Hip Arthroscopy After Traumatic Hip Dislocation

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Abstract
Introduction: To present arthroscopic findings after traumatic posterior hip dislocation in patients with mechanical hip symptoms.

Methods: All the patients that were treated with hip arthroscopy for mechanical hip symptoms after traumatic posterior hip dislocation with subsequent closed reduction between 2002 and 2006 were included in this study. The time between closed reduction and arthroscopy, arthroscopic findings and treatment, preoperative and last follow-up WOMAC scores and last follow-up X-rays were analyzed. Complications or the need for further surgical treatment are reported.

Results: We had 17 patients (13 male, 4 female), average age 28.5 years (range 19-37). Average time between closed reduction and arthroscopy was 3 months. 14 had anterior labral tears, 6 had posterior labral tears, 16 had acetabular chondral damage, all had femoral chondral damage, 14 had intraarticular fragments. Preoperative WOMAC was 46, last follow-up WOMAC was 87 (45 months average), range 45 to 93. One patient required Total Hip Replacement for Osteoarthritis and one presented avascular necrosis and is waiting for hip replacement.

Conclusion: Our clearest indication for arthroscopy after traumatic posterior hip dislocation was loose fragments inside the joint. Every patient presented mechanical hip symptoms, intraarticular damage was demonstrated in every case. Most of the patients had significant improvement after hip arthroscopy.

Key words: Posterior Hip Dislocation, Hip Arthroscopy.

Introduction
Traumatic posterior dislocation of the hip joint is usually the result of hi energy trauma mostly occurring in young adults. A simple dislocation is one without a fracture. Complex fracture dislocations involve an associated fracture of the acetabulum, femoral head or neck. The rate of coxarthrosis following hip dislocation is 24% for simple dislocations and 88% for those associated with acetabular fractures. Timely reduction may be essential to the survival of the femoral head and should be considered an emergency. Osteonecrosis has been reported to occur in 10% to 34% of hip dislocations (1) and depends on the severity of the injury and time between dislocation and reduction. Up to 58% of the patients may present subsequent hip osteonecrosis if the hip was reduced after 6 hours of dislocation (2). Subsequent treatment depends on the achievement of a concentric reduction or the presence of intraarticular fragments, associated injury and hip stability.

Un-concentric hip reduction or intraarticular fragments are ideal indications for hip arthroscopy (1, 3, 4, 5, 6).

Hip arthroscopy is typically performed as subsequent procedure after the hip has been reduced and the patient stabilized of associated injuries (1).

The purpose of this study is to report arthroscopic findings and results in a consecutive series of patients with traumatic hip dislocation initially treated with closed reduction that underwent hip arthroscopy as a subsequent procedure.

Our hypothesis was that Hip Arthroscopy is adequate as a subsequent procedure to treat intraarticular pathology secondary to traumatic hip dislocation and presents low morbidity and complication rates.
Methods
Patients that underwent hip arthroscopy after closed reduction of a traumatic posterior hip dislocation because of mechanical hip symptoms or documented intraarticular fragments between January 2002 and December 2006 were included in the present study. Patient demographics, the time between dislocation and closed reduction and the time between closed reduction and hip arthroscopy were documented.

All the patients were prospectively followed for a minimum of 3 years. Preoperative WOMAC scores and last follow-up WOMAC scores were obtained.

Arthroscopic findings were documented. The geographic zone method was applied retrospectively to document the location of the intraarticular lesions (7). The Outerbridge classification for cartilage lesions was utilized to grade chondral injury on the acetabulum and the femoral head (8).

Preoperative imaging studies consisted of simple radiographs (Anteroposterior Pelvis and Frog-leg lateral views) and Computed Tomography Scans (CT) in every patient in the series. Postoperative imaging studies were simple radiographs (Anteroposterior Pelvis and Frog-leg lateral views).

Complications and the need for further surgical treatment were included in this analysis.

Surgical Technique
All the patients were operated by the senior author (VMI). Hip arthroscopy was performed using lateral patient positioning on a fracture table (Maquet, Rastatt, Germany) (9, 10). Traction was applied to provide access to the central compartment of the hip. The hip was flexed about 10° to 15° with neutral rotations and slight adduction. The perineal post was oversized (more than 10mm in diameter) and lateralized against the medial thigh to protect the pudendal nerve and provide a lateralization vector to the traction force. The foot was well padded to prevent compression injury. Traction was considered adequate when a 10mm separation was documented using fluoroscopy between the lateral rim of the acetabulum and the femoral head (10). Fluoroscopy was used to establish the anterolateral portal first as described by Thomas Byrd (11). A dedicated hip arthroscopy instrument set was used (Hip Access System, Smith and Nephew Endoscopy, Andover MA). Subsequent portals were established under direct arthroscopic vision. The second portal established was the direct anterior portal (11). Other portals were established if needed.

A hip capsulotomy was always performed between the anterolateral and direct anterior portal holes in the hip capsule to improve access and mobility of instruments within the hip joint. The capsulotomy was also helpful in removing loose bodies combined with a slotted cannula. Straight and angled pituitary rongeours were used to remove loose bodies. Labral tears were partially resected or repaired depending on each case. Ligamentum teres tears were partially debrided to the point where there was no soft tissue impingement out of the ligamentum teres fossa between the acetabulum and the femoral head. Unstable chondral flaps were removed and exposed subchondral bone areas were microfractured. After pathology of the central compartment was treated instruments were taken out of the joint, traction was released and the hip periphery was examined for loose bodies without traction with the hip in a flexed position of about 35° and neutral rotation and abduction. Accessory portals were used to access the hip periphery (10).

Statistical Analysis
Preoperative and last Follow-up WOMAC scores were compared, a Sapiro-Wilk test was performed to evaluate normal distribution of data. Last follow-up WOMAC scores showed a not normal distribution of data. We conducted a non-parametric contrast testing with paired samples Wilcoxon test comparing preoperative and last follow-up WOMAC scores. Significance was set at a p value of < 0.05.

Results
Seventeen patients were included in the study, 13 male and 4 female, the average age for the series was 28.5 years (Range 19-37 years).
The time between dislocation and closed reduction ranged from 2 hours to 7 hours, average 4.5 hours, standard deviation (SD) 1.17. One patient had a patellar fracture that was treated at the time of the closed hip reduction. No patient presented sciatic nerve injuries or other neurological problems at the time of dislocation or reduction.

The average time between closed reduction and arthroscopy was 3 months ranging from 1 month to 8 months, SD 1.5. The indication for hip arthroscopy was intra-articular fragments diagnosed at preoperative imaging studies in 13 patients and mechanical hip symptoms including catching and locking in 4 patients.

Average preoperative WOMAC scores was 46 (range 41 to 57, SD 4.7). One patient required total hip replacement before completing the minimum follow-up of 3 years because of osteoarthritis, one more patient required a total hip replacement because of avascular necrosis at 3 years follow-up. There were 2 patients lost to minimum follow-up of 3 years, 4 patients completed minimum follow-up of 3 years 5 patients completed 4 years follow-up, 4 patients completed 5 years follow-up (Follow-up was 45 months average for the series). The average WOMAC score for the series at last follow-up was 87 points average (range 45 to 93 SD 14.5) (Table 1).

The difference between the preoperative and last follow-up WOMAC scores was statistically significant (p=0.001).

Arthroscopic findings:
Labral Tears (Table 2):
14 patients had anterior labral tears; 9 in zone 2 and 5 in zone 1, only one tear was repaired. Six patients had posterior labral tears, 5 in zone 4 and one detachment in zone 4 and 5 only the detachment was repaired, the rest were treated with partial resection. In 3 patients tears were present in both the anterior and the posterior labrum.

Acetabular Chondral Damage (Table 2):
Acetabular chondral damage was observed in 16 patients. One patient had large areas of Outerbridge type 4 lesions that included acetabular zones 2, 3 and 4 associated with very large intraarticular loose bodies, only debridment and resection of loose bodies was performed in this case. This patient needed total hip replacement before 3 years.

Fourteen cases presented Outerbridge type 2 and 3 lesions on acetabular zone 3 that were managed buy resection of unstable cartilage without the need for microfractures; in 11 of these 14 patients type 4 lesions in zones 2, 4 or 5 were also observed, these were treated by resection of unstable cartilage and microfractures. One patient presented an isolated Outerbridge type 4 lesion at zone 5 which was treated by resection of unstable cartilage and microfractures.

Femoral Head Chondral Damage (Table 3):
Every patient in the series had femoral chondral damage, 12 patients had Outerbridge type 3 lesions on the femoral head zone 3M and 3S, 3 Patients had Outerbridge type 3 lesions on Femoral Head zones 3M, 3S and 2M and 2S and 2 patients had Outerbridge type 3 lesions in zone 2S. All these lesions were treated by resection of unstable cartilage.

Loose Bodies:
Intraarticular fragments were observed in 14 patients at the acetabular fossa. One of the also had fragments at posterior labral detachment. All the loose bodies were removed from the inside of the joint.

Ligamentum Teres Lesions:
Every patient had hypertrophic tissue debrided from around the Ligamentum Teres, this tissue was recognized as scar tissue after Ligamentum Teres ruptures. In every case a stable portion of the Ligamentum Teres was preserved.
Hip Periphery:
No fragments were detected at examination of the hip periphery. In one patient disruption of the anterior hip capsule and anterior subluxation with external rotation was documented at the hip periphery. The capsular defect was closed with 2 sutures and the hip was stabilized.

One patient presented avascular necrosis at the 3 year follow-up visit and a Total Hip Replacement was indicated. This patient had the longest dislocation time before reduction in the series (7 hours).

Discussion
There are few reports in peer-reviewed literature regarding the use of hip arthroscopy to treat intraarticular pathology after posterior hip dislocation. Svoboda et al. (3) published a case report in 2003 of a patient with residual intra-articular fragments in the hip joint after posterior hip dislocation, the fragments were removed using hip arthroscopy and the authors concluded that hip arthroscopy is a safe and effective technique to remove loose fragments. Also in 2003 Yamamoto et al. (4) published a series of 11 cases of dislocation and fracture dislocation of the hip treated by arthroscopic removal of loose intraarticular fragments, 5 cases has associated Pipkin femoral head fractures (12), one of them treated with arthroscopic fixation of the fragment using an absorbable pin. Four cases required open surgery for fragment fixation after the arthroscopic procedure and concluded that arthroscopy provides safe access to the hip joint for fragment removal after hip dislocations and in some cases to perform arthroscopically assisted fragment fixation and report that in some cases it prevents the development of posttraumatic hip osteoarthritis after 5 years. Byrd et al (5) in 2004 reported on traumatic injury of Ligamentum Teres in 23 patients of which 6 had previous traumatic hip dislocation. Ligamentum Teres lesions were treated by partial debridment. Dr. Byrd reported associated intra-articular injuries in 15 patients that included loose bodies, chondral damage and labral tears. Ninety percent of the patients in the series showed more than 20 points improvement in the Harris hip Score. The authors concluded that traumatic injury to the ligamentum teres responds well to partial arthroscopic debridment. In 2009, Philippon et al. (6) published a series of 14 professional athletes that presented a traumatic hip dislocation during active competition. All the patients presented labral and chondral damage but the authors did not specify the location of these lesions. They also found that 8 patients in the series had cam type impingement and 5 patients had pincer impingement of which 4 were combined with cam impingement. Partial debridment of Ligamentum teres Tears was performed in 12 cases. The authors found that 11 patients presented loose bodies, which were removed arthroscopically.

The authors concluded that intra-articular pathology is very frequent after traumatic hip dislocations with the most common being labral lesions chondral damage, intra-articular loose bodies and Ligamentum Teres tears. Kelly et al. (13) presented at the 2008 AANA Annual Meeting a consecutive series of 14 patients with posterior subluxation or dislocation. Thirteen patients had a Magnetic Resonance Imaging (MRI) study performed, all the 13 patients had MRI evidence of an anterior labral tear, 4 had evidence of iliofemoral ligament disruption, and 3 had posterior labral tears. Of the 13 patients that had MRI studies performed 9 underwent hip arthroscopy. Anterior labral tears were found in every patient at arthroscopy. The authors concluded that anterior labral tears are common in posterior hip dislocation or subluxation. They also mention that these tears may contribute to posttraumatic pain and that arthroscopic intervention serves as an adequate form of treatment for this condition.

In our study we present a series of 17 patients with well documented posterior hip dislocation, information on the amount of time the hip was dislocated and the time between reduction and arthroscopic intervention of the hip were investigated. Only two patients were los to follow-up at a minimum of 3 years and our average follow-up was

The average increment of the WOMAC score for the full series between preoperative and last follow-up questionnaires was 40.5 points. This increment seems impressive but may be influenced because many of the patients were advised not to weight bear before the arthroscopic procedure to prevent third body wear from intraarticular fragments.

Two patients required a Total Hip Replacement; one patient presented avascular necrosis had the longest time with the hip dislocated (7 hours), the risk of avascular necrosis is well documented in the literature after
a hip dislocation and it increases importantly after 6 hours of having a dislocated hip (1). The patient that had osteoarthritis that required total hip replacement presented the most severe intraarticular damage on the acetabular side with extensive areas of exposed subchondral bone in the load bearing area.

All of the other patients in our series had more predictable results.

Femoral chondral damage was the most frequent finding and was restricted to one zone (2 subzones) in 14 patients and 2 zones (4 subzones) in 3 patients.

Every patient except one had acetabular chondral damage. One case had Outerbridge type 4 damage in 3 zones. This was the worst prognostic factor.

Eleven cases had 2 zone cartilage injury on the acetabulum of which one was Outerbridge Type 3 and one was Outerbridge type 4 (This mainly on the posterior zones). Standard arthroscopic techniques for cartilage lesions and Microfractures were used to treat these combinations with good results.

Ligamentum Teres Injuries were observed in every patient and were treated successfully by partial debridment, this corresponds to the results of Byrd et al. (11).

Anterior labral tears were more common than posterior labral tears, this corresponds to the observations made by Kelly et al. (13). Anterior labral tears were observed in 14 patients as opposed to only 6 patients that had posterior labral tears. Only one anterior detachment and one posterior detachment were repaired because marginal tears were more common than labral detachments or longitudinal tears in our series.

Loose bodies were found at the acetabular fossa (zone 6) in 14 out of 17 patients. In one patient in the series loose bodies were not detected in the preoperative studies including simple radiographs and CT scans. Arthroscopic loose body removal was successful in improving the outcome scores in every patient with the exception of the patient that has large loose bodies associated with massive cartilage damage over 3 acetabular zones.

Conclusion
Hip arthroscopy is an effective and safe method of treating intraarticular pathology in the hip after posterior hip dislocation. It also constitutes an important tool for diagnosis of pathology which is found to find in preoperative studies. The limitations of the successful arthroscopic treatment of patients after posterior hip dislocation are related with the amount of articular damage suffered during dislocation of reduction and by well known risk factors like the thime the hip is dislocated before reduction and associated injuries. No complications were directly related to the performance of hip arthroscopy in any patient in our series.
References