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Review article

Surgical reduction of congenital hip dislocation

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ABSTRACT

Surgical reduction of congenital hip dislocation is technically challenging. In our practice, surgical reduction is usually reserved for patients who have failed non-operative treatment, which is the first-line strategy. However, primary surgery may be indicated if the dislocation is diagnosed late and can be performed until 8 years of age. The reduction step is crucial. It starts with painstaking exposure of the capsule. Identifying the lower part of the acetabulum is the key to accurate repositioning of the epiphysis. The main intra-articular procedures are resection of the ligament teres, adipose tissue within the acetabular cavity, and transverse acetabular ligament; and eversion of the radially incised limbus. In patients younger than 1 year of age, surgical reduction can be performed via the anterior approach or, in some cases, the obturator approach. No complementary steps are needed. If the diagnosis is made late, in contrast, reduction of the hip must be combined with corrective procedures on the femur and acetabulum designed to stabilise the reduction before the capsulorrhaphy, with the goal of optimising hip stability and minimising the risk of residual dysplasia. Femoral shortening and derotation osteotomy was classically reserved for children older than 3 years but has now been shown to be a useful and prudent procedure in younger patients. This osteotomy decreases pressure on the epiphysis, facilitates the reduction, and diminishes the risk of recurrence and avascular necrosis of the femoral head, which are the two dreaded complications. The outcome depends on the care directed to the procedure and on the quality of postoperative management.

1. Introduction

Surgical reduction of congenital hip dislocation is a challenging procedure whose outcome depends on two factors: the ability of the surgeon to develop the optimal operative plan and the degree of gentleness and accuracy with which the surgery is performed. The two main complications are recurrent dislocation, which is chiefly due to faulty operative technique; and avascular necrosis of the femoral head, which may be related to poorly-controlled and excessively aggressive surgical gestures. Another cause of avascular necrosis is failed non-operative treatment responsible for damage to the tissues and blood vessels.

Learning the surgical technique described in this article is therefore of the utmost importance.

Surgery is rarely indicated. The management of congenital hip dislocation relies chiefly on non-operative techniques, which include early, ambulatory methods (double- or triple-diapering to abduct the hips, abduction pad, Pavlik harness) and later treatments applied in the hospital (traction and non-operative reduction and stabilisation). Surgical reduction is reserved for failures of this first-line treatment [1], when the obstacles to reduction cannot be overcome and the hip remains irreducible or unstable. Finally, surgical reduction may be indicated as the first-line treatment if the dislocation is diagnosed late; the most widely-accepted age threshold of 4 years is open to question.

This article focuses solely on congenital hip dislocation. The management of residual dysplasia is not discussed.

2. Surgical technique for hip reduction

2.1. Preoperative work-up

A preoperative work-up is mandatory to visualise and understand the obstacles to hip reduction. It should include a radiograph of both hips in internal rotation to ensure an accurate assessment of the neck-shaft angle, which is usually normal.

In addition to the pelvic radiograph, arthrography is a good investigation for visualising the isthmus of the capsule, interposition tissue deep within the acetabulum, and inversion of the limbus. If non-operative treatment fails to achieve reduction or stabilisation, arthrography is usually performed to look for explanations. Arthrography has the advantage of being a dynamic investigation.

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Magnetic resonance imaging (MRI) is not performed routinely before surgical reduction of congenital hip dislocation, as the information it provides does not help to choose the operative technique.

Computed tomography (CT) may help to understand the acetabular defects and to analyse the acetabular fossa, particularly before revision surgery for failed reduction. In the youngest patients, however, incomplete ossification and radiation exposure limit the usefulness of CT.

2.2. Preparing for surgery

Preoperative traction for 1 week can be used to lower the femoral head down to the level of the acetabulum and may prepare the blood vessels for the reduction. Traction is part of our standard practice, although no definitive proof of efficacy is available [2,3].

2.3. Principles of surgery: reduction and stabilisation

Surgical reduction is the main goal. The femoral head must be repositioned within the acetabulum. The main extra-articular obstacle to reduction is the iliopsoas muscle, which curves in front of the joint capsule. The intra-articular obstacles consist of the capsular isthmus, further narrowed by the iliopsoas muscle; the ligament teres; the transverse ligament; fibro-fatty tissue filling the acetabular fossa (pulvinar); and the inverted limbus that covers the joint surface. The surgical limbus is defined as a pathologic structure composed of the inverted labrum subjected to excessive pressures and of the adjacent capsular tissue [4] (the word "limbus" means border and is now used to designate the bony edge of the acetabulum).

The femoral epiphysis receives terminal vascularisation from the posterior circumflex artery [5], which can be viewed as an obstacle to reduction, given its vulnerability to injury by excessive traction during lowering of the femur, by surgical trauma, or by extreme hip abduction during immobilisation.

Stabilisation is achieved using a reduction position to complement the capsulorrhaphy and, in many cases, correction of bony abnormalities such as excessive femoral anteversion or length and acetabular dysplasia. Correction of bone deformities, when performed, should ideally be sufficient to ensure stabilisation, with the capsulorraphy simply closing the joint cavity. If needed, any redundant capsular tissue is removed.

2.4. Surgical approaches

Several approaches are available. Each approach has distinctive characteristics in terms of hip joint exposure.

2.4.1. Medial or obturator approach

With the child supine, the skin incision is performed in the genito-femoral fold. There are three approaches:

- the Ludloff approach [6,7] is the most widely-used and is located between the pectineus muscle anteriorly and the adductor longus and adductor brevis posteriorly;
- the Ferguson approach [8,9] is between the adductor longus and adductor brevis anteriorly and between the adductor magnus and gracilis posteriorly;
- the Weinstein and Ponseti approach is between the neurovascular bundle anteriorly and the pectineus muscle posteriorly.

When creating these medial approaches, the adductor longus is divided near its insertion on the pubic bone, and the anterior branch of the obturator nerve is identified under the pectineus muscle. The pectineus should be displaced anteriorly and the adductor brevis and gracilis posteriorly to expose the iliopsoas tendon, which is detached from the lesser trochanter. The capsule is exposed and opened by performing a T-shaped incision with one branch along the axis of the neck and the other along the lower edge of the acetabulum. The transverse ligament is then exposed. Division of this ligament at both ends is a crucial step. The fibro-fatty tissue filling the acetabular fossa can then be removed. The interposed limbus is incised radially to allow its eversion, which exposes the acetabular cartilage. This places the femur in its normal position. The hip is then placed in the reduction position of 90° flexion, 30° abduction, and 10° internal rotation.

The capsule cannot be closed. A spica cast is worn for 3 weeks then replaced by a Petit abduction splint, which allows flexion–extension of the hip, until the acetabular dysplasia is fully corrected [10,11]. With medial approaches, great care is in order to avoid injuring the medial circumflex artery.

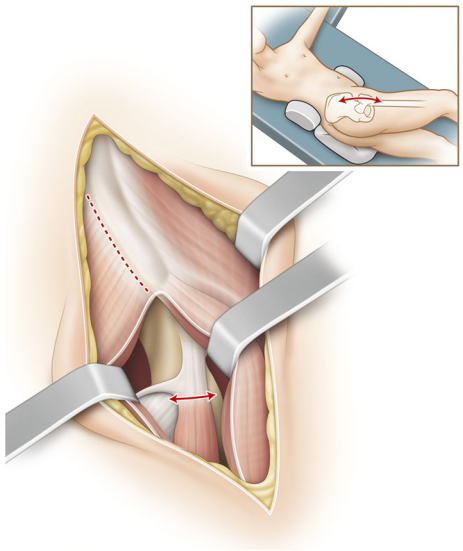

Fig. 1. Sandbag under the buttock and gel pad under the back to tilt the pelvis in a three-quarter oblique position. Bikini incision, approach to the tensor fasciae latae–sartorius gap and to the iliac crest. The rectus femoris is exposed.

2.4.2. Anterior approach

The child is supine with a large sandbag under the buttock and a gel pad under the back to turn the pelvis in a three-quarter oblique position. The bikini skin incision runs 1 cm below the crest then crosses under the antero-superior iliac spine and courses medially over a further 2 cm. The Smith–Petersen approach is then performed: the gap between the tensor fasciae latae and sartorius is identified, and the incision is kept within the fascia of the tensor fasciae latae (Fig. 1). The lateral femoral cutaneous nerve should not be identified, as it is within a protective sheath. This gap leads to the rectus femoris and is temporarily packed with a gauze pad. The wing of the ilium (lateral iliac fossa) is exposed subperiosteally after detaching the tensor fasciae latae anteriorly. The capsule is exposed gradually by retracting the gluteal muscles (Fig. 2). This step is challenging as the approach should be extended posteriorly along a sufficient distance to ensure full exposure of the capsule, in order to facilitate its re-tensioning. The rectus femoris tendon is dissected, divided, and gently retracted downwards. The iliopsoas muscle, which then becomes visible outside the field, is isolated circumferentially and divided as distally as possible, ideally at the white/red junction. Caution requires that the femoral nerve be visualised. Thus, the antero-inferior capsule can be fully exposed. This step is mandatory before the capsulotomy. Careful exposure of the capsule is best achieved using a rasp and, in some cases, a scalpel.