Original Article With Video Illustration

Surgical Dislocation of the Hip Versus Arthroscopic Treatment of Femoroacetabular Impingement: A Prospective Matched-Pair Study With Average 2-Year Follow-up

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Purpose: The purpose of this study was to prospectively compare outcomes of patients receiving surgical hip dislocation and those undergoing arthroscopic treatment for femoroacetabular impingement (FAI), using a matched-pair analysis. **Methods:** Between January 2008 and August 2011, patients aged 30 years or younger with a diagnosis of FAI treated with surgical dislocation or arthroscopy were included. Patients were excluded with Tönnis grade 2 or greater, dysplasia, Legg-Calve-Perthes disease, and previous hip surgery. Patients treated with surgical dislocation were pair-matched to patients treated arthroscopically in a 1:2 ratio. Patient-reported outcomes were prospectively obtained in all patients preoperatively and postoperatively at 3 months, at 1 year, at 2 years, and at latest follow-up. Alpha angles were measured preoperatively and postoperatively for both groups. Revision surgery and complications were recorded for each group. **Results:** Ten patients were included in the surgical dislocation group, and 20 pair-matched patients were included in the arthroscopic group. We obtained 100% follow-up at a mean of 24.8 months in the open group and 25.5 months in the arthroscopic group. Preoperative scores were similar between the 2 groups; significant improvements were made postoperatively for both groups. When we compared the 2 groups, the change in Hip Outcome Score—Sport-Specific Subscale (42.8 *v* 23.5, $P = .047$) and 2-year Non-Arthritic Hip Score (94.2 *v* 85.7, $P = .01$) were significantly higher in the arthroscopic group. Both groups showed a significant decrease in the alpha angle postoperatively ($P = .775$). **Conclusions:** Favorable results were shown with both approaches, with significant improvement in all patient-reported outcome measures and high patient satisfaction ratings. However, arthroscopic treatment of FAI showed greater improvement in the Hip Outcome Score—Sport-Specific Subscale and a higher absolute Non-Arthritic Hip Score at an average 2-year follow-up. **Level of Evidence:** Level II, prospective matched-pair comparative study.

Femoroacetabular impingement (FAI) is the abnormal contact between the acetabular rim and femoral neck. Cam impingement describes an abnormally shaped femoral head-neck junction, whereas pincer impingement depicts abnormal acetabular coverage of the proximal femur. FAI is a known cause of hip pain in young, active patients with non-dysplastic hips and a major factor in the development of osteoarthritis.[1]

Surgical treatment involves correction of the deformities causing bony contact during hip motion and treating any associated labral and articular cartilage damage.[2,3] Ganz et al.[4] described an open surgical dislocation technique allowing complete visualization of the proximal femur and acetabulum without compromising the femoral head vasculature. Several authors used this open technique and reported good early and midterm clinical success with minimal complications.[5-12] However, this is a major operation that requires the use of a trochanteric osteotomy and sacrifice of the ligamentum teres. The advantages and disadvantages of the open surgical dislocation and arthroscopy techniques are outlined in Table 1.

Hip arthroscopy has emerged as a promising modality in the treatment of FAI. The goal of the arthroscopic

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Table 1. Comparison Between Open Surgical Dislocation and Hip Arthroscopy in Treatment of FAI

	Advantages	Disadvantages
Open surgical dislocation	• Good visualization of joint • 360° joint access • Enables treatment of all pathologies • Templates can be used for femoral osteoplasty to ensure precise sphericity	• Major operation • Soft-tissue damage • Trochanteric osteotomy—risk of nonunion and hardware pain • Need to sacrifice ligamentum teres • Increased blood loss • Longer rehabilitation
Arthroscopic surgery	• Minimally invasive • Outpatient surgery • Minor soft-tissue damage • Faster rehabilitation • Easy approach to peripheral compartment and soft tissues	• Difficult access to ligamentum teres and inferior portion of joint • Traction complications—genital and perineal injury, pudendal neurapraxia • LFCN neurapraxia (portal injury) • Abdominal compartment syndrome

LFCN, lateral femoral cutaneous nerve.

procedure is to correct the FAI deformities with minimal collateral damage to soft tissues and without trochanteric osteotomy, allowing for outpatient surgery with faster rehabilitation and recovery. Originally considered the gold standard for FAI treatment, the superiority of the surgical dislocation technique has been questioned in recent systematic reviews comparing it with the arthroscopic technique.[2,3,13,14] Furthermore, early outcomes in the arthroscopic treatment of FAI have approached the results of the open technique.[15-19] However, there is still a lack of high-level evidence, including a lack of comparative clinical studies between open and arthroscopic procedures.

The purpose of the study was to prospectively compare the clinical outcomes of patients treated for FAI with surgical dislocation of the hip with those of patients treated with arthroscopy of the hip in a matched-pair cohort design. The hypothesis of this study was that patients treated with arthroscopy would have better outcomes than patients treated with surgical dislocation.

Methods

Study Population

At our institution, data are prospectively collected on all patients undergoing non-arthroplasty surgery of the hip. Patient-reported outcome (PRO) scores that are obtained include the modified Harris Hip Score (mHHS),[20] the Non-Arthritic Hip Score (NAHS),[21] the Hip Outcome Score—Activities of Daily Living (HOS-ADL), and the Hip Outcome Score—Sport-Specific Subscale (HOS-SSS)[22] at 3-month, 1-year, and 2-year follow-up time points. All 4 questionnaires are used, as it has been reported, based on psychometric evidence that there is no conclusive evidence for the use of a single PRO questionnaire for patients undergoing hip arthroscopy.[23] Good/excellent results were based on an mHHS greater than 80 points. Any revision surgery, complications, additional surgery, or conversion to total hip arthroplasty was documented. Our primary outcome measure was the HOS-SSS because we sought to define the difference in outcome at higher functional levels in these young cohorts.

The inclusion criteria for this study were patients aged 30 years or younger, with a diagnosis of FAI, treated with surgical dislocation or arthroscopic surgery. We excluded patients with Tönnis grade 2 or greater, developmental dysplasia of the hip, Legg-Calve-Perthes disease, and previous hip surgery. Our institutional review board approved this study.

The study period was between January 2008 and August 2011. Each patient was prospectively enrolled in the study and was offered the choice of surgical dislocation or an arthroscopic procedure. The advantages and disadvantages of each procedure were discussed with the patients, and all questions were answered. The decision for which surgery to undergo was made by the patient with either procedure indicated for the patient's pathology. Currently, the senior author (B.G.D.) does not routinely offer surgical dislocation as a first-line treatment for FAI unless clearly indicated.

A matched-pair group was created from a larger cohort of 785 patients undergoing arthroscopy for the treatment of FAI during the study period. The matched-pair group was selected based on age within 2 years, gender, diagnosis of FAI, and Workers' Compensation status.

The diagnosis of FAI was made based on history, clinical examination (positive anterior impingement sign), and imaging. In all patients a supine anteroposterior pelvis radiograph, Dunn view, cross-table lateral view, and false-profile view were obtained.[24,25] All radiographs were assessed by the senior author (B.G.D.). Alpha angle measurements were measured on the 45° Dunn view preoperatively and postoperatively.[25] Pincer impingement was evaluated on the anteroposterior pelvis radiograph. Hips were classified as pincer type if the radiographs showed protrusio acetabula, showed coxa profundo, or had a positive crossover sign. Hips were classified as cam type if they had an alpha angle >50 on the Dunn view. All hips were radiographically evaluated for arthritic stage according to the Tönnis grading system.[26] All patients in this study underwent magnetic resonance arthrography preoperatively for assessment of labral and chondral damage.

Surgical Dislocation Technique

Video 1 (available at www.arthroscopyjournal.org) highlights the surgical approach and technique for performing the surgical dislocation of the hip and technique for managing impingement lesions. The surgical approach for the hip dislocation was performed with the trans-trochanteric approach, as described by Ganz et al.[4] With the patient in the lateral position on a radiolucent table, a Z-shaped greater trochanteric flip osteotomy is performed through a lateral incision, followed by a Z-shaped anterior capsulotomy, to dislocate the head anteriorly. With the femoral head dislocated, a 360° view of the femoral head and acetabulum is permitted. Sites of femoroacetabular impingement are assessed, such as the non-spherical portion of the femoral head-neck junction, as well as anterior acetabular wall overcoverage. Intra-articular pathology such as articular cartilage damage and labral tears is documented.

Treatment of cam impingement involves removal of any non-spherical portions of the femoral head. The amount of bone to be removed is determined by use of a transparent spherical template matching the head size and restoring the normal convex contour of the head-neck junction and the concave contour of the neck. Pincer impingement is treated with resection of the anterior acetabular rim, which includes resection of damaged articular cartilage. Articular cartilage injuries are treated with chondroplasty with a shaver to debride unstable articular cartilage, with no microfracture procedures performed in this patient cohort.

Arthroscopic Technique

Video 2 (available at www.arthroscopyjournal.org) highlights the arthroscopic technique for addressing impingement lesions and labral repair. Arthroscopy of the hip is performed in the modified supine position.[27] The 2 portals routinely used are the anterolateral and mid-anterior portals placed slightly lateral to the originally described mid-anterior portal. The central compartment of the hip is first examined for articular cartilage damage and labral tears. As with the open group, articular cartilage injuries are treated with chondroplasty with a shaver, with no microfracture procedures performed in this cohort of patients. For pincer impingement, the anterior acetabular rim is removed with a 5.5-mm round burr. The amount of bony resection determines the treatment modality for the labrum, as discussed by Fry and Domb.[28] With less than 3 mm of acetabular resection, the labrum is assessed for instability. A stable labrum is not repaired, whereas an unstable labrum undergoes refixation to the bony base, with knotless 2.9-mm suture anchors (Arthrex, Naples, FL). For acetabular resection greater than 3 mm, the labrum is taken off of the acetabular cartilage, allowing for a larger rim resection and then undergoes refixation to the new labral rim with knotless suture anchors. According to the labral width, 2 refixation techniques are used, a looped simple stitch for thinner labrum and labral base refixation as described for thicker labrum.[28] Degenerative labral tears are debrided with a shaver.

The peripheral compartment of the hip is evaluated next. The area of cam impingement is visualized along the anterosuperior aspect of the femoral head-neck junction, and the osteoplasty is performed with a 5.5-mm round burr under fluoroscopy, with care taken to re-create the normal convex shape of the head-neck junction and the concave shape of the femoral neck.

Postoperative Management

A standard postoperative protocol was used for all patients. All patients wore the X-Act ROM hip brace (DJO, Vista, CA), and instructions varied by procedure. Arthroscopic patients were allowed 20 lb of partial weight bearing on the surgical side with the use of crutches for 2 weeks, whereas surgical dislocation patients were treated with the same protocol except that the period of partial weight bearing on crutches was 6 weeks. Physical therapy began for both groups on postoperative day 1, with the use of a stationary bike for 2 hours per day or a continuous passive motion machine for 4 hours per day.

Complications

Complications were documented at all follow-up visits. Hardware removal was not considered a complication because this is routinely performed after trochanteric osteotomy.

Statistical Methods

The 2-tailed, unpaired *t* test was used to evaluate differences between the arthroscopic and open surgical dislocation group, and the 2-tailed, paired *t* test was used to detect changes in preoperative to postoperative scores and radiographic measurements. A χ^2 test was used to evaluate groups of patients with good/excellent results. A power analysis was performed for our primary outcome measure, the HOS-SSS. Because there are no comparative studies to obtain the difference between groups that would be significant, we chose a difference between the groups of 20 points for the change in HOS-SSS at 2-year follow-up with an SD of 18, considering a power level of 0.8 to define our patient sample size. With these parameters, we calculated that 28 patients would be needed to achieve significance. $P < .05$ was considered significant.

Results

Patient Population

During the study period, 684 arthroscopic surgeries were performed for FAI. The 10 patients who met the inclusion criteria for the surgical dislocation group were similar to the pair-matched arthroscopic group in age, gender, Workers' Compensation status, and length of follow-up. No statistical significance was found between the groups for preoperative mHHS, NAHS, HOS-ADL, and HOS-SSS. Patient demographics are presented in Table 2. The mean length of follow-up was 24.8 months (range, 12 to 39 months) for the open group and 25.5 months (range, 21 to 34 months) for the arthroscopic group. In the open group, 7 had combined impingement and 3 had isolated pincer impingement. In the arthroscopic group, 13 had combined impingement and 6 had isolated pincer impingement. All 4 preoperative patient-reported scores (mHHS, NAHS, HOS-ADL, and HOS-SSS) were similar between the groups (P = .772, P = .848, P = .549, and P = .23, respectively). There were 10 labral repairs in the open group and 17 in the arthroscopic group. One patient in the study group was Workers' Compensation and was paired to 2 Workers' Compensation patients from the arthroscopic cohort.

Clinical Outcomes

Table 3 shows the PRO scores at final follow-up. The arthroscopic group and surgical dislocation group had significant postoperative improvement at 3 months, 1 year, and final follow-up, except for the 3-month HOS-SSS in the dislocation group. This may indicate a slower recovery after surgery. The arthroscopic group showed a significantly higher increase in the HOS-SSS when compared with the dislocation group at final follow-up: 42.75 versus 23.55 (P = .047). The arthroscopic group had a significantly higher NAHS at 3 months, 88.1 versus 75.3 (P = .016), and at final follow-up, 94.2 versus 85.7 (P = .01). Table 4 shows the mean preoperative to postoperative changes for each score. The mean improvement was similar between the groups for the mHHS, NAHS, and HOS-ADL. The NAHS (Table 4) showed a large improvement at final follow-up, with 18.3 points in the dislocation group versus 28.1 points in the arthroscopic group; however, this did not reach significance (P = .103). There was no statistically significant difference between the dislocation and arthroscopic groups at final follow-up for mHHS (92.0 *v* 92.4, P = .496), HOS-ADL (91.5 *v* 95.3, P = .426), and HOS-SSS (77.3 *v* 87.1, P = .625). Both groups showed similar visual analog scale scores and satisfaction at the latest follow-up. At final follow-up, 9 of 10 patients in the dislocation group reported good/excellent results and 19 of 20 patients in the arthroscopic group had good/excellent results (P = .608). There was a trend toward faster recovery for the arthroscopic group at the 3-month follow-up, with a higher change in NAHS and change in HOS-SSS, although this was not significant (Fig 1).

Radiographic

The preoperative alpha angle for patients with cam deformity, as measured on the modified Dunn view, was 58.4° for the dislocation group and 56.9° for the arthroscopic group (P = .705). The patients in the open group with cam impingement had a significant

Table 2. Patient Characteristics for Matched-Pair Cohorts of Surgical Dislocation Versus Arthroscopy

	Open Surgical Dislocation	Arthroscopic	Significance
No.	10	20	NA
Age (yr)	19	19.6	P = .769
Male	2	4	NA
Female	8	16	NA
Right	7	12	
Left	3	8	
Pincer	10	19	
Cam	7	14	
Combined	7	13	
Labral repair	10	17	
Labral debridement	0	3	
Positive Workers' Compensation status	1	2	NA
Follow-up (mo)	24.8	25.5	P = .732
Alpha angle (°)	58.44	56.93	P = .704
Preoperative mHHS	69.58	68.18	P = .772
Preoperative NAHS	67.35	66.09	P = .848
Preoperative HOS-ADL	68.59	72.17	P = .549
Preoperative HOS-SSS	53.76	44.34	P = .23

NA, not applicable because of 1:2 ratio of matched-pair cohorts.

Table 3. PRO Scores at Final Follow-up for Surgical Dislocation and Arthroscopic Groups

	Open Dislocation (n = 10)	Arthroscopic (n = 20)	Significance
mHHS	92 ± 12.6	92.4 ± 7.13	P = .914
NAHS	85.7 ± 12.4	94.2 ± 4.5	P = .01*
HOS-ADL	91.5 ± 7.7	95.3 ± 5.4	P = .129
HOS-SSS	77.3 ± 22.7	87.1 ± 12.1	P = .131
VAS	2.8 ± 3.1	2.0 ± 1.2	P = .328
Satisfaction	8.1 ± 2.3	9.2 ± 0.8	P = .07
Good/excellent	9	19	P = .605

VAS, visual analog scale.
*Statistically significant.

Table 4. Mean Change in PROs at Final Follow-up for Surgical Dislocation and Arthroscopic Groups

	Open Dislocation (n = 10)	Arthroscopic (n = 20)	Significance
ΔmHHS	22.5 ± 12.8	24.3 ± 11.2	P = .696
ΔNAHS	18.3 ± 12.6	28.1 ± 16.0	P = .103
ΔHOS-ADL	22.9 ± 13.9	23.1 ± 13.4	P = .971
ΔHOS-SSS	23.5 ± 19.7	42.8 ± 25.7	P = .047*
ΔVAS	2.1 ± 4.4	4.7 ± 2.0	P = .130

VAS, visual analog scale.
*Statistically significant.

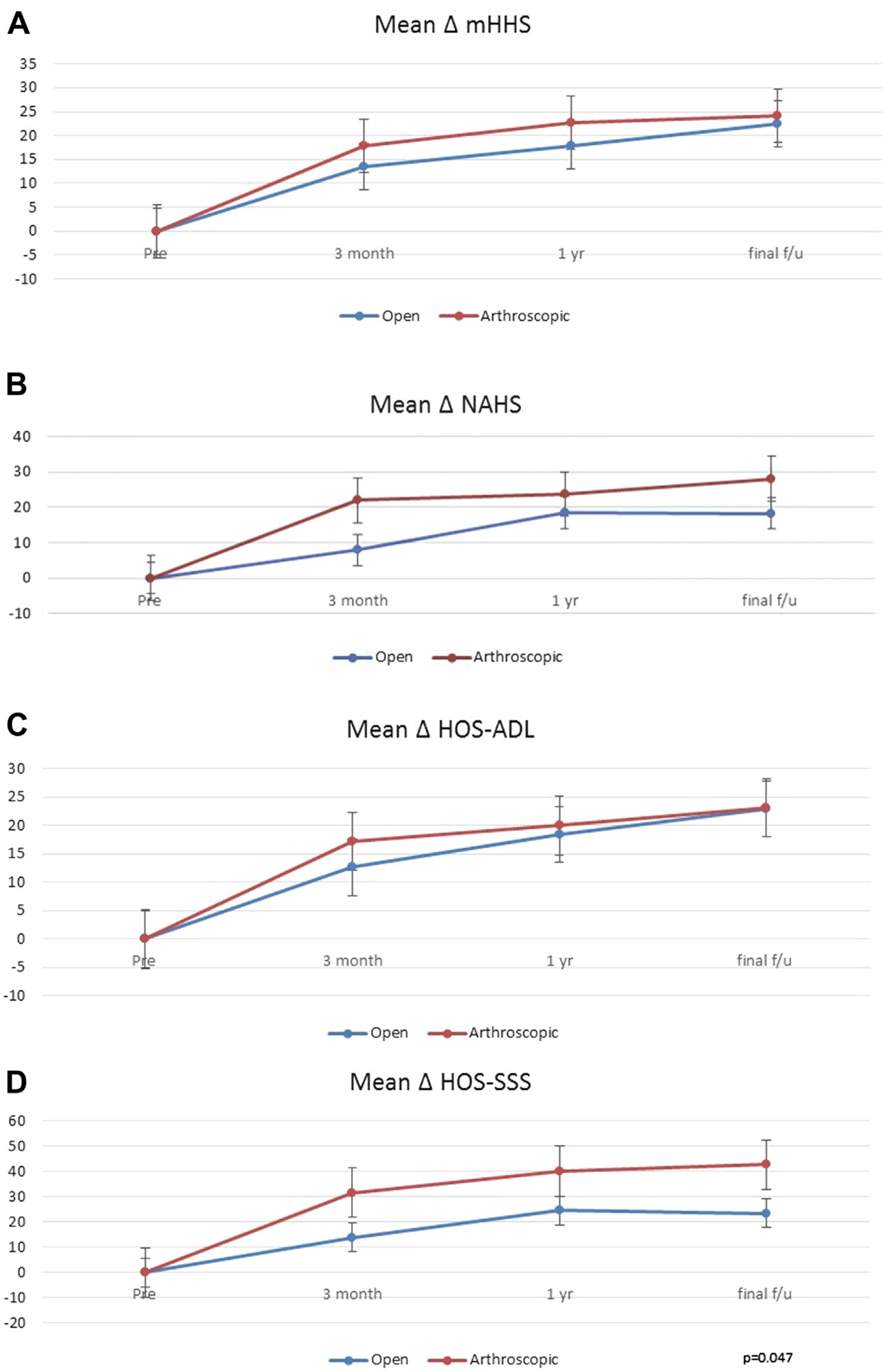

Fig 1. Changes from preoperative to postoperative scores for open surgical dislocation group (red lines) and arthroscopic group (blue lines): (A) mHHS improvement, (B) NAHS improvement, (C) HOS-ADL, and (D) HOS-SSS. (f/u, follow-up; Pre, preoperatively.)

improvement in the alpha angle from 58.4° to 39.6° ($P < .001$). The patients in the arthroscopic group receiving a femoral osteoplasty had a significant improvement from 56.9° to 40.3° ($P < .001$). Between the groups, there was similar improvement in the alpha angle ($P = .775$) (Fig 2).

Complications

Though not considered a complication, hardware removal was performed in 8 patients (80%) from the dislocation group. One patient underwent hip arthroscopy at the time of hardware removal. During hip arthroscopy, a femoral head articular cartilage defect was noted. The patient underwent microfracture of the defect. At final follow-up, 37 months after initial surgical dislocation, the patient had improved scores, with an mHHS of 83, up from 67 preoperatively. Another patient from the surgical hip dislocation group had revision surgery 29 months after the initial procedure. At the time of arthroscopy, the patient

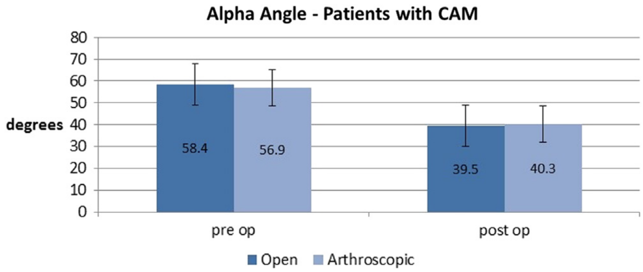

Fig 2. Alpha angle measurements (preoperative *v* postoperative) for patients who had cam impingement.

had a labral debridement, chondroplasty, and lysis of adhesions. This patient was lost to follow-up after the arthroscopic procedure. One patient in the arthroscopic group underwent iliopsoas release at 18 months postoperatively because of new-onset symptomatic internal snapping.

Discussion

To our knowledge, this is the first prospective study directly comparing surgical dislocation with arthroscopic treatment of FAI with an average 2-year follow-up. The results of the study are consistent with previous non-comparative studies, showing significant improvement in patients treated for FAI with surgical hip dislocation and with hip arthroscopy.[18,19,29] This matched-pair comparison suggested superior outcomes in the arthroscopic group at 2-year follow-up, with greater mean improvement in HOS-SSS and greater final NAHS. The results are consistent with previous systematic reviews showing similar, if not improved, results with the arthroscopic management of FAI.[19,29]

The significant improvement in the change in HOS-SSS and NAHS in the arthroscopic group over the dislocation group shows an important point when comparing the 2 treatments. In a study looking at the psychometric parameters in PRO scores, the authors concluded that no single outcome questionnaire is adequate in determining outcomes for hip arthroscopy.[23] For this reason, 4 PRO measures are used at our institution, with higher scores indicating less pain and greater functionality of the hip. To our knowledge, this is the first study to report outcomes using the Hip Outcome Score to evaluate patients undergoing surgical dislocation of the hip or to compare surgical dislocation with arthroscopy. HOS-SSS is important for instances in which patients are only limited in their ability to perform in athletics. The NAHS was developed for a young population with non-arthritic hip pain, not specifically for hip arthroscopy, perhaps making this the most ideal outcome score for these study groups that include open and arthroscopic treatments. The mHHS has no items that assess sport-related activities, and both the Hip Outcome Score and the NAHS may avoid the ceiling effect, which is inherent in the mHHS.

An obvious advantage of arthroscopy over surgical dislocation is the reduced trauma to the trochanter and the soft tissues may shorten recovery after surgery. The trochanteric osteotomy requires healing time and restrictions for rehabilitation that may delay recovery. At 3 months postoperatively, the arthroscopic group showed a significantly larger improvement in NAHS. In addition, the HOS-SSS for the open group showed no significant postoperative improvement at 3 months, indicating a slower recovery for the open group. Zingg et al.[30] showed a similar finding with improved Western Ontario and McMaster Universities Osteoarthritis Index scores at 3 months in patients treated with arthroscopy. The primary aim of this study was to compare short-term outcomes of the 2 cohorts and not to measure rate of recovery from the respective surgeries. The difference in outcome at 2 years could be attributed to sacrifice of the ligamentum teres, additional surgery for hardware removal of trochanteric osteotomy fixation, or increased scar tissue from the more invasive nature of surgical hip dislocation.

Beck et al.[10] were the first authors to report midterm outcomes using the open surgical dislocation technique, with reported improvements in the function-based Merle d'Aubigné-Postel score in 13 of the 19 patients followed up for a mean of 4.7 years. Five patients who had preoperative Tönnis grade 2 or evidence of severe articular cartilage damage went on to have a total hip arthroplasty at a mean of 3.1 years postoperatively. Subsequently, several reviews have evaluated the short-term and midterm outcomes of FAI treatment with open surgical dislocation.[5-12] Surgical dislocations have since been reviewed in several systematic reviews comparing open treatment with arthroscopic treatment for FAI.[2,3,13,14] Bedi et al.[13] reported that 197 patients in total were followed up for a mean of 40 months. Good to excellent results were reported in 65% to 85% of the patients. Failure, defined as patient dissatisfaction or conversion to total hip arthroplasty, occurred in 4% to 30% of patients, and the failure rate was attributed to advanced arthritis, older age, and more severe preoperative pain. Botser et al.[14] combined data to report a 9.2% complication rate in surgical dislocation patients versus a 1.7% rate in arthroscopic patients. Most studies agree that both treatments improve short-term and midterm pain and function in patients without advanced osteoarthritis; however, comparison between procedures has proven difficult because of the low level of evidence in the literature. Another limitation of the literature is the heterogeneous patient population, with different studies investigating different FAI pathologies: pincer, cam, and combined. In addition, the outcome measures vary among studies, with 6 different hip outcome measures being used throughout the literature.[3,14] Thus no conclusions can be made from the current literature regarding the optimal treatment for FAI.

Our better understanding of the pathomechanics behind FAI and the advances made in hip arthroscopy have made it a viable treatment option for this condition, with success rates ranging from 67% to 91%.[31-35] Failure after hip arthroscopy can occur from excessive labral debridement, iatrogenic cartilage damage, and incomplete removal of impingement lesions.[36] This underscores the importance of preoperative planning as well as proper execution at the time of arthroscopy. It is commonly accepted that there is a steep learning curve with hip arthroscopy,[37] and most arthroscopic studies published on FAI are performed by skilled, high-volume arthroscopists. All procedures performed in this study were performed by a high-volume surgeon in a tertiary referral setting.

The radiographic results confirm that femoral osteoplasty can be successfully performed by arthroscopic means. This is consistent with the findings of Bedi et al.,[38] who showed a similar improvement in the alpha angle and beta angle between surgical dislocation and arthroscopic cohorts.

The overall rate of complications with hip arthroscopy has been reported to be 1.5%.[39] The most common complication of hip arthroscopy is transient nerve injury due to portal or traction injury. Other complications include fluid extravasation and abdominal compartment syndrome, heterotopic ossification, instability or dislocation, and femoral neck fracture. In a systematic review, Botser et al.[14] reported a 9.2% complication rate, with 5.5% from trochanteric fixation complications during surgical dislocation. The same review reported a 1.7% complication rate in arthroscopy, with heterotopic ossification being the most common complication, at 1.1%. Because of the small cohort of patients in this study, we cannot verify that our results are consistent with the literature. However, there is one observation that can be made. The high rate of hardware removal in the open dislocation group must be taken into account when one is considering this procedure, from a patient and a surgeon standpoint. Although it is a low-risk procedure, hardware removal in the hip requires substantial resources and time that are not necessary in arthroscopy.

The advantage of this study is its prospective, matched-pair cohort design. This allows for the first direct clinical comparison of the 2 techniques. The design eliminates several variables involved in surgical technique, clinical protocols, and rehabilitation; thus the type of intervention becomes the primary variable. The similar radiographic results in correction of FAI between the groups further serve to isolate the approach as the primary variable. This study also used 4 different PRO tools, addressing the psychometric evidence that no single PRO tool is adequate for assessing outcomes in hip preservation surgery.

Limitations

The main limitation of our study is the small patient sample size. The narrow inclusion criteria and the option to undergo arthroscopic management made for a limited open dislocation group. During the study period, more patients opted for arthroscopic management. We sought to minimize the size limitation by creating a matched-pair comparison group. We also showed through a power analysis that these cohorts yielded a well-powered study for our primary outcome measure, the HOS-SSS, which is the only outcome measure of those obtained that can be reliably reported. When using multiple outcomes, a primary outcome must be chosen for which to perform a power analysis. This limits the results of the other outcomes because a lack of significance could be a type II error. Another limitation is the larger cohort choosing arthroscopy. Although the patient choice of approach could introduce selection bias, we addressed this by pair-matching the groups with respect to multiple variables, and showed similar preoperative PRO scores between the groups. Short term follow-up was also a limitation. Follow-up for each group averaged 2 years; however, 2 patients in the open group reached 1 year of follow-up. It is theoretically difficult to compare a patient with surgical hip dislocation at 1 year of follow-up with an arthroscopic patient at 21 months' follow-up, expecting lower scores during the shorter follow-up after open surgery. However, in this specific setting, the surgical hip dislocation patients with 1 year of follow-up achieved high scores in all 4 PROs, scoring 100 for the mHHS and 100 and 75 for the HOS-SSS.

Conclusions

Favorable results were shown with both approaches, with significant improvement in all PRO measures and high patient satisfaction ratings. However, arthroscopic treatment of FAI showed greater improvement in the HOS-SSS and a higher absolute NAHS at an average 2-year follow-up.

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