

FEMOROACETABULAR IMPINGEMENT AND PRINCIPLES IN ITS MANAGEMENT

Agrawal A.C.*

Saraf K.K.**

Kalia R.B.***

Femoroacetabular impingement (FAI) is an increasingly recognized cause of hip pain. It is defined as a pathologic mechanical process by which morphologic abnormalities of the acetabulum and/or femur combined with vigorous hip motion lead to repetitive collisions that damage the soft-tissue structures within the joint itself. Based on cross-sectional studies in which FAI morphology was studied before the presence of radiographic osteoarthritis (OA), and on prevalence studies in younger, asymptomatic persons, it is clear that FAI and its morphologic risk factors are common in young adult hips and predispose to the later development of OA. Longitudinal studies support the assertion that, in middle-aged adults, the presence of cam deformities at baseline substantially increases the risk of developing OA and the need for total hip arthroplasty (Fig. 1 and 2).

Management of femoroacetabular impingement is both conservative and operative. Surgical management of femoroacetabular impingement (FAI) is indicated after the trial of nonsurgical treatment. The surgical planning is done to assess the labrochondral pathology as well as of the acetabular and proximal femoral bony deformity. Advanced articular cartilage disease generally is associated with poorer outcomes. Surgical hip dislocation and hip arthroscopy have been used, with favorable early outcomes and low complication rates. The early outcomes of both open and arthroscopic surgical techniques demonstrate significant improvement in most

patients, with relatively low rates of complications. Because poorer clinical outcomes are associated with more advanced articular cartilage degeneration, improved strategies for the earlier identification and disease staging may enhance the long-term outcomes of both nonsurgical and surgical management.

NONSURGICAL MANAGEMENT

Limited information exists regarding nonsurgical management of symptomatic femoroacetabular impingement (FAI).^{1,2} Like the initial management of many musculoskeletal disorders, the management of symptomatic FAI can begin with a period of relative rest and a trial of a nonsteroidal anti-inflammatory drug. Therapeutic exercise is used commonly, and an understanding of the implications of the structural deformity on range of motion and muscle activation is important. Hip range of motion improvement should not be a goal of treatment. Initially geared toward symptom reduction, treatment can include avoiding positions during activities that provoke symptoms. Next, correcting movement impairments is addressed within the limits of pain. This can include a wide variety of methods, such as the correction of muscle-length deficits, concentric and eccentric strengthening, manual techniques to assist muscle activation, and neuromuscular retraining. Once the movement impairments are corrected or improving, progression to strengthening in the planes of motion that mirror the activities included in the goals of the individual

* Prof. & HOD Orthopaedics
AIIMS, Raipur CG
** Associate Professor,
Orthopaedics, Peoples Medical College, Bhopal MP
*** Associate Professor,
Orthopaedics, AIIMS, Raipur CG

Address for correspondence:
Prof. A.C. Agrawal,
603, Type V A,
AIIMS, Residential Complex,
Kabir Nagar, Raipur, C.G-49209

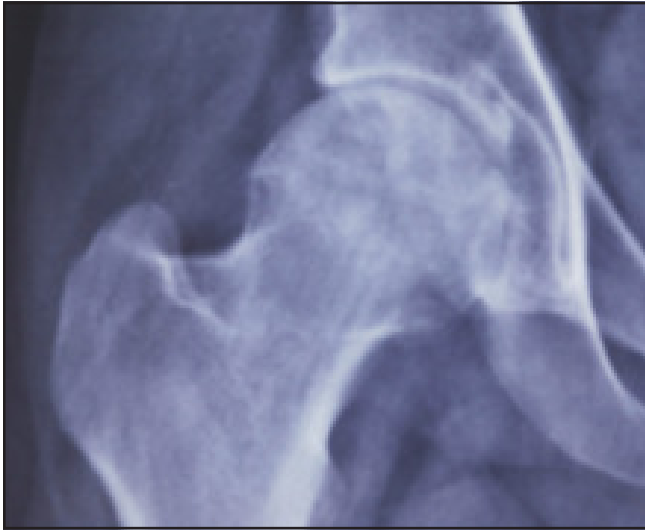


Figure 1 : Xray pelvis with both hips showing combined CAM and Pincer femoroacetabular impingement



Figure 2 : Xray lateral view of right hip joint showing femoroacetabular impingement and intraarticular erosion produced by it

patient's treatment is prescribed and later advanced to a maintenance home program. Prior to release from care, the patient should review with the healthcare provider a timeline for return to work, exercise, and sports activities.

SURGICAL MANAGEMENT

SURGICAL PLANNING

The surgical management of symptomatic FAI is performed to address the labrochondral pathology and the underlying bony deformity.³ This requires intervention in the central compartment (ie, acetabular rim, labrum, acetabular cartilage) and the peripheral compartment (ie, the femoral head-neck junction). Open surgical dislocation of the hip was the initial description of the management of FAI by Ganz et al,⁴ and arthroscopic techniques have gained rapidly in popularity.⁵ The choice of surgical approach is influenced significantly by patient characteristics, disease patterns, and surgeon preference.

The location, extent, and severity of cam deformity have important implications for the ease

of arthroscopic access to the lesion. Deformity extending posterior to the lateral retinacular vessels, which course across the posterolateral femoral head-neck junction,⁶ generally is not accessible arthroscopically by most surgeons and may be more amenable to open treatment. More complex proximal femoral deformities, such as residual Legg-Calvé-Perthes disease, can be managed more precisely with open surgical dislocation. The additional development of a retinacular soft-tissue flap adds further treatment options, such as relative neck lengthening, true neck osteotomies, and trimming or transposition of the greater and lesser trochanter.⁷

Similarly, the type of pincer deformity should be characterized, when present, including the degree of retroversion or global overcoverage. Severe retroversion with deficient posterior coverage, including a positive crossover sign and a posterior wall sign, may be treated best with an anteverting periacetabular osteotomy (PAO),⁸ with an additional femoral head-neck osteoplasty in most cases. A positive crossover sign in the presence of a negative posterior wall sign (ie, normal posterior coverage) indicates focal

anterosuperior overcoverage and generally can be treated with acetabular rim trimming, with labral takedown and refixation. Management of the acetabular deformity in these patients generally can be performed open or arthroscopically. The amount of lateral and anterior coverage should be noted using preoperative AP pelvis and false-profile radiographs to avoid causing iatrogenic instability by creating a dysplastic acetabulum. Postoperative subluxation and dislocation have been reported after acetabular rim trimming⁹ and may be catastrophic. Hips with global acetabular overcoverage may have acetabular protrusion or lateral center-edge angles $>40^\circ$.^{10,11} Global overcoverage generally has been managed with open surgical dislocation, although less severe cases may be amenable to arthroscopic treatment. Inadequate correction of the underlying deformity remains a common cause of failure after hip arthroscopy^{12,13} and open techniques.¹⁴

SURGICAL DISLOCATION

Ganz et al⁴ developed the technique that enabled the safe surgical dislocation of the hip based on a detailed understanding of the vascular supply of the femoral head. This technique protects the vascular supply from the medial circumflex femoral artery and its lateral retinacular branches. A digastric trochanteric osteotomy is performed, preserving the attachments of the gluteus medius muscle and the vastus lateralis muscle. The trochanteric fragment is mobilized anteriorly, and the hip is dislocated anteriorly, allowing circumferential access to the acetabulum and proximal femur.

HIP ARTHROSCOPY

Hip arthroscopy was introduced into clinical practice in the late 1970s, before the recognition of FAI, and commonly was used to manage labral tears and other intra-articular pathology. Since the recognition of FAI, hip arthroscopy has been used routinely to address proximal femoral and acetabular bony deformity in addition to labrochondral pathology.

ARTHROSCOPIC AND LIMITED OPEN COMBINED APPROACHES

Limited anterior exposures have been used to access the peripheral compartment and address the cam deformity and anterolateral acetabular rim. Although the approach provides excellent visualization of the anterolateral femoral head-neck junction, acetabular visualization is limited to the anterior rim. Limited open exposures can be combined with arthroscopic access to address the central compartment. Early outcomes of combined hip arthroscopy and limited open osteoplasty generally are similar to those of hip arthroscopy.¹⁴⁻¹⁷

The limited open approach can be complicated by injury to the lateral femoral cutaneous nerve. Other complications generally are similar to those of arthroscopic surgery.

ANTEVERSION PERIACETABULAR OSTEOTOMY

Some patients with major acetabular retroversion may be best treated with an anteversion (ie, reverse) PAO.⁸ Severe retroversion generally is indicated by the presence of a large crossover sign (ie, retroversion index $>50\%$) and a positive posterior wall sign, indicating deficient posterior coverage, on an AP pelvis radiograph with appropriate pelvic tilt and rotation. A prominent ischial spine sign also is noted and together with the posterior wall and crossover signs indicates the relative deformity of the entire hemipelvis. Anteversion PAO allows reorientation of the acetabular surface to eliminate retroversion and restore normal posterior coverage. Coexistence of a cam-type deformity also should be noted and can be addressed through an arthrotomy at the time of PAO.

HIP INSTABILITY

Case reports of iatrogenic instability after hip arthroscopy highlight two areas that are poorly understood. First, FAI deformities are common in association with acetabular and/or femoral

dysplasia, but arthroscopic surgery without correction of the underlying dysplasia can be associated with poor clinical results from persistent structural instability.¹⁸ Second, patients with capsular laxity and/or surgical compromise of the capsule during exposure of the peripheral component may be at risk for persistent symptoms from capsular incompetency. Some surgeons feel that subtle instability may occur postoperatively, potentially contributing to a prolonged recovery and possibly negatively influencing the outcome. As a result, some surgeons repair the arthroscopic capsulotomies;¹⁹ however, this approach has not been uniformly adopted.

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