A REASSESSMENT OF THE SURGICAL TREATMENT OF SEVERE CONTRACTURES OF THE HIP JOINTS FOLLOWING POLIOMYELITIS

With a Review of Cases Treated at the Nuffield Orthopaedic Centre, Oxford, 1953 to 1960

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THE orthopaedic problems of poliomyelitis have already begun to disappear as the incidence of the infection decreases following widespread use of vaccination. Far from losing interest in the surgical management of the deformities resulting from poliomyelitis, it seems to us that it is time to re-examine some of the case material which in the past has presented particular difficulties in treatment.

In this country severely affected cases are still seen, most of them referred from distant parts of the world. Unless the vast experience of a previous generation of orthopaedic surgeons with poliomyelitis problems is constantly re-examined, then there exists the danger that the small group of patients referred to above will come to be neglected. With this in mind, we have undertaken a review of the cases of flexion contractures of the hips in poliomyelitis.

Flexion deformities of the hip joints following poliomyelitis are not common. However, these deformities occur with varying degrees of severity and this paper is concerned with those cases which require surgical operations for their correction.

In a severe case, with irreducible flexion contractures of the hips, there may be associated deformities. Flexed knock knees, external torsion of the tibiae and valgus deformities of the feet contribute to the enormous difficulties that these patients have in walking. In addition, obliquity of the pelvis and an exaggerated lumbar lordosis are other clinical features of note (Fig. 1). Not only do these patients have great difficulty in walking, because of their inability to stand up straight, but they may also be troubled with severe low back pain.

The mechanisms responsible for the development of this deformity will be discussed briefly and the previously applied methods of treatment

FIG. 1.—Drawing of the human skeleton seen from the side, showing 45° flexion deformity at the hip joints, compensated partially by an exaggeration of the normal lumbar lordosis.

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will be reviewed. However, this paper is primarily concerned with a critical analysis of those cases of flexion contracture of the hips which have been treated surgically at the Nuffield Orthopaedic Centre over the last 7 years.

The causes of this deformity were studied in great detail in the period from 1920 to 1930 and many interesting papers were produced during this time, especially those by Yount (1926), Forbes (1928) and Fitchet (1933) and more recently by Irwin (1949), Barr (1950), Merle d'Aubigné and Scholder (1956).

Flexion contractures of the hips are very likely to develop in severely paralysed cases who are allowed to sit in chairs for prolonged periods—or who are nursed in bed with the hips kept constantly flexed. This tendency is even more marked where there is also muscular imbalance in opposing groups.

In severe deformities of this type, the contracture involves all the soft tissues from the skin to the tendons, ligaments, joint capsule and even to the perivascular and perineural tissues.

The development of the flexion contracture depends on the slow progressive fibrous metaplasia of the interstitial tissues involving also the paralysed muscular fibres leading to shortening and contracture of the intermuscular fasciæ and fascia lata. The tensor fascia lata plays a special role in the development of this deformity.

Whitman (1923) noted that this muscle was rarely paralysed following poliomyelitis. This has been confirmed by Sharrard (1955) who, in his investigation of the distribution of poliomyelitis paralysis among the muscles of the lower limbs, found that out of 962 severely paralysed cases, only 38 had paralysis of the tensor fascia lata.

The tensor fascia lata arises from the anterior 5 centimetres of the outer lip of the iliac crest, from the outer surface of the anterior iliac spine and part of the outer border of the notch below it, between the gluteus medius and sartorius, and from the deep surface of the fascia lata. It is inserted between two layers of the ilio-tibial tract of the fascia lata about the junction of the middle with the upper one-third of the thigh. Distally, the fascia lata fuses with the fascia femoris and forms a stout band which is inserted into a tubercle on the antero-lateral aspect of the lateral tibial condyle. This muscle, therefore, is a flexor of the hip joint and it assists in extension of the knee and also in abduction and in medial rotation of the thigh. Further, it flexes the pelvis towards the same side. The tensor fascia lata acts in synergism with the gluteus maximus in abduction of the hip. (The gluteus maximus is not only an extensor of the thigh but also a tensor of the fascia lata.)

Having examined the various actions of this muscle in the movements of the hip joint, it is clear that it can play an important role in the development of contractures at this joint (Fig. 2).

Occasionally, contracture of the tensor fascia lata, associated with fibrosis and shortening of adjacent intermuscular fascial septa, constitutes the major deforming factor at the hip joint. In such cases, correction of the deformity may be achieved by conservative means or by minor operations dividing only the tensor fascia lata and the contracted fascia as reported by Lange (1924), Yount (1926), Irwin (1949) and Fitchet (1933). Recently, Allbrook and Lunn (1960) have reported the results of multiple transverse incisions in the

FIG. 2.—Clinical photograph showing the compensatory lumbar lordosis which accompanies flexion deformities at the hip joints.

ilio-tibial tract for correction of severe paralytic hip contractures.

From a surgical point of view, the correction of flexion contractures of the hips becomes progressively more difficult when the pathological processes involve, in addition, structures other than the tensor fascia lata and the ilio-tibial tract. Simple procedures like those mentioned above are then no longer effective.

Legg (1923) recommended transposition of the tensor fascia lata posteriorly so that it could act as an abductor but not as a flexor of the hip joint.

Mezzari (1946) divided the contracted structures attached to the anterior superior iliac spine. Then he passed the detached muscles through a subcutaneous tunnel to anchor them to the pubic spine. This operation corrected the flexion abduction and external rotation deformities at the hip joint.

Barr (1950) described a rather extensive procedure for the transplanting of the distal end of the erector spinæ muscle into the detached ilio-tibial band which is brought under the vastus lateralis and passed deep to the gluteal aponeurosis. Added to this, other contracted soft tissues in front of the hip joint are divided. In this way the flexion con-

tracture of the hip is corrected and along with it, the associated lumbar lordosis.

Other authors have recommended even more radical procedures. Hallock (1950) reported the use of arthrodesis of the hip joint. Campbell (1923) reported successful results following transposition of the anterior superior iliac spine associated with release of the hip abductors and the rectus femoris muscle.

However, one of the most useful operations that has been devised for the surgical treatment of this condition was described by Soutter in 1926. He wrote: 'When the cases are of long standing, they may not yield to tenotomies of the tendons and of the tensor fascia femoris, and myotomies are necessary'. In this operation the fascia lata is incised transversely from the level of the anterior superior iliac spine, anteriorly, to the greater trochanter posteriorly. Then, by means of an osteotome, the attached muscles and fascia are removed from the anterior superior spine subperiosteally on the inside, on the outside and below; they are pushed downwards. With this method, the muscles are not cut across. Their periosteal attachment is simply moved downwards.

The method of surgical treatment to be

TABLE I
A SUMMARY OF THE FINDINGS IN 13 HIPs

Cases	Date of Onset of Poliomyelitis	Degree of Flexion Deformity of Hips	Date of Hip Operation	Post-operative Results Assessed in June, 1960
H.F.N.	July 1950	R. hip 30° flexion L. hip 10° flexion	April 1953 Bilateral	The patient walks satisfactorily. No lordosis. Left hip full extension. Right 5° flexion.
A.K.F.	Nov. 1950	L. hip 25° flexion, 20° abduction	May 1953	The patient is able to walk a little. Slight lumbar lordosis persists. Hip extension full.
A.F.	May 1944	R. hip 40° flexion L. hip 40° flexion	Feb. 1954	The patient walks well. No lumbar lordosis. Hip extension full.
C.A.P.	May 1953	R. hip 40° flexion, abduction 15°	May 1955	The patient walks well. Slight lumbar lordosis persists. Hip extension full.
S.D.	June 1953	R. hip 30° flexion	Dec. 1958	The patient walks well. There is no excessive lumbar lordosis. Hip extension full.
W.A.	Sept. 1955	R. hip 35° flexion L. hip 25° flexion	Feb. 1958 April 1958	The patient walks satisfactorily. A little lumbar lordosis persists. R. hip 5° flexion contracture. L. hip extension full.
H.J.	June 1957	R. hip 40° flexion, 15° abduction L. hip 30° flexion, 10° abduction	Sept. 1959 Dec. 1959	The patient walks well. No lumbar lordosis. Hip extension full.
D.T.	Aug. 1954	R. hip 45° flexion L. hip 45° flexion	Feb. 1960 March 1960	The patient walks well without compensatory lumbar lordosis. Hip extension full.

FIG. 3.—Clinical photograph showing the healed skin incisions over both hip joints, and the correction of the hip and spine deformities which has been achieved by operation.

described in this paper is based on Soutter's approach to the problem, though it differs in some details.

Analysis of Results

This paper is based on the examination of results in 13 hips operated upon in eight cases. The findings in each case are remarkably similar; consequently, only one of these will be presented in detail. Notes on each case, relevant to hip deformities, will be found in the accompanying table (Table 1).

Case Report. D.T., born 21.6.54.

August 1954. Contracted poliomyelitis. He developed gross muscle weakness in both lower limbs. A chart of his muscle power at the time showed strengths ranging from 0 to 2 in the lower limb groups; from 2 to 3 in the abdominal muscles and strengths of 3 in both of the quadratus lumborum muscles.

January 1958. He had developed flexion contractures

of 45° in both hip joints, with contractures of the tensor fascia lata muscles. He had a very pronounced compensatory lumbar lordosis which added greatly to his difficulties in walking. After observation over the course of a year, it became evident that his walking was deteriorating.

February 1960. Operations for release of the flexion contractures of the hips.

3.2.60. Left hip operation. The skin incision began just below the level of the iliac crest, about two fingers breadth behind the anterior superior iliac spine; passing forwards it was carried down on to the thigh for about 5 inches, along the line between the anterior superior and anterior inferior iliac spines.

The tensor fascia lata muscle and the anterior fibres of the gluteus medius were incised transversely just below the level of the iliac crest. The attachments of the sartorius and straight head of the rectus femoris muscles were then disinserted from the ilium. Division of these structures alone allowed the hip to extend fully. The wound was closed and a plaster spica applied to the left leg in full extension.

24.2.60. Right hip operation. The procedure was identical with that described above. However, the hip

did not extend fully. The tendon of the ilio-psoas muscle appeared to be responsible for the remaining 10° of flexion contracture. This was not divided because of the gross weakness of all the other hip muscles. The right hip was then included in plaster in extension to make a double hip spica.

Post-operative care. Both hips were immobilised for six weeks after the respective dates of operation.

Rehabilitation began with pool-therapy. He was discharged walking in calipers just over two months after his second operation.

Result. When seen four months after operation he was walking well in calipers. The unsightly lumbar lordosis had been corrected. The left hip could be fully extended but a 10° flexion contracture persisted in the right hip (Fig. 3).

Discussion

Contractures of the hip joints occur in a small group of patients in whom the lower limbs are severely paralysed following poliomyelitis. When flexion deformities are of the order of 40° , it may become impossible for the patient to walk, despite the use of calipers and crutches, if there is an associated weakness of the lumbar spinal muscles

including, in particular, the quadratus lumborum groups.

Dame Agnes Hunt used to obtain correction of these deformities by conservative means—using a hip spica on one side combined with fixed traction on a Thomas's splint applied to the affected leg (quoted by Powell in 1953). This proven-effective method is simple in principle, but its successful application requires a high degree of nursing skill.

From an examination of the cases treated at this Centre in the past 7 years, it appears that good, lasting results can be achieved in correcting the primary contractures and some of the associated disabling deformities by the use of a simple surgical procedure, combined with adequate post-operative care.

When considering the surgical approach to this condition, it is useful to refer back to the normal anatomy of the hip joint in the child. If one views a dissection of this joint from the side (Fig. 4), with the pelvis in the standing position,

FIG. 4.—A dissection of the hip joint of a child viewed from the side. The pelvis is in the anatomical standing position. The femoral head is in the acetabulum and the femoral neck is shown divided transversely. The structures on the right of the vertical line drawn on the photograph of the specimen are those which may become involved in the process of contractures at the hip joint. 1, Anterior superior iliac spine. 2, Sartorius muscle. 3, Tensor fascia lata muscle. 4, Gluteal aponeurosis. 5, Gluteus medius muscle. 6, Gluteus maximus muscle. 7, Gluteus minimus muscle. 8, Capsule of the hip joint. 9, Straight head of the rectus femoris muscle. 10, Tendon of the psoas major muscle and fibres of the iliacus muscle. 11, Femoral head. 12, The femoral neck cut transversely.

the orientation of the deforming factors that have been mentioned can be appreciated at once. Clearly then, with an exposure such as the one we have described, it is possible to divide each responsible deforming element in turn, down to and including the hip joint capsule itself, until all tight structures have been released, allowing the hip to extend fully.

It is necessary to respect the integrity of the ilio-psoas muscle in some of these cases when there is marked weakness of the quadratus lumborum muscle on the same side. In such instances the ilio-psoas attachment to the femur must be left intact, even at the expense of a full correction of the flexion deformity. Its integrity will be vital because without it the patient will be unable to carry a caliper when walking.

This relatively simple surgical approach compares satisfactorily with the variety of surgical procedures that have been reviewed in this paper, many of which appear to us to be too complex. The operation must be followed by an adequate period of immobilisation of the hip joints in the corrected position. Six weeks in a hip spica has been shown to be sufficient. The patient can then be taught to walk again within a few weeks, rehabilitation being aided significantly by pool therapy if this is available.

We consider that correct, intensive rehabilitation avoids severe flexion deformity in most cases, but patients with progressive deformity, despite good treatment, respond best to the type

of management that has been outlined. It assures a quick and satisfactory result without any tendency for the deformity to recur. Most of the cases reported here were able to walk satisfactorily within two months of their operation and from the point of view of the patient's psychological attitude to his disability, the results have been gratifying.

Summary

1. A review is presented of 13 operations based on Soutter's method for the correction of flexion deformities of the hip joints following poliomyelitis.
2. The literature dealing with other surgical methods is discussed.
3. It is pointed out that conservative measures such as those taught by Dame Agnes Hunt should not be forgotten; with the general shortage of nurses these methods, which are time-consuming and require a high degree of skill, are now rarely used.

I should like to thank Professor J. Trueta for his kindness in encouraging me to write this paper. I am indebted to the consultant surgeons at the Nuffield Orthopaedic Centre for permitting me to examine their cases. Mr. H. V. Crock provided me with Fig. 4, a photograph of a specimen dissected by him, now in the museum of the Anatomy Department in the University of Melbourne.

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