions of the American Orthopædic Association, 1898, Vol. xi, p. 429.

Bradford, E. H.: Lorenz Operation in Congenital Dislocation of the Hip.

Bradford, E. H.: Transactions of the Congress of American Physicians and Surgeons, 1897.

Bradford, E. H.: Warren-Gould, International Text-Book of Surgery, Vol. i, p. 741.
Bradford, E. H.: Transactions of the American Orthopædic Association, 1898, Vol. xi, p. 429.
Drehman, G.: Centralblatt für Chirurgie, No. 13, 1899.
Elliott, Geo. R.: Medical Record, May 28, 1897.
Hoffa, A.: Die moderne Behandlung der angeborenen Hüftgelenkslaxationen. Muenchen, 1898.
Lorenz, A.: Ueber die Heilung der angeborenen Hüftgelenksverrenkungen durch unblutige Einrenkung und functionelle Belastung. (Mit Literatur Verzeichnis.) Franz Dentricke, Leipzig und Wien, 1900.
Lorenz, A.: Berliner klinische Wochenschrift, January 16, 1899.
Lorenz, A.: Sammlung klinischer Vorträge, Neue Folge, No. 151, 152.
Lorenz, A.: Sammlung klinischer Vorträge, Neue Folge, No. 117.
Lorenz, A.: Pathologie und Therapie der angeborenen Hüftverrenkung. Auf Grundlage von 100 operativ behandelten Fälle. Urban und Schwarzenberg, Wien und Leipzig, 1895.
Mikulicz, J.: Archiv für klinische Chirurgie, Vol. xlix, pp. 368-386.
Paci: Wiener klinische Wochenschrift, 1896, Vol. v, p. 33.
Senger, E.: Berliner klinische Wochenschrift, 1897, Vol. xxxiv, p. 50.
Whitman, Royal: Transactions of the American Orthopædie Association. Vol. xii, p. 150.
Wirt, W. E.: Cleveland Medical Gazette, 1900, Vol. xv, p. 269.
Wolf, J.: Berliner klinische Wochenschrift, Nos. xviii and xix, 1899.