Arthroscopic Debridement Versus Refixation of the Acetabular Labrum Associated With Femoroacetabular Impingement

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Purpose: The purpose of this study was to compare the outcomes of arthroscopic labral debridement with those of labral refixation. Methods: We reviewed patients who underwent labral debridement during a period before the development of labral repair techniques. Patients with labral tears deemed repairable with our current arthroscopic technique were compared with patients who underwent labral refixation with a minimum of 1 year of follow-up. To better match the 2 groups, only patients with labral pathology caused by pincer-type or combined pincer- and cam-type femoroacetabular impingement were included. In the first 36 hips the labrum was debrided (group 1); in the next 39 hips the labrum underwent refixation (group 2). Outcomes were measured preoperatively and postoperatively with the modified Harris Hip Score (HHS), Short Form 12, and visual analog scale for pain. Preoperative and postoperative radiographs were obtained to evaluate bony resection (α angle) and osteoarthritis (Tönnis grade). Results: The mean age was 31 years in group 1, with a mean follow-up of 21.4 months, and 27 years in group 2, with a mean follow-up of 16.5 months. Preoperative subjective outcomes scores were not significantly different between groups. At the 1-year follow-up visit, subjective outcomes were significantly improved (P < .01) in both groups. HHSs were significantly better for the refixation group (94.3) compared with the debridement group (88.9) at 1 year (P = .029). At most recent follow-up, good to excellent results were noted in 66.7% of hips in the debridement group compared with 89.7% of hips in the refixation group (P < .01). Conclusions: Although other variables could have influenced these outcomes, these preliminary results indicate that labral refixation resulted in better HHS outcomes and a greater percentage of good to excellent results compared with the results of labral debridement in an earlier cohort. Level of Evidence: Level III, retrospective comparative study. Key Words: Hip arthroscopy—Femoroacetabular impingement—Hip—Hip labral tears.

There has been increased interest in preserving the labrum during hip joint–related procedures.1–4 There is no evidence to date that supports superior clinical outcomes with labral refixation compared with labral debridement in the setting of arthroscopic treatment of femoroacetabular impingement (FAI). Clinical, biomechanical, and finite-element model studies suggest that the acetabular labrum may have an importance in maintaining hip joint integrity.5,6 A previous study comparing labral refixation versus excision as part of an open joint preservation procedure for FAI showed improved outcomes and fewer radiographic degenerative changes with labral refixation at early follow-up.1 There have been no studies looking at arthroscopic labral debridement versus labral refixation. The purpose of this study was to evaluate the outcomes of arthroscopic labral debridement versus labral refixation. Our hypothesis was that preservation of the labrum would lead to improved outcomes when compared with debridement in the setting of arthroscopic treatment of FAI.
METHODS

Arthroscopic treatment of pincer-type FAI has been performed at our institution since November 2004. Initially, this consisted of simple labral debridement and trimming of the acetabular rim. Beginning in June 2006, we began trimming the rim by takedown of the labrum with refixation in select cases. The indications for acetabular rim trimming included a combination of radiographic and intraoperative findings consistent with pincer impingement. Radiographic findings consistent with pincer impingement included relative acetabular retroversion (crossover sign, prominent ischial spines), os acetabuli or acetabular rim fractures, coxa profunda, protrusio acetabuli, and a pincer divot at a normal femoral head-neck junction. Intraoperative findings consistent with pincer impingement included peripheral labral ecchymosis, labral flattening, areas of intralabral cystic changes, ossification or calcification, os acetabuli, posterior acetabular linear chondral wear, a linear groove or pincer divot at the femoral head-neck junction, and extension of the peripheral acetabulum well beyond (>5 mm) the labrochondral junction. Indications for labral refixation included a hip with pincer-type or combined pincer- and cam-type impingement, labral pathology, and an adequate amount of relatively healthy labral tissue available for refixation. An ideal labrum for refixation lacked significant intrasubstance degeneration, calcification, ossification, or complex tearing and was typically located anterosuperior. Most posterior labral lesions include significant labral ossification and are not considered to be ideal for labral takedown and refixation in most cases. To compare the results of this method, we retrospectively reviewed the operative reports, intraoperative images, and preoperative imaging studies of patients treated before the development of this technique to identify those treated with labral debridement who would have fulfilled the current criteria for labral refixation. Management of labral lesions with associated pincer-type impingement requires a degree of labral takedown or detachment to resect the prominent acetabular rim. Labral lesions associated with isolated cam-type impingement do not necessarily require a formal takedown. Therefore only labral lesions due to pincer-type or combined pincer- and cam-type FAI were included for the purposes of providing better-matched groups with respect to labral management techniques.

The inclusion criteria in the debridement group included radiographic and intraoperative findings consistent with pincer-type or combined pincer- and cam-type impingement and subsequent arthroscopic labral debridement and management of FAI before the development of labral refixation techniques. All patients included in the study had magnetic resonance imaging, plain radiographs, detailed operative notes, and intraoperative images showing that a relatively healthy portion of the labrum was available for refixation without complex tearing, intralabral ossification, or calcification. Additional inclusion criteria included minimal to no radiographic degenerative changes and minimum of 1 year of follow-up. The inclusion criteria for the refixation group included labral refixation with radiographic and intraoperative findings consistent with pincer-type or combined pincer- and cam-type FAI and a minimum of 1 year of follow-up. Over the study period (November 2004 to July 2007), 149 hips (143 patients) with minimal to no radiographic degenerative changes underwent arthroscopic treatment of FAI. A total of 75 hips (69 patients) were identified that fulfilled the previously mentioned criteria and had achieved 1 year of follow-up. All patients who fulfilled the inclusion criteria were included in the study.

Before the development of labral refixation techniques at our institution (November 2004 to June 2006), 75 hips (73 patients) underwent arthroscopic treatment of FAI. Of these hips, 36 (34 patients) that underwent labral debridement met the inclusion criteria (group 1). There were 25 male patients and 9 female patients with a mean age of 31 years (range, 16 to 57 years). The mean follow-up was 21.4 months (range, 12 to 36 months; standard deviation [SD], 9.1 months). The preoperative diagnosis was isolated pincer impingement in 6 hips and combined pincer and cam impingement in 30 hips. Preoperative radiographs showed Tönnis grade 0 changes in 26 hips, grade 1 changes in 8, and grade 2 changes in 2.

After the development of labral refixation techniques (June 2006 to July 2007), 74 hips (72 patients) underwent arthroscopic treatment of FAI. Of these hips, 39 (37 patients) underwent labral refixation and met the inclusion criteria (group 2). There were 23 male patients and 14 female patients with a mean age of 27 years (range, 16 to 56 years). The mean follow-up was 16.5 months (range, 12 to 24 months; SD, 5.6 months). The preoperative diagnosis was isolated pincer impingement in 6 hips and combined cam and pincer impingement in 33 hips. Preoperative radiographs showed Tönnis grade 0 changes in 30 hips, grade 1 changes in 8, and grade 2 changes in 1.

Anteroposterior (AP) radiographs with the coccyx centered over the pubic symphysis and 0 to 2 cm of
distance between these 2 structures, frog lateral plain radiographs, and cross-table lateral plain radiographs with 15° of internal rotation were obtained in all patients preoperatively, at their initial postoperative visit, and yearly thereafter. In all patients a magnetic resonance imaging arthrogram was obtained with gadolinium. An anesthetic injection (0.25% bupivacaine) was typically included to verify the hip joint proper as the source of pain. Three-dimensional computed tomography reconstruction was obtained to better evaluate acetabular version, labral ossification, locations of os acetabuli, and patterns of cam lesions in selected patients.

This technique of arthroscopic treatment of FAI has been described previously. Correction of the pincer lesion was performed with fluoroscopic guidance. The amount of rim resection was based on preoperative radiographs, center-edge angles, and intraoperative assessment of rim prominence (Figs 1 and 2). Associated cam impingement, present in 63 cases, was also addressed (Figs 1 and 2). The extent of bone removed on the femoral side was based on preoperative assessment of α angles on AP and lateral radiographs, as well as intraoperative assessment of α angles on AP and lateral radiographs imaging with maximal internal, neutral, and external rotation. Intraoperative assessment of impingement was also performed through direct arthroscopic visualization of the hip in maximal flexion, internal and external rotation, adduction, and abduction.

The senior author performed all surgical procedures with the patient in the supine position using anterior peritrochanteric and anterior portals. Rarely, a posterior peritrochanteric portal was made for posterior rim trimming in patients with coxa profunda or posterior overcoverage (or both). In group 1 rim trimming was performed after the labrum was debrided along the area of pincer impingement leaving the remainder of the labrum intact (Fig 3). In group 2 labral refixation was performed with a mean of 2.4 suture anchors (range, 2 to 6 anchors) after acetabular rim trimming was performed based on the degree of pincer impingement (Fig 4).

Postoperative rehabilitation was guided according to the specifics of the procedure. Patients who underwent simple debridement were allowed to bear weight as tolerated with crutches as needed. Patients undergoing labral refixation were restricted to toe-touch.
weight bearing for 2 weeks with range of motion encouraged but avoiding extremes of external rotation. Patients who underwent microfracture in either group were restricted to toe-touch weight bearing for 6 to 8 weeks.

Outcomes for both groups were prospectively measured with the modified Harris Hip Score (HHS), Short Form 12 (SF-12) scoring, and visual analog scale (VAS) for pain preoperatively and postoperatively at 6 weeks, 3 months, 6 months, and yearly thereafter. For patients with cam impingement, the senior author measured all $\alpha$ angles on AP pelvis and cross-table lateral radiographs obtained preoperatively and at 2 weeks postoperatively. The senior author evaluated all preoperative and yearly radiographs for osteoarthritic changes using the Tönnis classification system. Chondromalacia was documented intraoperatively by use of a map of the femur and acetabulum. The degree of chondromalacia was graded according to the Outerbridge classification system, and the location was reported according to the zones system.

The differences between preoperative and mean latest follow-up outcomes measures were analyzed by use of paired samples $t$ tests, with $P < .05$ used to determine significance. Differences between groups were analyzed by use of independent samples $t$ tests as well as analyses of variance where appropriate. For analysis of the Tönnis grade, Mann-Whitney nonparametric $t$ tests were used. Fisher exact tests were used to determine significant differences between failure rates and percentage of good to excellent results. Finally, an a priori power analysis was performed. From our preliminary data, we estimated that a clinically significant, between-groups difference in HHS would be 6.0 with an SD in each group of 8.0. On the basis of these numbers, a large effect size of 0.75 would be yielded, and thus to obtain a power of 0.80 or higher, each group would need to include at least 29 hips.

**RESULTS**

In group 1 all patients underwent labral debridement (Fig 3). Chondromalacia was primarily noted about the anterosuperior acetabulum (zones 2 and 3) (Table 1). Grade 4 lesions were noted in 12 hips, being less than 0.5 cm in diameter in 3 hips, 0.5 to 1 cm in diameter in 2 hips, and greater than 1 cm in diameter in 7 hips. Eight full-thickness lesions were treated with microfracture. An additional 7 hips underwent debridement of ligamentum teres lesions, and one hip had a loose body.

In group 2 all patients underwent labral refixation (Fig 4). Chondromalacia was primarily noted about the anterosuperior acetabulum (zones 2 and 3) (Table 1). Grade 4 lesions were noted in 14 hips, being less than 0.5 cm in diameter in 7 hips, 0.5 to 1 cm in diameter in 2 hips, and greater than 1 cm in diameter in 5 hips. Four full-thickness lesions were treated with microfracture. An additional 3 hips underwent debridement of ligamentum teres lesions, and no hip had loose bodies.
The postoperative outcomes measures obtained most recently were significantly improved compared with preoperative measures in both groups ($P < .01$) (Figs 5-7). Modified HHSs were significantly better in the refixation group (94.3) compared with the debridement group (88.9) at the 1-year follow-up visit ($P = .029$) (Fig 5). There were no statistically significant differences between groups 1 and 2 for SF-12 and VAS pain outcomes measures at any time postoperatively (Figs 6 and 7).

At most recent follow-up, good to excellent results (HHS >80) were noted in 24 hips (66.7%) in the debridement group and 35 hips (89.7%) in the refixation group ($P < .01$). Failure was defined as an HHS of less than 70, subsequent debridement of a hip that had undergone labral refixation ($n = 1$), or conversion to total hip arthroplasty ($n = 1$). The failure rate was 11.1% (4 hips) in the debridement group compared with 7.7% (3 hips) in the refixation group ($P > .05$).

The mean decrease in α angles after femoral resection osteoplasty on AP and lateral radiographs was 19.6° and 29.4°, respectively, in the debridement group compared with 16.6° and 25.3°, respectively, in the refixation group. There were no statistically significant differences for femoral bone resection on AP ($P = .661$) or lateral ($P = .363$) radiographs or for radiographic degenerative changes ($P = .079$) over time between groups (Fig 8).

With regard to complications, heterotopic bone developed postoperatively in 3 patients in the debridement group. Two of these patients subsequently had revision hip arthroscopy and postoperative irradiation to remove symptomatic heterotopic bone. After this complication was recognized, subsequent patients were treated with naproxen (500 mg twice daily) for 3 weeks postoperatively. No patient in the repair/refixation group had heterotopic bone develop postoperatively. Two other patients in the debridement group underwent revision femoral osteochondroplasty for inadequate initial decompression. In the repair group 1 patient with a 2.5-cm full-thickness acetabular chondral defect at the time of arthroscopy underwent total hip arthroplasty at the 1-year follow-up visit. Another patient in the repair group sustained a reinjury 2 months after surgery while wake boarding. This patient was moving out of the country; revision hip arthroscopy was performed that showed the failure of 1 of the labral suture anchors. The labrum was debrided and the patient recovered uneventfully. Both of these patients in the repair group were considered failures.

### Table 1. Degree (Outerbridge Grade) and Location (Zone) of Chondromalacia Found Intraoperatively

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**NOTE.** Data are presented as number of hips. There were no statistically significant differences between groups in the degree or location of chondromalacia documented at the time of arthroscopy.

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**Figures:**

**Figure 5.** Progression analysis of HHSs showed statistically significant improvements postoperatively in both groups. There was a significantly better mean HHS at 1 year in the refixation group (black bars) compared with the debridement group (white bars) ($P = .029$), which was not noted before this time point. (Pre, preoperative.)

**Table 1.** Degree (Outerbridge Grade) and Location (Zone) of Chondromalacia Found Intraoperatively
DISCUSSION

The principal findings of this study were that labral refixation resulted in better HHSSs, a greater percentage of good to excellent results, and a trend toward fewer progressive degenerative changes at early follow-up compared with an earlier cohort of labral debridements in the setting of arthroscopic treatment of pincer-type and combined pincer- and cam-type impingement. Biomechanical and finite-element model analyses have shown that the acetabular labrum may contribute to hip joint stability, hip joint congruity, and function to distribute synovial fluid through a sealing function.5,6 In a cadaveric study it has been shown that most of the vascularity in the labrum is at the capsular side.13 This study further showed no difference in vascularity between torn and intact specimens, favoring a healing potential for labral tears in this region. In a sheep model, surgically induced labral tears were repaired with a single suture anchor, and all specimens were later found to heal by way of fibrovascular scar tissue to the capsule or underlying acetabular bone (or both).14 There are limited data indicating good short-term results and no long-term follow-up after arthroscopic labral repair/refixation in humans.3,4,15-17

There has been only 1 published study evaluating labral refixation versus debridement.1 This study was done with an open dislocation technique that is well described in the literature for management of FAI.1,18-21 FAI has become a well-recognized disorder that is associated with chondrolabral disruption and progressive degeneration of the hip joint.1,4,8,19,20,22,23 The authors of the previous study found significantly better outcomes at 1 and 2 years in the refixation group when compared with the labral excision group.1 They also found an increase in radiographic degenerative changes over the study time period (up to 2 years) with labral excision compared with labral refixation. This was a consecutive series of patients, and it may be that improvements in the latter refixation group were the result of a combination of labral preservation and improved technique for managing this disorder over time.

**FIGURE 6.** Progression analysis of SF-12 scores showed statistically significant improvements postoperatively without differences between the debridement (white bars) and refixation (black bars) groups. (Pre, preoperative.)

**FIGURE 7.** Progression analysis of VAS pain scores showed statistically significant improvements postoperatively without differences between the debridement (white bars) and refixation (black bars) groups. (Pre, preoperative.)
Our study is the first to compare the results of arthroscopic labral debridement and labral refixation. All procedures were performed by the same surgeon using the same prospectively collected outcome scoring. In addition, the cohorts were of sufficient size to detect measurable differences based on power analysis. Better HHS outcomes and a trend toward fewer degenerative changes at most recent follow-up in the refixation group compared with the debridement group are in line with the results previously published in patients treated with an open dislocation technique. It should be noted that outcomes scoring for both groups was significantly improved postoperatively without differences between groups for SF-12 and VAS pain scoring.

In the previous study the open dislocation technique involved a routine labral takedown, rim trimming, and labral refixation as part of the procedure regardless of the presence or absence of labral tearing. In our study the diagnosis of pincer-type and combined pincer- and cam-type FAI was chosen to create a more homogeneous group of patients, all of whom had evidence of labral tearing and underwent refixation of a torn or damaged labrum. Patients with isolated cam impingement, for which treatment of a torn labrum may differ, were not included in our study.

This preliminary study does have significant recognized shortcomings. Most evident are the limitations imposed by the use of a historical control. Every effort was made to properly match patients in the historical debridement group with those selected for labral refixation, but the potential bias cannot be eliminated. In addition, there is a steep learning curve for arthroscopic surgery to treat FAI. Similar to the previous study, it is possible that improvements seen in the later refixation group could be affected by improved techniques for treatment of FAI and a better understanding of this disorder over time. This is evident with 2 revision surgeries for removal of symptomatic heterotopic bone before routine use of postoperative nonsteroidal anti-inflammatory drugs, as well as 2 revision femoral osteochondroplasties for inadequate decompression in the debridement group. These variables could only be eliminated by a prospective randomized study. However, with the growing awareness of the importance of the acetabular labrum and its potential for healing, we would not be comfortable randomly assigning patients to have the labrum resected. Thus studying this historical control group remains the most practical method for evaluating this important topic.

**CONCLUSIONS**

Although other variables could have influenced the outcomes, these preliminary results indicate that labral refixation resulted in better HHS outcomes and a greater percentage of good to excellent results compared with the results of labral debridement in an earlier cohort.

**REFERENCES**


