AJSM PreView, published on August 16, 2007 as doi:10.1177/0363546507305097

Revision Hip Arthroscopy

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Background: Hip arthroscopy has become increasingly popular; however, little is known about revision hip arthroscopy.

Hypothesis: Revision hip arthroscopy is associated with unaddressed femoroacetabular impingement. The purpose of this study was to describe reasons for revision hip arthroscopy.

Study Design: Case series; Level of evidence, 4.

Methods: Between March 2005 and March 2006, 37 revision hip arthroscopies were performed by the senior author. Data were collected through retrospective review of clinical and operative notes.

Results: All patients required revision surgery because of persistent hip pain. There were 25 women and 12 men with an average age of 33 years (range, 16-53 years). The average time from prior surgery to revision was 20.5 months (range, 2.9-84 months). Common findings among patients needing revision were hip pain, decreased range of motion, and functional disability. The average modified Harris Hip Score was 53 (range, 22-99). Thirty-six patients had radiographic evidence of femoroacetabular impingement at the time of revision. Revision procedures included 34 (95%) for femoroacetabular impingement, 32 (87%) for labral lesions, 26 (70%) for a chondral defect, 23 (62%) for lysis of adhesions, and 13 (35%) for previously unaddressed instability. Two patients had total hip arthroplasty after revision, and 3 patients required further revision. Of the remaining 32 patients, early follow-up was obtained on 27 (84%) at an average of 12.7 months postoperatively (range, 6-19 months). Outcomes showed patients regained some of their lost function within the first year.

Conclusion: Patients commonly required revision hip arthroscopy because of persistent impingement.

Keywords: revision hip arthroscopy; labral tear; femoroacetabular impingement; FAI; outcome

Arthroscopic treatment of intra-articular hip lesions has grown in popularity during the last decade. Studies in the literature reporting early clinical outcomes of hip arthroscopy have generally showed good to excellent results.[3-5,10,15,18] However, literature discussing reasons for revision hip arthroscopy is lacking.

Primary indications for hip arthroscopy include loose/foreign bodies, chondral defects, capsular laxity, ligamentum teres lesions, and labral lesions.[11-14] As understanding of the pathological mechanisms affecting the hip has increased, great changes in treatment have been seen in just the last few years. Notably, as recently as 2003, the observation by Ganz et al[6] that femoroacetabular impingement (FAI) can be the cause of labral tears in the nondysplastic hip transformed the way that these injuries are approached. Shortly after, Wenger et al[22] noted that labral tears are rarely seen in the absence of bony abnormalities. Neglecting to recognize and treat these bony abnormalities may predispose any treatment of the affected soft tissue to failure.

The purpose of this study was to describe the reasons why patients underwent revision hip arthroscopy at a major referral center. We hypothesized that patients requiring revision hip arthroscopy would have impingement that was not treated during the index arthroscopy or a reinjury.

METHODS

Between March 2005 and March 2006, the senior author (M.J.P.) performed 37 revisions of previous hip arthroscopies from multiple centers. Data from the primary surgeries were obtained from a retrospective review of clinic notes, operative notes, and images.

Before the revision surgery, all patients underwent a thorough preoperative history and physical examination. Range of motion measurements included flexion, abduction, and adduction in the supine position as well as internal and external rotation in the prone position. Also, patients were evaluated before revision arthroscopy with

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One or more authors have declared a potential conflict of interest: Dr Marc Philippon is a surgical consultant to Smith & Nephew, receiving grant support and royalties.

The American Journal of Sports Medicine, Vol. X, No. X
DOI: 10.1177/0363546507305097

a prospective subjective questionnaire that documented the SF-36[15,20,21] general health survey as well as modified Harris Hip Score.[4]

Radiographs obtained of all hips included anterior-posterior (AP) and cross-table lateral views and were evaluated for signs of cam impingement (decreased anterior or superior femoral head-neck offset),[9] pincer impingement (acetabular retroversion or coxa profunda),[17] acetabular dysplasia (as defined by a center-edge angle <20°),[1] and degree of osteoarthritis (as defined by the Kellgren-Lawrence Scale).[1] The degree of femoral head-neck offset was evaluated on cross-table lateral radiographs using the method described by Notzli et al.[9] The presence of a crossover sign, as described by Reynolds et al, was considered to be diagnostic for pincer impingement due to acetabular retroversion.[17]

The modified supine approach[3,4,16] was used for revision hip arthroscopy. Two portals (anterior and anterolateral) were established.[7,8,11-14] Labral tears and chondral injuries were identified and treated as needed. Traction was released, and a dynamic examination of the hip in all motion planes was performed. Under direct visualization with the arthroscope, the hip was flexed, extended, internally and externally rotated, and adducted and abducted to provide visualization of impingement. This dynamic examination provided the surgeon with a blueprint for adequate resection of both cam and pincer-type FAI, which were both decompressed as needed.[11-14] After decompression, a final dynamic examination was performed to confirm adequate resection of both cam and pincer-type FAI and lack of entrapment of the labrum during joint motion.[12,13]

Statistical Analysis

Comparison of outcome scores by binary categorical variables was performed using the independent samples *t* test; for multiple (>2) categorical variables, we used 1-way ANOVA. Comparison of outcome scores and continuous variables were performed using the Pearson correlation coefficient. Statistical analysis was performed using SPSS (version 11, SPSS Inc, Chicago, Ill) software package. All reported *P* values are 2-tailed with an α level of .05 indicating statistical significance. An independent statistician reviewed all data.

RESULTS

Nineteen (51%) of the 37 hips were revisions of the senior author, and 18 (49%) were referred after hip arthroscopy by another surgeon. There were 25 women and 12 men. The average age at revision was 33 years (range, 16-53 years). Primary hip surgery procedures included in Table 1. The average time from prior surgery to revision was 20.5 months (range, 2.9-84 months). Thirteen patients (35%) had more than 1 previous hip surgery.

Before revision, 12 patients reported gradual onset of symptoms, 8 patients had sudden onset with minimal to no perturbation, and 17 patients reported sudden onset of symptoms with trauma. There was no difference in age, days from prior surgery to revision, or treatment at revision between these 3 groups ($P > .05$). Although not significant, the group with sudden onset and minimal to no perturbation had the lowest prerevision modified Harris Hip Score (score, 50) compared with sudden onset with trauma (score, 57) and gradual onset (score, 59; $P > .05$).

TABLE 1
Prior Surgical Treatments

Diagnosis	Treatment	No. of Hips
Labral tear	Labral debridement	25
	Labral repair	7
Chondral defect	Chondroplasty acetabulum	7
	Chondroplasty femoral head	10
	Microfracture acetabulum	7
	Microfracture femoral head	2
Capsular laxity	Capsular plication	6
	Thermal capsulorrhaphy	4
Ligamentum teres tear	Ligamentum teres debridement	6
Impingement	Osteoplasty cam impingement	10
	Rim trimming pincer impingement	5
Loose body	Loose body removal	6

Before revision, all patients showed impairment of general health status as measured by the SF-36 questionnaire. The mean physical component summary score was 39.2. There were no differences found between men and women for the component scores of the SF-36 ($P > .05$).

Patients also demonstrated functional disability as measured by the modified Harris Hip Score. The mean score prerevision was 56 (range, 22-99).

Thirty-four patients reported that their hip pain had not resolved after their previous arthroscopy. Posterior hip pain was reported in 51% of the patients, lateral hip pain in 55%, and groin pain was reported in 86%. Location of pain was not significantly associated with the treatment at revision ($P > .05$). Location of pain was also not associated with prerevision modified Harris Hip Score, age, or time from prior surgery to revision ($P > .05$).

Decreased flexion compared with the opposite extremity was recorded in 27 (73%) patients, decreased abduction in 21 (57%), decreased internal rotation in 20 (54%), and decreased external rotation in 21 (57%). No association was found between range of motion and the pathologic lesions identified at revision ($P > .05$). Patients with decreased abduction had a significantly lower prerevision modified Harris Hip Score (score, 51) compared with those without decreased abduction (score, 66; $P = .023$). No other range of motion deficits were associated with modified Harris Hip Score, age, or days between prior surgery and revision ($P > .05$).

On radiographic evaluation before revision, 36 of 37 patients had evidence of impingement that was either unaddressed or inadequately addressed at the time of index

procedure. Three patients had radiographic evidence of developmental dysplasia of the hip. Four patients had Kellgren-Lawrence grade 3 or 4 osteoarthritis before revision, and these patients had a significantly lower modified Harris Hip Score before revision (34 vs 59; $P = .031$). All patients with Kellgren-Lawrence grade 3 or 4 osteoarthritis had decreased range of motion. All patients with osteoarthritis were treated for FAI, chondral defects, and labral lesions.

Revision procedures included 32 (87%) for labral lesions, 26 (70%) for a chondral defect, 22 (60%) for previously unaddressed FAI, 22 (59%) for lysis of adhesions, 13 (35%) for previously unaddressed instability, and 12 (32%) for repeat treatment of FAI (Table 2). Other procedures performed included femoral head partial resurfacing (n = 2), labral reconstruction, and ligamentum teres reconstruction. Labral and ligamentum teres reconstructions were performed using iliotibial band autografts. Treatment of chondral defects included chondroplasty or microfracture. Patients who underwent treatment for a chondral defect at the surgery before revision waited an average of 30 months for revision, compared with 15 months for patients who did not undergo chondral defect treatment ($P = .04$).

Of the 3 patients with dysplasia, 1 had prior labral debridement and underwent labral reconstruction at revision. The other 2 patients underwent treatment of labral and chondral injuries at index arthroscopy and underwent lysis of adhesions and treatment of chondral injuries at revision arthroscopy.

Two patients had a total hip replacement at 7 and 9 months after revision hip arthroscopy. Both of their prerevision modified Harris Hip Scores were below 30. Three patients required repeat revision. One patient had a feeling of instability, and 2 patients reported a new injury. These patients required further arthroscopic surgery at 9, 11, and 15 months, respectively, after revision.

Of the 32 hips that did not fail the revision, early follow-up was obtained on 27 patients (84%) at an average of 12.7 months postoperatively (range, 6-19 months). The modified Harris Hip Score improved to an average of 77 (range, 36-100). There was no correlation between the follow-up modified Harris Hip Score and time from prior surgery to revision. Follow-up scores were not influenced by the reason for revision or the number of prior revisions. Average patient satisfaction was 8.0 (range, 2-10). Patients who reported sudden traumatic injury had a higher mean postrevision modified Harris Hip Score (score, 92) than did the other patients (score, 76; $P = .009$). Patients with prerevision decreased abduction had a lower follow-up modified Harris Hip Score (score, 76) than did patients with no decreased abduction (score, 87; $P = .041$).

TABLE 2
Revision Surgical Treatments[a]

Diagnosis	Treatment	No. of Hips
Labral tear	Labral debridement	23
	Labral repair	8
	Labral reconstruction with ITB	1
Chondral defect	Chondroplasty acetabulum	14
	Microfracture acetabulum	8
	Chondroplasty femoral head	14
	Microfracture femoral head	10
	Partial femoral head resurfacing	2
Capsular laxity	Capsular plication	10
	Thermal capsulorrhaphy	3
Ligamentum teres tear	Ligamentum teres debridement	21
	Ligamentum teres reconstruction	1
Impingement	Osteoplasty cam impingement	28
	Rim trimming pincer impingement	17
Loose body	Loose body removal	10
Adhesions	Lysis of adhesions	15

[a]ITB, iliotibial band.

DISCUSSION

This study showed that the most common reason patients returned for revision hip arthroscopy was persistent impingement. Patients had increased functional disability if they had decreased abduction, waited longer for revision, or had radiographic evidence of hip osteoarthritis. At revision, the most commonly treated problem was impingement. Early subjective outcomes after revision hip arthroscopy, as measured by the modified Harris Hip Score, indicated that patients can regain some of their lost function within the first year. Patients require revisions for many reasons, including reinjury, continued hip pain, or return of symptoms.

Arthroscopic hip procedures have recently evolved from treating only soft tissue injuries to treating bony abnormalities, including FAI. Published clinical outcomes of hip arthroscopy have consistently been good to excellent, regardless of the procedure performed, provided that the chondral surfaces were largely intact.[4,10,15,18] Furthermore, recent studies have shown the labral lesions are associated with bony abnormalities.[2,22] In this study, 36 of 37 patients had radiographic evidence of impingement that was either unaddressed or inadequately addressed at the time of index procedure. The authors believe that treatment of bony abnormalities is essential to the long-term success of the treatment of soft tissue lesions.

In the knee, the microfracture technique to treat full-thickness loss of articular cartilage has shown good long-term outcomes.[19] In our study, 4 patients had osteoarthritis at the time of revision. Three of these 4 patients had microfracture technique for the treatment of articular cartilage defects. These patients were educated on the poor results expected. However, the patients requested hip arthroscopy instead of total hip arthroplasty. More research is needed regarding hip arthroscopy for osteoarthritis and predictors of success.

Adhesions were also common reasons for revision hip arthroscopy. The adhesions were often located between the site of previous labral repair or resection and the capsule, in the area of greatest labral vascularity. It is the authors' belief that an emphasis on early range of motion may prevent the formation of adhesions within the hip joint.

Limitations of this study included the retrospective design, small study group, and lack of a control group. The fact that all of the patients in this study were seen at a

major referral center constitutes a selection bias. The subjective outcomes are limited by the relatively brief time to follow-up as well as the necessary omission of all patients who went on to total hip arthroplasty or a subsequent revision arthroscopy. It does, however, demonstrate that short-term symptomatic relief is possible after revision hip arthroscopy. Further study is required to determine long-term outcomes. Another limitation was the use of the modified Harris Hip Score to measure functional disability. It is the most widely used outcome score for hip arthroscopy, yet it has not been validated. The shortcomings of this outcome score are made evident by our study, as 1 patient who had a modified Harris Hip Score of 99 required revision surgery.

In summary, 13% of hip arthroscopies performed at this major referral center were revision arthroscopies for persistent impingement. Decreased abduction, increased time between index arthroscopy and revision, and the presence of osteoarthritis were associated with increased disability in patients presenting for revision hip arthroscopy.

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