JOINT PRESERVATION: AVOIDING ARTHROPLASTY

Hip dysplasia in the young adult
AN OSTEOTOMY SOLUTION

The treatment of hip dysplasia should be customised for patients individually based on radiographic findings, patient age, and the patient’s overall articular cartilage status. In many patients, restoration of hip anatomy as close to normal as possible with a PAO is the treatment of choice.

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Primary hip osteoarthritis (OA) is extremely rare. Up to 90% of young patients (< 50 years of age) that develop OA of the hip have an underlying structural problem, which in half of the cases is hip dysplasia. If untreated, hip dysplasia can lead to end stage hip OA eventually requiring total hip replacement (THR). THR secondary to hip dysplasia is relatively rare when compared with the other aetiologies of hip arthritis. The European Joint Registries report an incidence of THR for hip dysplasia of between 1.8% to 8.6%, while a review of the Mayo Clinic joint registry of over 31 000 THRs implanted between 1969 and 2010 showed our incidence to be 7%.

In contrast to femoroacetabular impingement (FAI) where the movement of the hip joint results in damage, in the dysplastic hip, it is the altered hip structure that leads to abnormal loading of the joint and which subsequently suffers static damage. The femoral and acetabular structural abnormalities seen in the dysplastic hip lead to a decrease in the contact area between the femoral head and the acetabulum. This in turn increases the contact stresses around the superolateral aspect of the hip joint, resulting in labral tearing, and ultimately cartilage attrition.

If untreated, end-stage hip OA will follow, and the severity of the hip dysplasia will determine how soon OA will develop (Fig. 1). In their study of 286 patients who underwent a THR secondary to hip dysplasia, Murphy, Ganz and Müller found that the contralateral hip only went on to suffer severe OA if it too showed features consistent with hip dysplasia.

Of the initial cohort of 286 patients, 115 went on to suffer severe OA in the contralateral hip and all of these patients showed radiological evidence of dysplasia in both hips. Similarly, none of the hips that remained free of severe OA by age 65 had a lateral center-edge (LCE) angle < 16°, a Tönnis roof angle > 15° and femoral head uncovering > 31%.

Why joint preservation?

Despite the optimism of modern bearing surfaces including the development of highly cross-linked polyethylene, THR should still be discouraged in the young patient. Alternative surgical options do exist and many young patients with symptomatic hip dysplasia, in the absence of OA, may benefit from a joint preservation procedure such as arthroscopy in selected patients or, more commonly, pelvic osteotomy.

Alternatives

The treatment algorithm for patients with hip dysplasia depends on age, cartilage status and the severity of dysplasia. Asymptomatic patients would benefit from non-operative treatment and follow-up with serial radiographs but if symptoms develop, then prompt referral for surgery may be warranted.

Patients with mild hip dysplasia (LCE between 18° and 25°) and traumatic labral pathology may benefit from arthroscopy and labral repair. Nevertheless, this is a rare scenario and this form of management should not be used as the mainstay of treatment. Patients with a
lateral centre-edge of > 25° and degenerative labral pathology should not be treated this way, as labral debridement or resection can lead to accelerated progression of OA (Fig. 2).³

The goal of treatment in symptomatic patients who have acetabular structural changes consistent with hip dysplasia, but with preserved articular cartilage, should be the restoration of hip anatomy as close to normal as possible. To achieve this, the Bernese peri-acetabular osteotomy (PAO)⁶ is the preferred technique in many centres in North America and Europe because of its balance between minimal exposure, complications, and ability to provide optimal correction.

The advantages of the PAO are manifold.⁹ First, it can be performed through one incision without violation of the abductors, thus enhancing recovery. The osteotomy also preserves the posterior column of the acetabulum and therefore allows early weight-bearing post-operatively. Secondly, the pelvic ring and outlet are not disrupted, which can be important for women of childbearing age. Thirdly, because the sacrospinous ligaments are not attached to the fragment created by the osteotomy, it may be positioned so that correction of the deformity can be accomplished in multiple planes by displacing the fragment medially, laterally and anteriorly as needed.¹⁰ Finally, a capsulotomy can
Indications and contraindications for PAO
The ideal patient for reconstructive osteotomy is a patient < 40 years of age who has a Tönnis grade of 0 or 1,12 a poorly covered femoral head but where congruency between the acetabulum and femoral head is possible, no arthritis, and is not obese (BMI < 30 kg/m²). Conversely, patients who are better candidates for non-operative treatment or THR are patients > 40 years of age who present with joint space narrowing, a supra-acetabular cyst visible on x-ray or MRI, or when congruency between the femoral head and acetabulum cannot be achieved after correction due to severe acetabular or femoral head deformity. A relative contraindication is the obese patient with a BMI > 30 kg/m².

The correction obtained by PAO, improving lateral correction, medialisation of the joint, and appropriate version, leads to better distribution of forces across the hip joint, protecting the acetabular labrum and preventing articular cartilage damage as long as the pre-operative cartilage damage was not severe (Fig. 3).

Outcomes
The results of PAO have been reported in many papers (Table I). They all report similar improvements in pain, functional scores, and in radiological coverage of the femoral head. Despite this, none have shown significant improvements in the range of hip movement and there is a
decrease in the range of movement post-operatively. The longest follow-up of PAO to date shows a survivorship, defined as not yet requiring THR or arthrodesis, of 60% at 20 years (Fig. 4).13 Nevertheless, this series may underestimate the success of the PAO as it included a variety of patients with a multitude of diagnoses, some of whom may not have been candidates for a PAO today.

There have been several refinements to the PAO technique in recent years in the hope of obtaining better post-operative range of motion, improvements in function and even longer lasting results. These include: precise correction of the fragment in all planes, with special attention to the avoidance of retroversion and improved lateral coverage through medialisation of centre of rotation; adjunctive femoral head neck junction chondroplasty to improve range of motion and avoid impingement14; and adjunctive management of the labral pathology, either arthroscopically or through open surgery.15

Conclusion

Symptomatic hip dysplasia can be a major source of pain and dysfunction in the young patient. If untreated, it will inevitably lead to articular damage and hip OA.

The treatment of hip dysplasia should be customised for each patient based on radiological findings, their age, and their overall articular cartilage status. In many of these patients, restoration of their hip anatomy as close to normal as possible with a PAO is the treatment of choice.

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References


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