

Usefulness of Arthroscopic Treatment of Painful Hip after Acetabular Fracture or Hip Dislocation

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Background: Painful hip following hip dislocation or acetabular fracture can be an important signal for early degeneration and progression to osteoarthritis due to intraarticular pathology. However, there is limited literature discussing the use of arthroscopy for the treatment of painful hip. The purpose of this retrospective study was to analyze the effectiveness and benefit of arthroscopic treatment for patients with a painful hip after major trauma.

Methods: From July 2003 to February 2013, we reviewed 13 patients who underwent arthroscopic treatment after acetabular fracture or hip dislocation and were followed up for a minimum of 2 postoperative years. The degree of osteoarthritis based on the Tonnis classification pre- and postoperatively at final follow-up was determined. Clinical outcomes were evaluated using visual analogue scale for pain (VAS) and modified Harris hip score (MHHS), and range of motion (ROM) of the hip pre- and postoperatively at final follow-up.

Results: There were nine male and four female patients with a mean age at surgery of 28 years (range, 20 to 50 years). The mean follow-up period of the patients was 59.8 months (range, 24 to 115 months), and the mean interval between initial trauma and arthroscopic treatment was 40.8 months (range, 1 to 144 months). At the final follow-up, VAS and MHHS improved significantly from 6.3 and 53.4 to 3.0 and 88.3, respectively ($p = 0.002$ and $p < 0.001$, respectively). However, there were no significant differences in hip flexion, abduction, adduction, external rotation, and internal rotation as minor improvements from 113.1°, 38.5°, 28.5°, 36.5°, and 22.7° to 118.5°, 39.0°, 29.2°, 38.9°, and 26.5° were observed, respectively ($p = 0.070$, $p = 0.414$, $p = 0.317$, $p = 0.084$, and $p = 0.136$, respectively). None of the patients exhibited progression of osteoarthritis of the hip at the final follow-up.

Conclusions: Arthroscopic treatment after acetabular fracture or hip dislocation is effective and delays the progression of traumatic osteoarthritis.

Keywords: Hip, Wounds and injuries, Osteoarthritis, Arthroscopy

On account of an increasing understanding of femoroacetabular impingement (FAI), hip arthroscopy has gained considerable popularity in the past decade.¹⁾ And there has been an increasing body of literature regarding ar-

throscopic management of FAI and most of them were intra-articular pathologies about cam- and pincer-type of FAI.²⁻⁵⁾ Recent sports medicine literature has focused mainly on these hip conditions, but advances in diagnostic imaging techniques now allow for the precise diagnosis of various intra-articular conditions including labral tears, chondral lesions, hip osteoarthritis, ruptured ligamentum teres, osteonecrosis, problems after hip resurfacing or arthroplasty, hip instability, synovial conditions, and problems associated trauma.^{6,7)} Among them, nonconcentric reduction after hip dislocation or intra-articular fragments

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due to fracture around hip joint are possible candidates for hip arthroscopy.⁸⁻¹²⁾

Fractures or dislocations around the hip joint are caused by high-energy trauma and mainly occur in young adults as a result of traffic accidents, such as motor vehicle accidents.^{13,14)} The rate of coxarthrosis after hip dislocation is 24% for simple dislocations and 88% for those associated with acetabular fractures.⁹⁾ Hip pain after acetabular fracture and hip dislocation is associated with anatomical reduction, presence of intra-articular loose fragments, instability of the hip joint, and concomitant injury. The most common painful intra-articular pathologies after acetabular fracture or hip dislocation major hip joint trauma are ligamentum teres injury, loose body, cartilage injury, and labral tear.⁸⁾ The hip pain due to intra-articular pathology can potentially be a signal for early degeneration and progression to osteoarthritis.¹⁰⁾ However, there is limited literature discussing the usefulness of arthroscopy for the treatment of hip pain after high-energy acetabular fracture or traumatic hip dislocation.^{15,16)}

We hypothesized that arthroscopic treatment of painful hip after acetabular fracture or hip dislocation is

effective and delays the progression of traumatic osteoarthritis. This retrospective study was carried out to evaluate clinical outcomes and radiological outcome of arthroscopic treatment for painful hip with intra-articular pathologies after acetabular fracture or hip dislocation.

METHODS

Patient Selection

This study was approved by the Chungnam National University Hospital Institutional Review Board and informed consent was waived from all patients. From July 2003 to February 2013, we performed retrospective review of 13 patients, who underwent hip arthroscopy due to persistent pain and intraarticular pathology after major hip trauma such as acetabular fracture and hip dislocation. The exclusion criteria was as follows: (1) a history of low-energy hip trauma (i.e., contusion or sprain); (2) history of surgery involving the femur or pelvis before the major trauma; (3) Tonnis grade 2 or above;¹⁷⁾ (4) proliferative disease of the hip (i.e., synovial chondromatosis, pigmented villonodular synovitis); (5) neuromuscular disease (i.e., cerebral palsy);

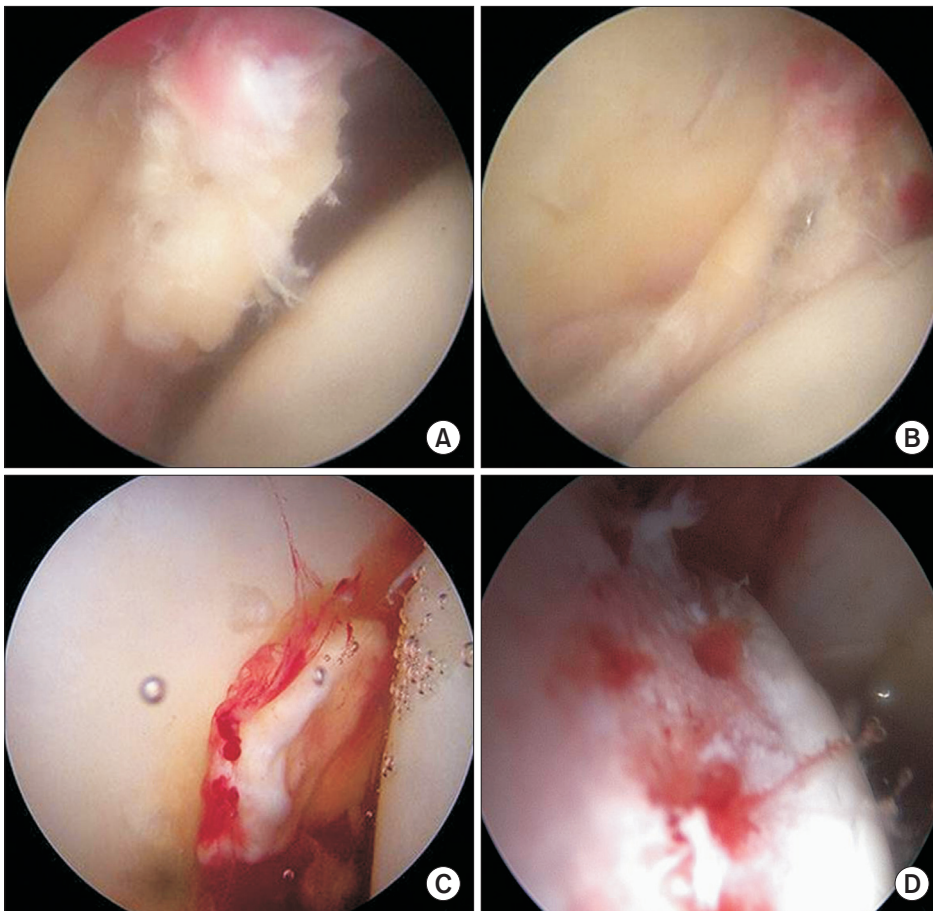


Fig. 1. A 50-year-old male who had traumatic hip dislocation underwent arthroscopic treatment. (A) Arthroscopic view shows posterior labral tear. (B) Arthroscopic view shows arthroscopic partial labrectomy. (C) Arthroscopic view shows intra-articular loose body on acetabular articular surface. (D) Arthroscopic view shows removal of loose body and microfracture.

(6) Legg-Calve-Perthes deformity; (7) ankylosing spondylitis or diffuse idiopathic skeletal hyperostosis; and (8) developmental dysplasia of the hip. Arthroscopic treatment was planned based on persistent or aggravating hip pain and intra-articular pathologies such as loose fragments, labral tears, and ligamentum teres injury on hip three-dimensional computed tomography (3D CT) and magnetic resonance imaging (MRI).¹⁸⁾

Surgical Technique and Postoperative Care

All arthroscopic procedures were performed by a single senior surgeon. After general anesthesia, the patient was placed in a supine position, the hip joint was abducted by 10° to 15°, and the lower extremity was placed in a neutral position and fixed to the fracture table. For procedures on the central compartment of the joint, the hip joint was extended about 8 to 10 mm under monitoring with an image amplifier. Three portals (anterior, anterolateral, and posterolateral) were made, mainly using a 70°-angled arthroscope. After the intra-articular pathologies were identified subsequent to appropriate anterolateral capsulotomy, loose fragments were removed using a grasper *via* the anterior or posterolateral portal, and labral tears were debrided using an arthroscopic shaver or repaired using a 2.9-mm Bioraptor suture anchor (Smith & Nephew, London, UK) (Fig. 1A–C). Ligamentum teres injury was debrided using a shaver or was shrunk by Vulcan (Smith & Nephew) through the anterior or posterolateral portal, and cartilage injuries of the femoral head and acetabulum were treated by microfracture (Fig. 1D). After traction was released, the arthroscope was moved towards the periph-

eral compartment through the same portal while the hip joint was flexed by about 40°, at which time a 30° angled arthroscope was introduced. Pathologies of the peripheral compartment, such as a femoral head neck spur or a traumatic bony deformity, were treated by femoroplasty.^{13,18)}

All cases underwent 3D CT on the second day postoperatively to check the postoperative state of the acetabuloplasty and femoroplasty and removal of loose bodies (Fig. 2). All patients were discharged on the third day after the procedure. Partial weight-bearing with crutches was permitted for four weeks in case of patients who had undergone osteoplasty and labral repair. Continuous passive motion and passive pendulum exercise were started after the procedure to avoid postoperative capsular adhesion. Hyperflexion of the hip over 90° was forbidden for four weeks.

Radiological and Clinical Evaluation

We identified the degree of osteoarthritis based on the Tonnis classification pre- and postoperatively at final follow-up.¹⁷⁾ Clinical outcomes were evaluated using visual analogue scale for pain (VAS) and modified Harris hip score (MHHS), and range of motion (ROM) of the hip pre- and postoperatively at final follow-up.¹⁹⁾

Statistical Analysis

The paired *t*-tests were used to assess the difference in outcomes before surgery and at the time of the final follow-up. The IBM SPSS ver. 19.0 (IBM Co., Armonk, NY, USA) was used for all statistical analyses, with the α level set at 0.05.

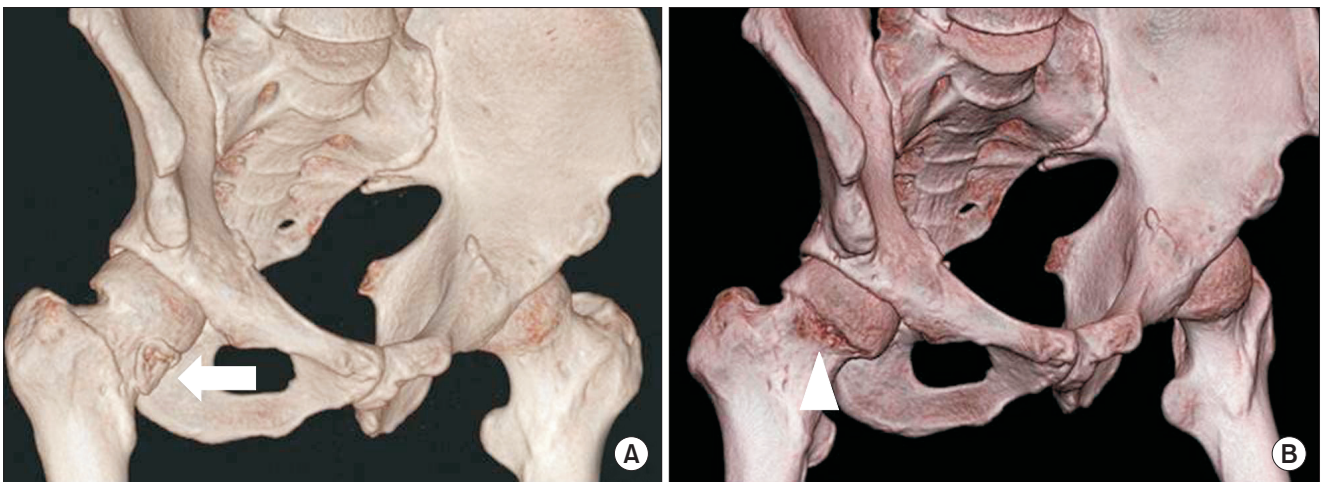


Fig. 2. Pre- and postoperative three-dimensional computed tomography (3D CT) images. (A) Preoperative 3D CT image shows loose body on femoral head and neck (arrow). (B) Postoperative 3D CT image shows removal of loose body and femoroplasty (arrowhead).

RESULTS

There were 13 patients (nine males and four females) with a mean age of 28 years (range, 20 to 50 years) at the index operation. The mean follow-up period was 59.8 months (range, 24 to 115 months). The mean interval from initial trauma to arthroscopic surgery was 40.8 months (range, 1 to 144 months) (Table 1). The cause of injury was traffic

Table 1. Demographic Data

Variable	Value
No. of patients (hips)	13 (13)
Sex (male:female)	9:4
Age at surgery (yr), mean (range)	28 (20–50)
Right:left	7:6
Interval from initial trauma to arthroscopic surgery (mo), mean (range)	40.8 (1–144)
Follow-up (mo), mean (range)	59.8 (24–115)
Previous history	
Acetabular fracture	11
Hip dislocation	7
Operation due to trauma	6
Tonnis grade of hip at surgery	
0	8
1	5
Concomitant lesion	
Labral tear	10
Ligamentum teres rupture	9
Loose body	5
Femoroacetabular impingement	2
Procedure for concomitant lesion	
Labrectomy	9
Labral repair	1
Ligamentum teres debridement	9
Ligamentum teres shrinkage	4
Loose body removal	5
Femoroplasty	2
Microfracture	2
Spur resection	4

accident in ten patients and sports injury in three patients, of them, six patients had undergone hip surgery after acetabular fracture or hip dislocation. Arthroscopically, we performed loose bony fragment removal, debridement or repair of a torn acetabular labrum, debridement or shrinkage of a torn ligament teres remnant, excision of osteophytes, synovectomy, or microfractures (Table 1).

At the final follow-up, VAS and MHHS improved significantly from 6.3 and 53.4 to 3.0 and 88.3, respectively ($p = 0.002$ and $p < 0.001$, respectively). However, there were no significant differences in hip flexion, abduction, adduction, external rotation, and internal rotation as improvement was seen from 113.1°, 38.5°, 28.5°, 36.5°, and 22.7° to 118.5°, 39.0°, 29.2°, 38.9°, and 26.5°, respectively ($p = 0.070$, $p = 0.414$, $p = 0.317$, $p = 0.084$, and $p = 0.136$, respectively) (Table 2).

None of the patients exhibited progression of osteoarthritis of the hip at the final follow-up. Eight and five patients with preoperative Tonnis grade 0 and 1 were successful in maintaining their grade, respectively. There were no intra- or perioperative complications such as neural injury and wound infection.

DISCUSSION

Hip arthroscopy provides a clear view of the articular surface of the femoral head, the acetabular labrum, the ligamentum teres and synovium.⁷⁾ Today, hip arthroscopy is becoming popular for procedures not only inside the hip joint but also surrounding it.^{6,20,21)} Therefore, arthroscopic surgery of the hip joint can facilitate diagnosis and treatment of labral tears and other intra-articular and peripheral pathologies.^{8,18,22-24)} However, few reports have focused on arthroscopic treatment of coxarthrosis after fracture

Table 2. Comparison of the Pre- and Postoperative Clinical Outcomes at the Final Follow-up

Variable	Preoperative	Final	<i>p</i> -value
Visual analogue scale	6.3 ± 1.7	3.0 ± 2.4	0.002
Modified Harris hip score	53.4 ± 21.2	88.3 ± 7.7	< 0.001
Flexion (°)	113.1 ± 13.0	118.5 ± 7.7	0.070
Abduction (°)	38.5 ± 3.2	39.0 ± 2.8	0.414
Adduction (°)	28.5 ± 2.4	29.2 ± 1.9	0.317
External rotation (°)	36.5 ± 6.6	38.9 ± 4.6	0.084
Internal rotation (°)	22.7 ± 9.0	26.5 ± 7.5	0.136

Values are presented as mean ± standard deviation.

or dislocation of the hip joint. In the previous study, arthroscopic debridement of 23 ligamentum teres ruptures that occurred after major hip trauma showed a satisfactory outcome on the Harris hip score with a 20-point improvement or better, and 15 cases had intra-articular pathologies such as loose bodies, cartilage injury, and labral tears.⁸⁾ The most common intra-articular pathologies that occur in athletes after hip dislocation are labral tears, cartilage injury, loose bodies, and ligamentum teres injury.¹⁰⁾ In our study, loose bodies, labral tears, ligamentum teres injury, and cartilage injury as intra-articular lesions were checked, and the VAS and MHHS improved significantly at the final follow-up after surgery. In addition, osteoarthritis did not progress at the final follow-up.

In particular, an intra-articular loose body, frequently observed after hip trauma, could cause progression of traumatic osteoarthritis.²⁵⁻²⁷⁾ Svoboda et al.¹¹⁾ reported that arthroscopic removal of the loose body in patients with posterior dislocation of the hip was safe and effective. Yamamoto et al.¹²⁾ reported that among 11 patients with fracture and/or dislocation of the hip joint, who underwent arthroscopic treatment, nine patients were treated with loose body removal, which safely prevented traumatic arthritis. In our study, five patients underwent arthroscopic removal with effective relief of their symptoms. Furthermore, it has been reported that labral tear results in hip pain and osteoarthritis.^{2,3,28)} Ilizaliturri et al.¹³⁾ reported that among 17 patients, who underwent arthroscopic treatment after posterior dislocation of the hip, 14 patients had anterior labral tears and six patients had posterior labral tear and most of the patients had significant improvement after hip arthroscopy. In our study, ten patients had labral tear on arthroscopy and experienced relief of symptoms after treatment with debridement and/or repair (Table 3).

Our study had several limitations. First, the number

of patients was not large enough to generate significant results. However, patients, who underwent arthroscopic treatment due to acetabular fracture or hip dislocation, were exceptional. Second, we could not design a prospective comparative study. Nevertheless, our study is associated with significant features. First, there exist only few studies discussing the use of arthroscopy for the treatment of hip pain following high-energy acetabular fracture or traumatic hip dislocation. Second, we demonstrated that arthroscopic treatment for coxarthrosis after acetabular fracture or hip dislocation effectively prevents progression of traumatic arthritis on short-term follow-up.

In conclusion, arthroscopic treatment for painful hip after acetabular fracture or hip dislocation could result in satisfactory outcomes including relief of symptoms and prevention of the progression of traumatic arthritis on a minimum follow-up of 2 years. Consequently, the hypotheses that arthroscopic treatment of painful hip after acetabular fracture or hip dislocation is effective and delays the progression of traumatic osteoarthritis were supported through the present study. However, future study demands mid- and long-term results in more patients, which will provide detailed insights to this area of study.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

Table 3. Summary of Arthroscopic Treatment of Trauma around Hip Joint

Source	No. of patients	Type of trauma (no.)	Preoperative score	Postoperative score
Byrd and Jones ⁹⁾	23	Major trauma (9) including dislocation (6) and twisting (8)	47 HHS	90 HHS
Philippon et al. ¹⁰⁾	14	Dislocation (14)	-	-
Svoboda et al. ¹¹⁾	1	Posterior dislocation (1)	-	-
Yamamoto et al. ¹²⁾	10	Hip fracture and dislocation (10), and acetabular fracture (1)	-	-
Ilizaliturri et al. ¹³⁾	17	Posterior dislocation (17)	46 WOMAC	87 WOMAC
Present study	13	Acetabular fracture (11) and dislocation (7)	6.3 VAS 53.4 MHHS	3.0 VAS 88.3 MHHS

HHS: Harris hip score, WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index, VAS: visual analogue scale for pain, MHHS: modified HHS.

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