Hip Arthroscopy in Traumatic Hip Dislocation:

Literature review and two case reports

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Hip dislocations occur commonly in young adults from high-energy motor vehicle accidents. Injuries to the hip range from simple dislocation without a fracture to complex fracture of the acetabulum or femoral head/neck. Complications after traumatic hip dislocation are devastating. This injury may lead to prolonged disability and dysfunction from complications such as osteoarthritis (OA) and osteonecrosis. Osteoarthritis after traumatic hip dislocation occurs at a frequency of 24% to 54%. There was a report that demonstrated 24% of the simple hip dislocation patients developed osteoarthritis. The development of OA after hip dislocation is considered to be caused by residual intra-articular small bone or cartilage fragments. Several patients may have loose bodies within the joint that goes unrecognized and untreated. There is a high prevalence of intra-articular loose bodies despite negative plain radiographs and thin-cut CT scans. Direct arthroscopic visualization is the best way to demonstrate the intra-articular loose bodies and debris. The main purpose of this article is to review the role of hip arthroscopy in traumatic hip dislocations and a variety of traumatic hip injuries.

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Introduction

Hip dislocations occur commonly in young adults from high-energy motor vehicle accidents. Substantial force is required to dislocate the native hip joint. A high likelihood of associated injuries is observed, either systemic or musculoskeletal, and ipsilateral knee injuries are common.

Injuries to the hip range from simple dislocation without a fracture to a complex fracture of the acetabulum or femoral head/neck. Hip dislocation is classified based on the direction of displacement of the femoral head in relation to the acetabulum, whether anterior or posterior. The most widely used classification is the Thompson and Epstein classification (Table 1). Anterior dislocation can be divided into three types: obturator, pubic, and iliac.

Closed reduction of the dislocated hip should be considered as an emergency management to prevent avascular necrosis of the femoral head.

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Closed reduction is usually accomplished via traction in line with the deformity. Many reduction techniques have been described for anterior and posterior dislocation. The Allis maneuver was first described in 1896 and is used commonly in our institutes. However, despite hip fracture-dislocation being treated with anatomical reduction, many patients still fail to return to their preinjury functional level[1-4].

Complications after traumatic hip dislocation are devastating because these patients tend to be young and active. This injury may lead to prolonged disability and dysfunction from the complications, such as osteoarthritis (OA) and osteonecrosis.

It has been known for a long time that loose bodies are generated with traumatic hip dislocation as the femoral head impacts against the acetabulum[6]. The development of osteoarthritic changes after a hip dislocation is considered to be caused by residual intra-articular small bone or cartilage fragments, or by inaccurate reduction of the bone fragment[7-11]. In 1974, Epstein reported that the development of osteoarthritis following hip dislocation was caused by the intra-articular free osteochondral fragments, and he recommended

treatment by open reduction together with washing out the osteochondral fragments[12]. Evans et al. proved experimentally in rabbit joints that free cartilaginous particles inside the joint increase chondrolytic enzyme activity and induce secondary arthritis[13].

Osteoarthritis after traumatic hip dislocation occurs at a frequency of 24% to 54%[5,7,14-16] and the incidence of this complication correlates with the severity of the trauma. Simple dislocation is believed to have a good prognosis. However, in 1983, Upadhyay et al. reported a long-term follow-up study, averaging 14.7 years, involving 74 cases of simple traumatic hip dislocation. Interestingly, they found that 24% of the simple hip dislocation patients developed osteoarthritis[16].

Incongruity of the hip joint after reduction on plain radiographs or computed tomography (CT) scans is a sign of bony or chondral fragments interposition. However, a negative CT scan does not rule out the presence of intra-articular pathology. There is a high prevalence of intra-articular loose bodies despite negative plain radiographs and thin-cut CT scans. Several patients may have debris within the joint that goes unrecognized and untreated. Direct arthroscopic visualization is the best way to demonstrate the intra-articular loose bodies and debris[17,18].

Table 1 Thompson and Epstein classification[5]

Type	Description
1	Dislocation with or without minor fracture
2	Posterior fracture-dislocation with a single, significant fragment
3	Dislocation in which the posterior wall contains comminuted fragments with or without a major fragment
4	Dislocation with a large segment of posterior wall that extends into the acetabular floor
5	Dislocation with fracture of the femoral head

Hip Arthroscopy

Hip arthroscopy techniques have advanced greatly in the past decade. Various hip pathologies such as femoroacetabular impingement, acetabular labral tear, cartilage injury, septic hip, synovial disease, and loose bodies can be treated by modern hip arthroscopy techniques. Even though the number of hip arthroscopies performed by sports medicine surgeons increases worldwide, there is still a relatively small number of hip arthroscopies performed in Thailand.

The main purpose of this article is to review the role of hip arthroscopy in traumatic hip dislocations and a variety of traumatic hip injuries.

From the present literature, there are several intraarticular hip pathologies that can be found in hip dislocations. Philippon et al. evaluated 14 athletes with traumatic hip dislocations, all of which had labral tears and chondral defects. Furthermore, 11/14(78.6%) had loose osteochondral fragments in the hip joint[19]. Ilizaliturri et al. performed hip arthroscopies in 17 patients with traumatic hip dislocations. They found labral tears in 16/17 patients (94.1%), femoral chondral injury in all patients (100%), acetabular chondral injury in 16/17(94.1%), and intraarticular loose fragments in 14/17(82.4%)[20].

Regarding the treatment options, hip arthroscopy is used increasingly as a less invasive surgery for diagnosing and treating the hip trauma. Mullis and Dahners reviewed 36 patients who had hip arthroscopies after traumatic hip dislocations or acetabular wall fractures. The loose bodies were found in 33/36 patients (92%). Interestingly, loose bodies appeared in 7/9 cases (78%) with negative results from plain x-rays and CT scans[18].

Ilizaliturri et al. treated 17 dislocated hip patients with arthroscopy. They performed arthroscopic loose body removals, partial labral resections for complex tears, labral repairs for labral detachments, and flap removals for unstable chondral injuries. The WOMAC score was significantly improved from 46 to 87[20].

Chernchujit et al. described the hip arthroscopy technique and 15.7 month results of arthroscopic loose body removal in 7 hip dislocations. All patients had a full range of motion, no hip pain, and good stability. The average Harris Hip Score was 89.8[21].

Yamamoto et al. reported a study of hip arthroscopy in 11 hip trauma cases (10 hip dislocations, 1 acetabular fracture). In all cases, small intraarticular free fragments were found, but 7 hips were not detected by CT scans. One fracture dislocation of the femoral head (Pipkin I) could be stabilized by the arthroscopic technique. In the acetabular fracture, the reduction and percutaneous pinning were also performed by arthroscopic surgery. After an average follow-up period of 9.5 years, 9 in 11 hips had excellent results. However, there was one case of aseptic necrosis of the femoral head in Pipkin 3 and one incident of osteoarthritis in the hip dislocation group (Thompson-Epstein type 4). They concluded that the hip arthroscopy is a useful procedure for removing small free fragments and stabilizing femoral head fractures[17].

Khanna et al. studied intra-articular hip pathologic findings in 29 traumatic hip injuries by using arthroscopy versus imaging. 17 out of 29 hips were found to have loose bodies by arthroscopy. Only in one case from the 17 can the loose bodies be identified preoperatively by plain radiography. Furthermore, there were only two cases in which CT scans demonstrated the loose bodies. The

sensitivity of the X-rays and CT scans were 6% and 14%, but both had 100% specificity. For 11 intra-articular stepping cases by arthroscopic findings, 5 were found by plain radiography and 6 were diagnosed by a CT scan. The sensitivity of the X-rays and CT scans were 45% and 67%, respectively. The specificity of both investigations was 100% and 90%. From 11 MRIs of hips, 10 cases were diagnosed for labral tears as all could be found by arthroscopy. Sensitivity of the MRI for diagnosing the labral tear was 91%. They concluded that plain radiographs and CT scans have low sensitivity for diagnosing the loose bodies and intra-articular stepping when compared with the hip arthroscopy[27].

Park et al. performed a hip arthroscopy in a patient who had a femoral head fracture dislocation associated with an acetabular fracture (Pipkin type IV). Although the patient underwent closed reduction of the dislocated hip, and open reduction and internal fixation of the acetabular fracture, he still had a discomfort in the hip. The hip arthroscopy demonstrated a torn labrum and multiple osteochondral fragments. After the labral fixation and osteochondral fragment removals, the patient recovered immediately[22]. Park et al. also reported the technique of hip arthroscopy for stabilizing the fracture dislocation of the femoral head (Pipkin I).[28]

Although the hip arthroscopy is a less invasive procedure, it has several complications. The overall complication rate is 1.4% to 5%. The complications are neurapraxia (femoral nerve, sciatic nerve, lateral femoral cutaneous nerve, and pudendal nerve), scrotal necrosis, cartilage injury, infection, and avascular necrosis of the hip[23,24]. Bartlett et al. reported a case of both column fracture of the acetabulum. The acetabular fracture was successfully stabilized by open reduction and internal fixation. Although the fragments were intraoperatively removed, a postoperative CT scan showed a persistent fragment and minimal joint subluxation. The fragment was removed by hip arthroscopy. During the surgery, the arthroscopic fluids were leaked into the intraabdominal cavity through the fracture site. The patient had a cardiac arrest from intra-abdominal compartment syndrome. An emergency exploratory laparotomy was performed to release the pressure. After fluid drainage, the patient survived. They concluded that hip arthroscopy is not advocated for acute or healing acetabular fractures[25].

Hip instability is another complication that may be caused by hip arthroscopy. Rosenbaum et al. report a posterior hip dislocation following a hip arthroscopy for a treatment of femoroacetabular impingement[26]. Instability induced by the hip arthroscopy plays a major role and should be approached cautiously especially in patients with hip dislocations.

It is still not clear in the present literature whether the removal of loose bodies prevents osteoarthritis and improves clinical outcomes. However, it is clear that direct injury occurs to the articular cartilage by axial load and shear forces generated during the dislocation and reduction.

Although some basic science studies showed that loose bodies might lead to inflammatory changes in the joint, it is also possible that loose bodies could remain in the fovea and adsorb to the synovium. Many researchers suspect that undetected loose bodies are responsible for the development of degenerative arthritis in some of the patients with simple dislocations or fracture dislocations. The lowest rate of posttraumatic arthritis reported was 24% for simple dislocations and higher for fracture dislocations.

Further prospective studies are necessary to determine whether early arthroscopic removal of loose bodies after traumatic dislocation decreases the incidence of post-traumatic hip arthritis and improves the clinical outcomes of our patients.

Case presentation

Patient 1

A 32-year-old male patient fell from a height and suffered a posterior dislocation of his left hip. He had flexion, adduction, and internal rotation deformities of the affected hip. Plain radiographs showed a posterior hip dislocation without acetabular or femoral head fracture. Closed reduction was performed within 3 hours after the accident. Neurovascular status was normal. There was no concomitant injury. Post-reduction radiographs showed a small bony fragment located medial to the femoral head; however, the overall joint space was concentric. A CT scan was undertaken to evaluate the hip joint. A small bony fragment at the fovea could be seen on the CT scan (Fig. 1). Risks, benefits, and the controversial issues of hip arthroscopic surgery in traumatic hip dislocation were discussed with the patient. The consent form was signed. After that, a hip arthroscopy for loose body removal was performed by the author (TP) in day 5 after the accident.

The patient was under general anesthesia. He was placed in a supine position using a standard fracture table with traction. A well-padded post was crucial to prevent injury to the perineum. Longitudinal traction was applied to create the space of the joint. (Fig. 2) We used standard anterolateral, posterolateral, anterior, and mid anterior portals. We did not perform capsulotomy connecting the portals. Intra-operatively, we found bony avulsion of the ligamentum teres from the fovea capitis with pieces of bony fragments from the fovea. (Fig. 3A) Removal of loose bodies was performed using pituitary forceps. (Fig. 3B) Small bony and cartilaginous debris was removed by a motorized shaver and irrigation.

(A) (B)

Fig. 1 Axial (A) and coronal (B) CT demonstrated fragmented bony avulsion from the fovea.

Fig. 2 The patient was in a supine position on a standard fracture table. The left hip was at 10 degrees abduction and flexion. The left foot must be tightly fixed to the fracture table boot otherwise it may slip when traction is applied. The large soft peroneal post was placed eccentrically toward the affected hip to prevent pudendal nerve injury.

(A) (B)

Fig. 3 (A) An osteochondral fragment was identified and mobilized with an arthroscopic instrument.
(B) Multiple loose bodies were removed from the hip sized 3-7 mm.

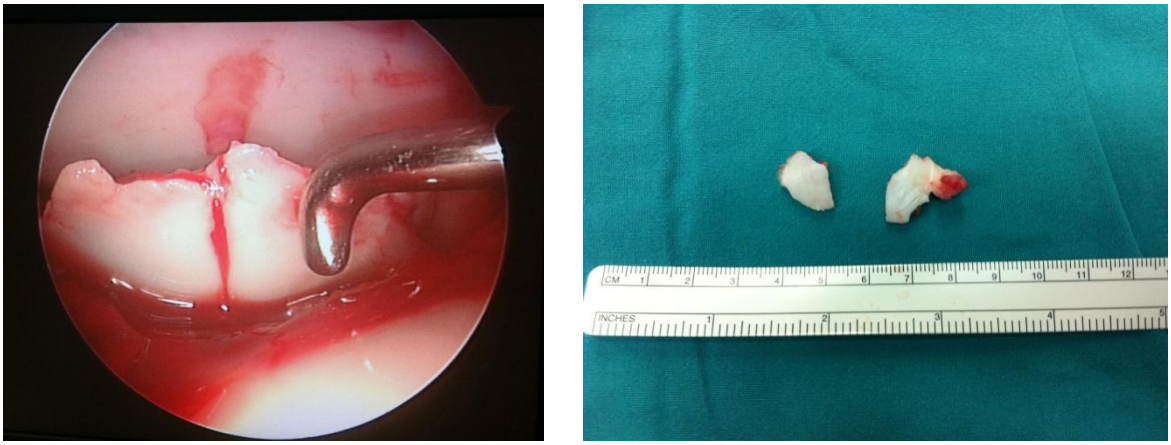
Patient 2

An 18-year-old male patient suffered a motorcycle accident and had a posterior dislocation of his right hip. Plain radiographs showed a posterior hip dislocation with a femoral head fracture inferior to the fovea (Pipkin type I). Closed reduction was performed on an emergency basis. Plain radiographs and a CT scan after reduction demonstrated intra-articular small bony fragments and fracture of the femoral head (Fig. 4). After discussion about the risks and benefits of surgery to the patient, he decided to undergo hip arthroscopy. The surgery was performed by the author (TP) 3 days after the injury. He was placed in a supine position using a standard fracture table with traction to open the joint space (Fig. 5). Our purpose was to remove the small bony fragments and irrigate the joint, not to remove or fix the fracture of the femoral head. Intra-operatively, we found partial anterior labral detachment of approximately 5 mm in length. We assessed with the arthroscopic probe and found that it was stable; therefore, we decided not to fix it. We performed a dry arthroscope in this case because of continuous bleeding from the fracture site causing poor visualization when we pumped fluid into the joint. After complete arthroscopic examination, we identified two large osteochondral fragments interposed between the femoral head and acetabular cartilage (Fig. 6A). They were bony fragments which attached to avulsed ligamentum teres. Finally, two osteochondral fragments were removed with pituitary forceps (Fig. 6B). Post-operatively, our two patients were allowed to walk with full weight bearing as tolerated with crutches. No immediate post-operative complications were observed.

(A) (B)

Fig. 4 Axial (A) and coronal (B) CT demonstrated fracture of the femoral head inferior to the fovea (Pipkin I) with a large bony fragment in the cotyloid fossa.

Fig. 5 The hip joint was opened by longitudinal traction force. A long needle and nitinol wire were inserted follow by the dilator.



(A) (B)

Fig. 6 (A) Dry arthroscope was performed in this case because of continuous bleeding from the fracture site causing poor visualization when fluid was pumped into the joint.
(B) Large free osteochondral fragments were found between the femoral head and acetabulum.

Conclusion

It is still not clear in the present literature whether the removal of loose bodies prevents osteoarthritis and improves clinical outcomes. However, it is clear that direct injury occurs to the articular cartilage by axial load and shear forces generated during the dislocation and reduction. There is a high prevalence of intra-articular loose bodies despite negative plain radiographs and thin-cut CT scans. Direct arthroscopic visualization is the best way to demonstrate the intra-articular loose bodies.

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การส่องกล้องในข้อสะโพกเคลื่อนหลุดจากการบาดเจ็บ: ทบทวนวรรณกรรมและรายงานผู้ป่วย 2 ราย

ไตร พรหมแสง, พบ, สิทธิโชค สุขเจริญยิ่งยง, พบ, กิตติพงษ์ คงรักเกียรติยศ,พบ,
สมศักดิ์ คุปต์นิรัติศัยกุล, พบ

ข้อสะโพกเคลื่อนหลุดพบได้บ่อยในวัยผู้ใหญ่ โดยมักเกิดจากอุบัติเหตุจราจรที่มีความรุนแรง การบาดเจ็บมีตั้งแต่การเคลื่อนหลุดธรรมดาจนไปถึงการเคลื่อนหลุดแบบมีกระดูกเบ้าสะโพกหรือกระดูกหัวสะโพกหัก ภาวะแทรกซ้อนจากการเคลื่อนหลุดสร้างความทุกข์ทรมานและส่งผลต่อการใช้ชีวิตของผู้ป่วยอย่างมาก ภาวะแทรกซ้อนที่พบได้บ่อยคือกระดูกหัวสะโพกตายและข้อสะโพกเสื่อม โดยสถิติเราสามารถพบภาวะข้อสะโพกเสื่อมจากการเคลื่อนหลุดประมาณร้อยละ 24-54 ถึงแม้ว่าจะเป็นการเคลื่อนหลุดแบบธรรมดาก็ยังพบภาวะข้อเสื่อมได้สูงถึงร้อยละ 24 ซึ่งสาเหตุอาจเกิดจากมีเศษกระดูกและกระดูกอ่อนตกค้างอยู่ในข้อ โดยผู้ป่วยส่วนใหญ่ไม่ได้รับการวินิจฉัยและการรักษาที่ถูกต้อง อุบัติการณ์ของการพบเศษกระดูกตกค้างในข้อหลังการเคลื่อนหลุดมีสูงมาก ถึงแม้ว่าบางครั้งการตรวจด้วยภาพถ่ายรังสีธรรมดาและภาพถ่ายรังสีคอมพิวเตอร์จะไม่พบร่องรอยของเศษกระดูกก็ตาม การผ่าตัดส่องกล้องข้อสะโพกเป็นการตรวจที่สามารถวินิจฉัยการตกค้างของเศษกระดูกได้ดีที่สุด จุดประสงค์ของบทความนี้คือ เพื่อทบทวนวรรณกรรมที่เกี่ยวข้องกับการรักษาโดยการผ่าตัดส่องกล้องข้อสะโพกในผู้ป่วยที่มีการเคลื่อนหลุดของข้อสะโพก