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Debridement of the Adult Hip for Femoroacetabular Impingement

Indications and Preliminary Clinical Results

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Untreated femoro-acetabular impingement is a common cause of osteoarthrosis of the hip. Surgical debridement of the adult hip with femoro-acetabular impingement recently has been advocated with the aim of relieving symptoms and slowing or halting progression of the arthrosis. At surgery, femoral sources of impingement are relieved by debriding the aspheric peripheral portion of the femoral head and the adjacent femoral neck. Acetabular sources of impingement can be relieved by debridement of the anterior rim. The most fundamental questions concerning these procedures relate to the preoperative and postoperative function, postoperative survivorship of these hips and the incidence of osteonecrosis. The current study assesses a group of 23 hips in 23 patients treated by surgical debridement for impingement. Twenty-two patients were treated by full surgical dislocation and one patient was treated by relief of impingement without dislocation. Followup ranged from a minimum of 2 years to 12 years. At most recent evaluation, seven patients had been converted to total hip arthroplasty, one had arthroscopic debridement of a recurrent labral tear, and 15 patients have had no further surgery. No hips developed osteonecrosis. Of the seven patients who had to have their procedure converted to total hip arthroplasty, three of these hips failed early and four patients' hips recovered and functioned well and subsequently deteriorated with total hip arthroplasty done between 6.4 and 9.5 years after debridement. Hips at greatest risk of failure have advanced arthrosis or a combination of impingement and instability preoperatively. The procedure effectively treats hips with impingement and without considerable secondary arthrosis or instability.

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Femoroacetabular impingement is the most common cause of end-stage osteoarthrosis of the hip in young men and a common cause of osteoarthrosis in young women.[17] Commonly, the hip develops impingement from femoral (so-called cam impingement) or acetabular deformities (pincer impingement) or both, in the absence of overt pediatric hip disease.[8]

Acetabular sources of impingement include coxa profunda and acetabular retroversion.[18,21,24] Acetabular retroversion can be diagnosed on an AP radiograph of the pelvis by noting that the femoral head is covered more by the anterior rim than by the posterior rim.[21] Excessive anterior coverage can be diagnosed on the false-profile view.

The femoral cause of impingement consists primarily of posterior placement of the femoral head on the femoral neck with inadequate anterior head-neck offset, leading to impingement in flexion and internal rotation.[11,20] This finding can be seen on true or frog lateral radiographs.[4] Asphericity of the femoral head laterally can similarly lead to impingement in abduction. Impingement can also an be caused by Legg-Calvé-Perthes disease, slipped capital femoral epiphysis[12] or by posttraumatic deformities.[5] Whereas the etiology of the primary femoral sources of impingement has not been firmly established, abnormal separation of the proximal femoral epiphysis into the capital epiphysis and the trochanteric apophysis has been suggested.[25,26]

In the current study the indications, surgical techniques, and results of a series of patients treated for impingement are reported.

MATERIALS AND METHODS

Twenty-three hips in twenty-three patients treated by debridement for relief of impingement were observed for a minimum of 2 years postoperatively. There were 10 patients with isolated cam type impingement, one with isolated pincer impingement and 12 with combined pathomorphology. Twenty-two of the 23 hips were treated by full surgical dislocation. One hip was treated by relief of impingement without dislocation. Diagnoses included primary femoroacetabular impingement in 12 hips, previous trauma in four hips, a combination of dysplasia and impingement in four hips, slipped capital femoral epiphysis in one hip, impingement secondary to osteochondromatosis in one hip, and Legg-Calvé-Perthes disease in one hip. The previous trauma included two hips with traumatic subluxation, one hip with a Pipkin fracture malunion, and one hip with a femoral neck fracture. Patients were evaluated clinically and radiographically by a single examiner for evidence of impingement and secondary osteoarthrosis. Patients answered a questionnaire about the presence or absence of pain, use of pain medications, ability to perform activities of daily living, and their functional status at each preoperative and postoperative visit. Preoperative and postoperative Merle D'Aubigné scores were calculated for each patient.

The presence of femoro-acetabular impingement was diagnosed on the basis of the clinical examination and on the plain radiographs. Patients were examined for signs of anterior impingement by stressing the hip in full flexion and internal rotation, for signs of posterior impingement in hyperextension and external rotation, and for lateral impingement in abduction. Radiographically, signs of pincer impingement caused by excessive acetabular coverage or acetabular retroversion were assessed by identifying the anterior rim on the false profile view or by the configuration of the anterior and posterior rim on the AP pelvis view. Signs of cam impingement caused by anterior femoral deformity was assessed on Lauenstein lateral and false profile radiographs.[4] Cam impingement caused by lateral femoral deformity was assessed on the AP radiographs. Further assessment occasionally included dynamic fluoroscopic AP and lateral examinations or computerized tomography imaging. Preoperative grade of osteoarthritis was staged according to Tönnis.[29]

In addition to surgical dislocation and debridement, three hips were treated by intertrochanteric osteotomy and four hips were treated by periacetabular osteotomy because of deformities or instability present in addition to the impingement. Thirteen of the patients were men and 10 of the patients were women. Patients had a mean age of 35.4 ± 9.5 years (range, 17.3–54.0 years). Mean followup was 5.2 ± 2.9 years (range, 2.0–12.0 years).

The hip exposure was done using the direct lateral exposure in 14 hips, the trochanteric slide exposure in six hips,[7,22] the iliofemoral exposure in two hips, and combined iliofemoral and direct lateral exposures in one hip. The specific technique of the trochanteric slide exposure has been previously described.[7,22] The important difference between the exposure used for total hip arthroplasty and that for surgical dislocation is that the branches of the medial circumflex vessel are preserved and the capsule is opened on the acetabular side with the aim of preserving blood supply to the femoral head.[9,19,23,30,32] The direct lateral exposure also differs from the exposures used for total hip arthroplasty[3] in that the abductors are developed separately from the capsule and, as with the trochanteric slide exposure, the capsule is opened along the acetabular rim and down the psoas sheath.

The trochanteric slide exposure was chosen for hips with extensive impingement that included posterior-inferior acetabular impingement. The direct lateral exposure was chosen for hips in which less exposure of the posterior-inferior acetabulum was required. The iliofemoral exposure was chosen for hips with pure anterior femoroacetabular impingement.

With the hip capsule open, the position of the femoroacetabular impingement was noted. The hip then was dislocated and the aspherical and osteophytic peripheral portions of the femoral head were debrided (Fig 1), taking care to preserve the lateral epiphyseal branches of the medial circumflex artery.[9] Where necessary, acetabular sources of impingement, typically in the anterior ½ of the acetabular rim, also then were debrided.[8,13] Areas of exposed bone on the remaining articular surfaces were treated with drilling or the microfracture technique.[2,27] The hip

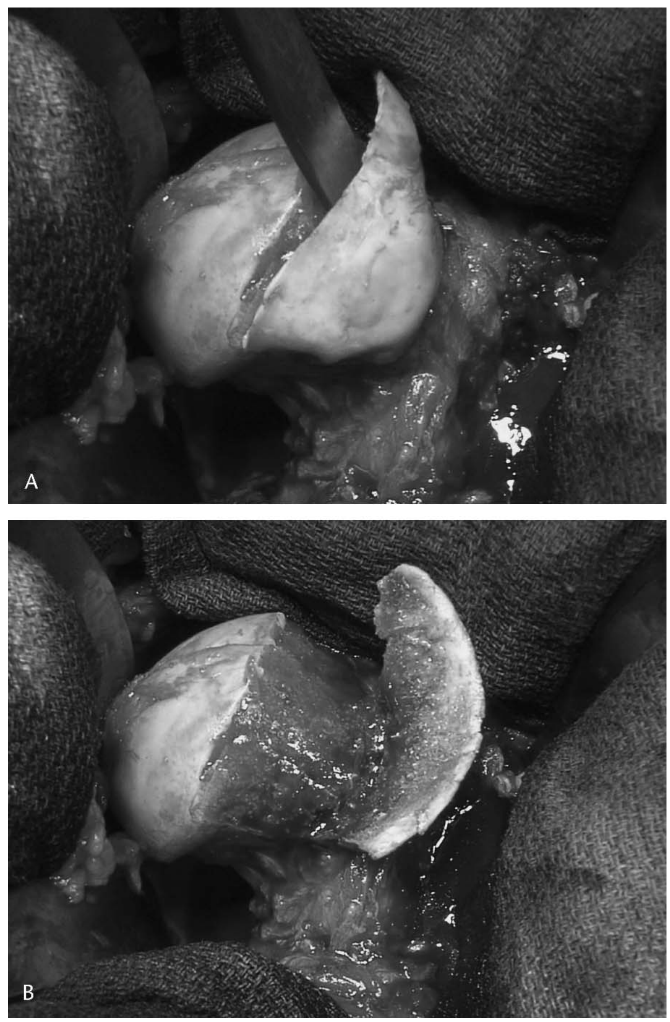

Fig 1A–B. (A) The aspherical portion of the femoral head neck offset of a patient with residual Legg-Calve-Perthes deformity is shown. (B) Debridement of this bony prominence ensures an impingement-free range of motion and can successfully relieve clinical symptoms.

was then reduced and carried through a range of motion to confirm relief of impingement. Postoperatively, the patients were treated by 50% weightbearing for 6 weeks with the exception of the periacetabular osteotomy patients who were treated by 25% weight bearing for 6 weeks and 50% weight bearing for 3 weeks. In clinical followup, failure was defined by revision to prosthetic hip replacement.

Statistical Analysis

Differences between the preoperative and postoperative Merle d'Aubigné score were calculated with the Wilcoxon rank sum test.

RESULTS

Of the twenty-three hips, 15 hips have continued to function well without further surgery (Fig 2), one had hip arthroscopy for a recurrent torn acetabular labrum, and 7 were converted to total hip arthroplasty. Preoperatively, clinical assessment showed hip scores by the Merle d'Aubigné scale averaged 13.2 ± 1.5 (range, 11–15). Radiographically, seven patients showed no radiographic signs of osteoarthritis. Four had Grade 1, one Grade 2 and three had Grade 3 osteoarthritis. Of the surviving 15 hips, the hip scores improved significantly to 16.9 ± 1.35 (range, 13–18) at the time of the last followup ($p < 0.0001$).

Of the seven patients that were converted to total hip arthroplasty, three patients did not improve after surgery and four patients improved, functioned well, and subsequently deteriorated with conversion to total hip replacement at between 6.4 years and 9.5 years after debridement. Of the three early failures, all three had risk factors in addition to impingement. One had circumferential osteophyte formation causing extrusion of the femoral head and two had residual untreated acetabular dysplasia. None of the patients with a combination of impingement and dysplasia that had treatment by debridement and periacetabular osteotomy have failed. All four patients that eventually failed had grade 2 or grade 3 osteoarthritis preoperatively. There were no cases of osteonecrosis or trochanteric nonunion.

DISCUSSION

The current study shows that debridement of the adult hip for relief of impingement can be safe and effective in carefully selected patients. Debridement with full surgical dislocation of the hip has not been frequently done for reconstructive problems because of the risk of iatrogenic osteonecrosis.[1,6,10,14,28,28,31] The current study confirms previous studies that show that full dislocation of the hip can be safely done if the primary blood supply to the femoral head is respected.[7,9,19] The clinical results of the current study also shows that hips at highest risk for failure are hips with impingement and another risk factor such as untreated dysplasia or subluxation caused by osteophytes.

If these complex hips are to be salvaged, these failures suggest that relief of the impingement and stabilization of the joint should be done simultaneously. This finding is further supported by the successful treatment of impingement and dysplasia by simultaneous debridement and periacetabular osteotomy.

The current study relied on plain radiographs as the primary method of imaging. Because the typical location for early osteoarthrosis in these patients is in the anterosuperior portion of the joint, the early degenerative changes are not visible on plain radiographs. Magnetic resonance arthrography has been shown to identify the

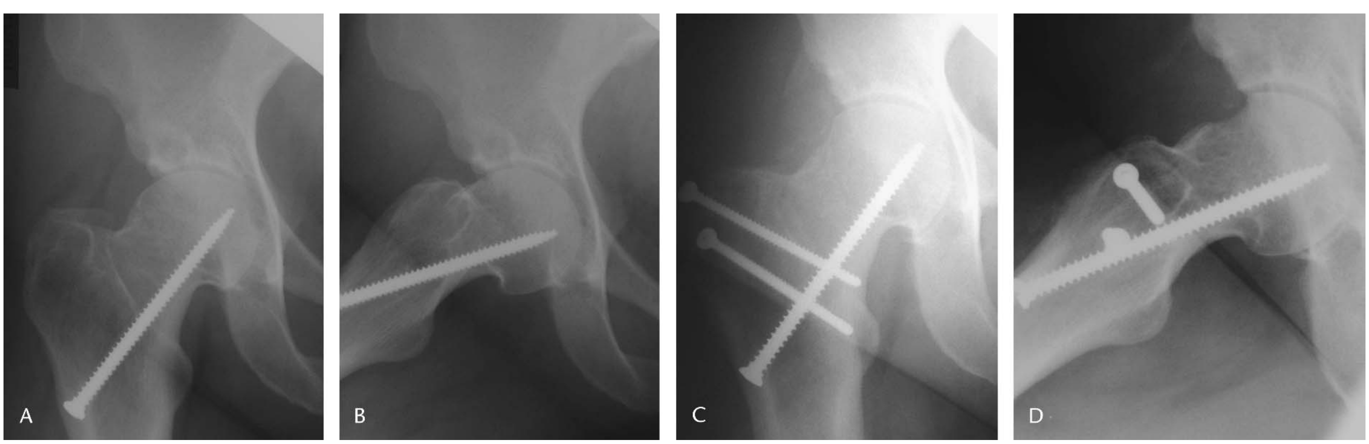

Fig 2A–D. (A) Preoperative AP and (B) lateral radiographs show a 41-year-old woman with a history of slipped capital femoral epiphysis. (C) Postoperative AP and (D) lateral radiographs at 69 months after debridement show preservation of the joint. The (D) lateral radiograph also shows restoration of anterior head-neck offset on the lateral view.

intra-articular pathology with greater sensitivity than plain radiographs and should be considered during the preoperative evaluation.[15,16]

This study is limited by the small number of patients and the heterogeneity of the patient population. Although it may be reasonable to expect that cases of pure femoroacetabular impingement in the absence of trauma, asphericity, instability, or secondary arthrosis will have the best prognosis after surgery, this small group is insufficient to allow those assumptions to be statistically proven.

Recommending surgical treatment for impingement often is difficult. Many of these hips are nearly painless until considerable, irreversible changes have already affected the joint. Recommending extensive surgery before irreversible damage has occurred can be difficult because most of these hips function well, with few symptoms at the early stage of deterioration. More limited methods of relieving impingement, such as smaller iliofemoral exposures or even arthroscopic debridement, may have a role in facilitating recovery. Less extensive methods though, have an increased risk of inadequately assessing and treating the problem. Our current experience shows that surgical debridement can relieve impingement and improve function without causing osteonecrosis of the hip.

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