OPEN REDUCTION IN CONGENITAL DISLOCATION OF THE HIP

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There is a wide divergence of opinion on the merits and demerits of open reduction of the congenitally dislocated hip. The protagonists of conservative treatment are at least as dogmatic as those in favour of open reduction and, in spite of the favourable results described by the latter, open reduction has never met with widespread enthusiasm and is usually reserved for those hips in which closed reduction has failed. The reasons for this seem to be threefold: firstly, there is a belief that open reduction damages the hip joint and causes growth disturbance in the upper femoral epiphysis and possibly stiffness as well; secondly, it is a big and, in a small child, dangerous operation; and thirdly, the cause of obstruction is not always obvious even when the hip is open. These objections will be dealt with later but some comment must be made on them now. In the small series of twenty-three cases described here in which open reduction has been carried out, there has been no instance of growth change in the epiphysis. The longest time since operation is three years, and the shortest time is six months. The operation to be described is simple and quick, being unassociated with shock, and there has never been any necessity for a transfusion or other form of resuscitation. The third argument is perhaps more valid according to reports in the literature. Leveuf (1948) described constriction of the capsule, adherence of the capsule to the head below or to the floor of the acetabulum, hypertrophy of ligamentum teres, fibro-fatty tissue, inverted limbus, among others as being the causes of obstruction, and many other authors have described similar findings. Doubt about the actual cause of obstruction has often led to an unnecessarily wide exposure of the joint to determine which factor is responsible in any particular instance.

On the other hand there seems to be little doubt that in the vast majority of congenitally dislocated hips there is some interposition of soft tissues at least in the early stages of the reduction whatever method is used to bring about the reduction. Opinions differ as to whether the soft tissue atrophies or is pushed out of the way by pressure of the head in the acetabulum, but the results of conservative treatment show that in about one-third of the hips treated the result is reasonably good, while in two-thirds it is unreasonably bad. This suggests that, although the obstruction is removed one way or another in a certain number of hips, yet in many, perhaps most, either it is incompletely removed or the damage done in the process leaves a permanently defective joint.

The value of gradual reduction on the "Wingfield" frame, and its advantages in reducing the incidence of osteochondrosis have been described by Scott,* but there seem still to be some missing factors which account for the remainder of indifferent results. This investigation has been carried out as a natural continuation of that work in an attempt to determine the nature of the obstruction that prevents immediate and complete reduction, and to devise an operation by which it can be removed with the least possible trauma.

NATURE OF THE OBSTRUCTION

The present report is confined to those cases of dislocation called by Haas "typical dislocations": dislocations associated with arthrogryposis seem to have a different pathology and are not considered here. The exploration of twenty-three hips with typical dislocations

* SCOTT, J. C.: Congenital Dislocation of the Hip. Page 372 of this number.

has led to the conclusion that an obstruction, if present, always has the same cause—namely an inverted limbus. Of the twenty-three hips opened it has been found in every one, and its removal has resulted in immediate, unresisted and complete reduction.

The limbus is a fibrocartilaginous lip to the acetabulum, which in the fresh specimen is pliable and may easily be inverted into the joint. It is largest posteriorly and postero-superiorly. Our knowledge of the pathological limbus is at first mainly obtained from arthrograms, in which the limbus can be seen turned into the joint (Severin 1950). When the joint is opened, the size, shape and position can readily be seen, and direct vision can give much more information how the obstruction is caused. Arthrographic appearances

Diagrams illustrating the size, position and appearance in arthrograms of the inverted limbus relative to the acetabulum. Figure 1 shows the usual size; Figures 2 and 3 show the extremes. In Figure 4 is seen the appearance in an arthrogram of a hip in which the limbus is inverted as in Figure 1; the head has been partially reduced. Figure 5 shows the arthrographic appearance of the hip represented in Figure 2; the limbus is so large that it almost forms a diaphragm. Figure 6 shows arthrographic appearance of the hip represented in Figure 3; the limbus cannot be seen; it lies posteriorly but the upper lip is deformed for the reason shown in Figure 7.

suggest that the limbus produces its obstruction by deformation of the upper lip of the acetabulum: what is not so readily appreciated but is obvious on direct vision inside the joint is that, though there is much variation in the extent of the limbus, it is largest posteriorly and is always to be found in that position, whereas the distance that it extends forwards along the upper lip is variable.

Figures 1 to 7 show diagrammatically the variations in size and appearance of the limbus which have been encountered. The first diagram (Fig. 1) shows the usual size; Figures 2 and 3 show the extremes. Figures 4 to 6 show the appearance as seen in the arthrogram of each type when the head has been reduced to the level of the acetabulum. Usually the

limbus is seen as a small fold turned into the joint (Fig. 4). This is sometimes mistaken for an hour-glass constriction (Fig. 8). If the limbus is very large and extends right across the joint almost like a diaphragm, it may be so large that it cannot readily be seen because the

FIG. 8

Arthrogram showing a medium sized inverted limbus giving an appearance often described as an hour-glass constriction of the capsule.

FIG. 9

FIG. 10

Figure 9—Arthrogram showing a very large limbus forming almost a diaphragm. The femoral head is deformed by pressing on it. Figure 10—Arthrogram of a hip in which a small limbus is present posteriorly. The upper lip is severely deformed by pressure of the femoral head.

head is flattening it into the depths of the joint (Fig. 9). When the limbus is small and lies posteriorly only, it cannot be seen in the arthrogram, but when the head is partly reduced we see the appearance shown in Figures 6 and 10. This is because the antero-

posterior diameter of the acetabulum has been reduced so that the head is "riding" on anterior, posterior and superior lips and is unable to sink into the depths of the joint (Fig. 7). The superior lip is deformed in consequence (Fig. 6) and the "reduction" is unstable. There can be little doubt that the limbus is large enough to cause an obstruction in this way. Figures 11 to 13 show three that have been excised.

With the assumption that the inverted limbus is the only major cause of obstruction to

FIG. 11

A medium sized limbus excised from the hip of a girl aged four years and eleven months.

FIG. 12

FIG. 13

Figure 12—A large limbus excised from the hip of a child aged two years. The edges are thick, the centre thin, possibly from pressure of the head. Conservative treatment had been persisted with for six months before open reduction was undertaken (same scale as Figure 11). Figure 13—A small limbus excised from the hip of a child aged one year eight months (same scale as Figure 11).

reduction of the head into the acetabulum, it is obviously no very difficult matter to design an operation to remove the limbus without having to dislocate the joint or carry out any extensive dissection, and involving the least possible shock.

OPERATION

The operation is greatly facilitated if the hip is first partly reduced on a suitable frame until the femoral head lies opposite the acetabulum. Plain radiography will usually show

that it is standing out (Case 2, Fig. 17), and an arthrogram will reveal the obstructing limbus and "pooling" in the depths of the acetabulum (Case 2, Fig. 18).

The usual skin preparation is carried out with the patient on a frame, which is removed immediately before operation. On the operation table the legs are allowed to adduct and a sandbag is placed beneath the affected hip. The approach is a modification of the Smith-Petersen. A straight incision is made from below and medial to the anterior superior spine, obliquely upwards and backwards to the mid-point of the iliac crest. This is deepened, and the skin and fat are retracted upwards to expose the iliac crest, from which the abductor muscles are detached and reflected subperiosteally from the wing of the ilium until the capsule of the joint is exposed. This is facilitated by separating the tensor fasciae latae from the sartorius for about one inch.

The rectus with its reflected head is exposed and the edge clearly defined. It is usually possible to separate the rectus from the capsule with blunt dissection but occasionally a knife must be resorted to. It is never necessary to detach it from the anterior inferior spine. The rectus can then be lifted clear from the capsule with a retractor. A small, transverse incision is made in the capsule close to the acetabular lip, until the white, shining articular cartilage of the femoral head is visible and a little synovial fluid exudes. The incision is carried forwards transversely to the capsule deep to the rectus. This is done most easily and quickly with a Smillie cartilage knife. The incision is carried backwards to the posterior superior limit of the joint.

If the leg is now pulled downwards firmly, a gap of about one-quarter of an inch can be produced through which the inside of the joint can be seen. Sometimes the infolded limbus can be seen quite readily, but usually at first sight it is far from obvious and the acetabulum seems to be deep and well formed—quite different from the appearances on the radiograph. Examining the inside of the acetabulum with a probe will often disclose no abnormality, but, if a blunt hook is introduced into the joint, the tip of it can easily be slipped over the edge of the fold, which up to then has harmonised so well with the acetabular roof as to be "invisible." The tip of the hook can be forced through the base of the fold and the part of the fold lying in front can be separated from its periphery until the hook comes out. The free end is grasped with Kocher's forceps and drawn out of the joint, when the extent of the true roof of the acetabulum becomes visible and the fold is seen extending to the bottom of the acetabulum, attached at its periphery all the way. It is quite easily accessible and is removed with a pair of strong, curved scissors. With the fold removed the inside of the joint becomes much more readily visible and the whole of the acetabulum can be inspected without damage to the ligamentum teres or dislocation of the joint.

When the limb is fully rotated medially and abducted about 30 degrees the head sinks deeply into the acetabulum. The reduction will be stable, and so long as some degree of medial rotation is maintained, there is no danger of redislocation while the wound is being closed. It is unnecessary to suture the capsule, as the incision is closed with the hip medially rotated. Reattachment of the muscles to the iliac crest and closure of the skin are all that are required to complete the operation. A hip spica is applied with the hip fully rotated medially and abducted 30 degrees. More abduction than this may result in some degree of abduction contracture which may take some time to correct and delay early walking.

DISCUSSION

This paper is not concerned with the long-term result of the operation described, but is rather an attempt to demonstrate that the inverted limbus is a very important, if not the all-important, cause of failure to achieve immediate and complete reduction of a congenitally dislocated hip.

FIG. 14

Case 1—After seven weeks' reduction on a frame the femoral head is still standing out.

FIG. 15

Case 1—After excision of the limbus the femoral head is well and centrally placed.

FIG. 16

Case 1—Two and a half years after open reduction. The femoral head is standing out just a little, but the position has remained unaltered for one and a half years.

In this series of twenty-three open reductions of the hip, eighteen were done early—that is, before conservative measures had been tried for more than a few weeks. Five were done late, when conservative measures had failed and the hip had redislocated. Three of these have been combined with shelf operations. In all twenty-three hips the inverted limbus has been readily demonstrated. In twenty-one it was excised completely, and in two it was simply cut across transversely and left. In only one instance was any other procedure undertaken to obtain reduction, and in this a ruptured ligamentum teres was excised. In the others, when an enlarged ligamentum teres, a hypertrophied Haversian gland or other possible cause of obstruction was found, it was left untouched.

In all those in which the limbus was excised, reduction was complete on medial rotation and a little abduction, and, provided the medial rotation was maintained, remained stable. When the limbus was merely divided, reduction at the time was much less stable and radiographs showed a gradual reduction over some weeks. This suggests that, in these hips at any rate, the sole cause of obstruction was the infolded limbus.

The operation is not original but it is rather a combination of a number of operations described by others, based on the Smith-Petersen approach. The Smith-Petersen incision tends to leave an unsightly scar which may contract below the anterior superior spine, whereas the straight incision heals more satisfactorily. The incision is higher and more horizontal than that described by Cole (1935) because, unlike Cole's description, the basis of this operation is an exposure of the postero-superior aspect of the joint so that very little need be exposed anteriorly. Bleeding is thus reduced, the joint is not dislocated and the ligamentum teres when present is left untouched. The operation is quick, simple and free from shock, never taking more than thirty minutes and sometimes as little as fifteen. It has never been found necessary to use any form of resuscitation or transfusion.

The ages of the patients have been low compared with those described in other series, varying from eleven months to five years, most being about two years of age, and in no instance has an hour-glass constriction been found. No operative complications have been encountered. The first hip was operated on three years ago, the most recent in this series, six months. There has been one recurrent subluxation due to anteversion, correction of which has resulted in a nearly normal hip. There has been no growth change in the femoral epiphysis, and no hip which has been mobilised yet has regained less than 90 degrees of flexion. Many that have been free for more than a few months have regained full movements.

Because of the stability of the joint in medial rotation and the tendency to redislocation in lateral rotation it seems to be logical to follow the open reduction with a rotation osteotomy before mobilisation; that has usually been done.

ILLUSTRATIVE CASE REPORTS

Case 1—Girl aged one year nine months. Congenital dislocation of the left hip was reduced on a frame, but even after seven weeks in wide abduction the head was still standing out (Fig. 14). The arthrogram showed an obstructing limbus which was excised (Fig. 15); a spica was applied for three months, and thereafter Batchelor plasters were used for eight months; then a rotation osteotomy was done. Three years after admission this child has a full range of painless movement and complete stability (Fig. 16). She had also a subluxation of the right hip, which persisted after conservative treatment. It was corrected by a rotation osteotomy.

Case 2—Girl aged two years and four months when the dislocation was diagnosed. The dislocation was "reduced" on a frame but after five weeks the femoral head was still standing out (Figs. 17 and 18). Open reduction was undertaken, the limbus being excised (Fig. 19); a spica was applied for three months, followed by rotation osteotomy and a spica for six weeks, when free mobilisation was allowed. Now, a year later, she walks without a limp. The Trendelenberg is negative; there is full flexion, a normal arc of rotation but only 40 degrees of abduction. The result is marred by the coxa vara which has unfortunately been exaggerated by the osteotomy (Fig. 20).

Comment—These two cases have been chosen simply to illustrate the results after prolonged immobilisation and after immobilisation for a much shorter period. There is no reason yet to suppose that the result in the other cases will be any worse or any better than those shown.

FIG. 17

FIG. 18

Case 2. Figure 17—After reduction on a frame for five weeks. The femoral head is opposite the acetabulum but is standing out. Figure 18—The amount the head is standing out is well shown in this arthrogram. Note the pooling in the acetabulum and the compressed limbus turned into the joint.

FIG. 19

FIG. 20

Case 2. Figure 19—After reduction the head has sunk into the acetabulum. Figure 20—One year after operation the child has regained full movement except abduction which is only 40 degrees. The hip is stable, but the bony roof is still a little oblique though much better.

So far they are all running a similar course, some taking a little longer to achieve mobile joints than others, but the patients operated upon are taking no longer than others that have been treated conservatively.

Though it is far too early to be certain, there is at present no evidence to suggest that excision of the limbus causes any lasting damage to the joint and, as it is composed only of fibrocartilage, it will probably regenerate.

SUMMARY

1. It is suggested that the obstruction causing delayed reduction of the congenitally dislocated hip is the infolded limbus.
2. An operation is described by which the infolding limbus may be easily and safely removed.
3. The early results of the operation are reported.
4. The evidence for the original assumption is discussed.

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