Arthroscopically-Assisted Removal of Retained Loose Bodies in Acute Acetabular Fractures: A Modified Technique

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Abstract

Arthroscopically-assisted extraction of loose bodies retained in a hip joint after hip dislocation or acetabular fracture in the acute setting remains controversial. This article describes a practical and reproducible arthroscopically-assisted modified anterior approach for extracting loose bodies from a hip joint. This approach may be used in the acute dislocation or fracture setting.

Surgical challenges arise when loose bodies are retained in a hip joint after an acetabular fracture—nonoperative or operative—in trauma patients. Controversial issues include which loose bodies must be removed when a concentric reduction is obtained, what timing is optimal for surgery, and which removal approach is most effective. Investigators have recently proposed hip arthroscopy as an alternative approach to loose body removal and theorized its advantages over open debridement.[1-4] However, a case report of intraoperative iatrogenic abdominal compartment syndrome and subsequent nonfatal cardiac arrest caused by fluid extravasation has made surgeons wary of using this technique in the acute fracture setting.[5]

Most of the current literature on the use of hip arthroscopy in hip trauma cases describes extraction of loose bodies after hip dislocation, bullet extraction, or femoral head fracture reduction and fixation.[1-6] Standard arthroscopic principles have been applied to facilitate visualization and navigation within the hip joint for these traumatic cases incorporating infusion pumps, traditional hip portals with multiple cannulas, and traction to the leg. Unfortunately, in the trauma setting, patients may have other injuries or capsular defects that rule them out as good hip arthroscopy candidates. Complications after hip arthroscopy in trauma cases include fluid extravasation into the gluteal compartment; scrotal or perineal pressure wounds; lateral femoral cutaneous nerve injury; traction nerve palsies of the peroneal, pudendal, sciatic, and femoral nerves;

Figure 1. Radiographic image of loose body in hip joint.

Figure 2. Preoperative coronal computed tomography shows incarcerated fragments under immediate weight-bearing dome of acetabulum.

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Figure 3. Preoperative axial computed tomography shows intra-articular fragments with subluxation of hip joint.

Figure 4. Anteroposterior view on intraoperative fluoroscopy of hip joint shows retained loose bodies after application of femoral distractor.

iatrogenic cartilage injury caused by instruments; and cardiac arrest resulting from abdominal compartment syndrome.[1]

We successfully used an arthroscopically assisted modified open anterior approach to remove bony fragments from 6 patients in the acute fracture setting. This is a safe, effective, and reproducible technique for extracting fragments from the hip joint, and it provides excellent visualization without the need for traditional fluid irrigation, multiple portals, and traction with posts (**Figures 1, 2**).

Operative Technique

The patient is placed in the supine position on a radiolucent table. A bolster is placed under the involved knee to flex the hip and knee and to relax the anterior hip muscles. The involved hip joint and lower extremity are prepared and draped in standard surgical fashion. A modified Smith-Petersen approach is used to access the hip joint. A skin incision 5 cm long is made starting 2 finger widths distal to the anterior superior iliac spine. The interval between the sartorius and tensor fascia lata is developed after the lateral femoral cutaneous nerve is identified. Dissection is carried down between the gluteus medius and indirect head of the rectus femoris to the capsule. The lateral femoral circumflex vessel may need to be cauterized and transected. After the origin of the indirect head of the rectus femoris is released, an anterior capsulotomy 3 cm long is performed in line with the skin incision. Care must be taken during the capsulotomy to avoid injuring the femoral head cartilage or labrum.

Under fluoroscopic guidance, a large femoral distractor is then applied across the hip joint with pins placed in the supra-acetabular and greater trochanteric regions (**Figures 3, 4**). After distraction of the hip joint, a 30° arthroscope is introduced into the hip joint through the capsulotomy. As needed, suction catheter and rubber irrigation tubing may also be introduced into the hip joint through the capsulotomy. No cannulas or irrigation pumps are needed. Irrigation is performed in a limited fashion and intermittently, with standard suction as needed. No more than 100 mL of normal saline is needed to lavage the joint. The camera is introduced along the inferior aspect of the capsulotomy, with instruments above. Excellent visualization of the femoral head, fovea, and intra-articular fragments may be obtained without active bleeding or large hematoma collection. Although longer hip arthroscopy equipment may be used for fragment removal, routine knee arthroscopy probes and graspers may be used to extract fragments without difficulty. The entire fovea is readily visualized, allowing for the pulvinar to be lifted and the fragments to be localized (**Figures 5-7**). A 70° scope appears to allow for better visualization posterior to the femoral head.

After the femoral distractor is removed, the arthrotomy is closed and the anterior hip capsule is repaired. The tensor fascia is left open to avoid potential closure-related damage to the lateral femoral cutaneous nerve. Use of the small entry makes closure of the tensor fascia unnecessary. Subcutaneous tissue and skin are closed in standard fashion. Drains are used as necessary. Final fluoroscopic images of the hip should be obtained to assess the concentricity of the joint as well as fracture reduction. Postoperative weight-bearing protocols may vary according to injury.

Patients and Outcomes

In this series, 6 patients with hip trauma secondary to motor vehicle accidents presented to our institutions. All patients with loose bodies were placed in skeletal traction while awaiting the open removal surgery.

Patient 1 had a right transverse posterior wall fracture-dislocation of the hip and a left sacroiliac fracture-dislocation on initial radiographic evaluation. After successful closed reduction in the emergency department, computed tomography (CT) of the pelvis was performed to delineate the pelvic and acetabular fractures; intra-articular fragments were visible on the CT image. The patient was neurologically intact and hemodynamically stable. The next day, he was taken to the operating room for percutaneous screw fixation of the sacroiliac fracture-dislocation and open reduction and internal fixation (ORIF) of the acetabular fracture through a Kocher-Langenbeck approach. During surgery, multiple attempts were made to localize the fragments. We removed some fragments after applying a femoral distractor. Although fluoroscopy showed a concentric reduction of the hip, postoperative CT showed fragments retained in the joint as well as a slight hip incongruity.

Patient 2 sustained a right posterior wall acetabular fracture, and intra-articular fragments were identified on CT. The patient also had an ipsilateral femur fracture and a Lisfranc injury. He was neurologically intact. The acetabular fracture involved less than 20% of the posterior wall and did not require surgical intervention. The night of admission, retrograde femoral nailing was performed for the ipsilateral femur fracture. Given the size of the intra-articular fragments, the patient was taken to the operating room. There, the hip joint fragments were removed and ORIF of the Lisfranc injury was performed.

Patient 3 had a left posterior wall acetabular fracture. CT showed fragments incarcerated in the hip joint. The patient was neurologically intact. The same day he arrived, he was taken to the operating room so that the large interposed posterior wall fragments could be removed from the hip joint. ORIF of the acetabular fracture was performed through a Kocher-Langenbeck approach, and the loose bodies were removed from the hip joint. Postoperative CT showed fragments retained under the immediate weight-bearing dome of the acetabulum.

Patient 4 was a Division I collegiate football player with an isolated right posterior wall acetabular fracture-dislocation. Intra-articular fragments were identified on radiography. CT of the pelvis showed loose bodies in the weight-bearing dome of the acetabulum, but the acetabular fracture involved less than 20% of the posterior wall and did not require surgical fixation. The patient was neurologically intact. He was taken to the operating room for removal of the loose bodies from the hip.

Patient 5 had an isolated right posterior wall acetabular fracture-dislocation. Radiographs showed an eccentric hip joint. CT of the pelvis showed incarcerated intra-articular fragments associated with a nonoperative posterior wall fracture.

Figure 5. Intraoperative arthroscopy of fragment in fovea of acetabulum.

Figure 6. Intraoperative arthroscopy of extraction of loose body with grasper.

Figure 7. Hip joint after removal of fragment. Note cartilage abrasions on the femoral head.

Patient 6 had a right posterior wall fracture-dislocation on initial radiographic evaluation. He had a contralateral ankle fracture and ipsilateral pneumothorax with chest tube. CT showed a large intra-articular fragment in the weight-bearing dome of the acetabulum. Given the size of the intra-articular fragment, the patient was placed in skeletal traction until cleared for surgery.

All 6 patients had their intra-articular fragments removed in an acute fracture setting. Patient 1 underwent surgery for extraction of intra-articular fragments 5 days after his acetabular fixation. Patient 2 had loose bodies removed 5 days after sustaining his hip fracture-dislocation. Patient 3 had hip joint fragments removed 5 days after his acetabular surgery.

Patients 4, 5, and 6 had their loose bodies removed on hospital day 2. Pre-extraction CT helped delineate the size, shape, and location of fragments. During surgery, there was no active bleeding or large hematoma collection obstructing visualization. In all 3 cases, clear visualization allowed for easy navigation of the instruments used to grasp and extract fragments.

There were no intraoperative or postoperative complications, no nerve injuries, and no hip flexion contractures or heterotopic ossification. No patient received heterotopic ossification prophylaxis. All wounds healed well. All patients were instructed to use crutches and follow either a protected weight-bearing protocol or a non–weight-bearing protocol for 6 weeks after surgery. At 6-month follow-up, no patient reported hip pain or mechanical symptoms, such as catching or locking with hip motion. All patients were ambulating without assistive devices.

Discussion

Loose bodies in joints appear to contribute to the early development of synovitis and cartilage degradation, as noted in rabbit studies conducted by Evans and colleagues.[7] Epstein therefore recommended open reduction for all hip dislocations with documented loose bodies in order to decrease the rate of degenerative changes.[1] Although nonconcentric reductions of the hip joint and fragments under the immediate weight-bearing dome of the acetabulum are absolute indications for removal of loose bodies, there is less general consensus as to the necessity of removal of loose bodies with concentric reductions, particularly those in or below the fovea. Advocates of benign neglect of such loose bodies in or below the fovea have proposed open debridement only for symptomatic patients. Although the mechanism for intrasynovial resorption of loose bodies in joints is well recognized, the time frame in which it occurs is unknown and may not be predictable from the time when fragments become attached to the synovial lining. Thus, the mechanical wear and chronic synovitis caused by fragments in the joint may lead to progressive arthritis of the hip.[4,6,7]

In a retrospective review of the incidence of intra-articular fragments in patients with traumatic hip dislocations or small acetabular wall fractures that otherwise would have been treated nonoperatively, Mullis and Dahners[4] arthroscopically identified loose bodies in 7 of the 9 patients in whom postreduction CT of the hip did not show the fragments. Similarly, Yamamoto and colleagues[8] found loose bodies arthroscopically but not on preoperative CT of the hip in 8 of 11 joints in a series of hip dislocation cases. These free osteochondral or articular cartilage fragments may contribute to the development of hip arthritis after dislocations or fracture-dislocations. Open debridement with traction may not provide adequate visualization or palpation of the fragments, particularly with the pulvinar present in the fovea. Traditional hip arthroscopy is a less invasive procedure that allows for better visualization of fragments, but performing it in the acute trauma setting may be technically difficult and dangerous.[8]

Our proposed technique for arthroscopically-assisted removal of loose bodies from the hip joint is a safe and effective treatment method for patients in the acute fracture setting. We reviewed the literature and found no reports of an arthroscopically-assisted technique used to extract loose bodies in the setting of acute acetabular fractures. All 6 patients in our series had loose bodies removed within 5 days of their injury or acetabular surgery. Preoperative CT did allow for better delineation of the fragments in the joint. Visualization of the fragments was excellent, and there was no difficulty navigating to or extracting the fragments with graspers through the anterior capsulotomy. There were no complications secondary to fluid extravasation, as irrigation pumps were not needed. Operative times in leg traction were not lengthy, as femoral distractors were applied only toward the later part of the case. There were no nerve palsies secondary to distraction across the hip joint during the procedure. Although there were no traumatic neurovascular injuries in this series, some patients with preexisting nerve or vascular injuries may not be candidates for this procedure.

Using the supine position, our technique allows for convenient airway management, intravenous access, and peripheral management of issues such as chest tubes, particularly in obese or multiple injury patients. Leg traction is not required, so pudendal nerve injuries and scrotal or perineal pressure wounds caused by posts may be avoided in patients with preexisting edema in this region secondary to anterior pelvis ring fractures.[1,7] Ipsilateral lower extremity injuries may be circumvented with distraction applied only across the hip joint. Some acetabular fractures and proximal femur fractures may not allow for safe placement of femoral distractors. The modified Smith-Petersen approach—an extension of the anterior hip arthroscopy portal—is familiar to most surgeons. We recommend that this technique be used by surgeons who are comfortable with the open approach. Care must be taken to protect the lateral femoral cutaneous nerve during the approach and the femoral head and labrum during the capsulotomy. Multiple portals or trocars are not needed for good visualization of fragments. Basic knee arthroscopic instruments are all that is needed for fragment extraction. Although the entire fovea is easily visualized, loose bodies along the posterior inferior aspect of the femoral head may be difficult to visualize with an anterior approach.

Arthroscopically-assisted removal of loose bodies from the hip joint after hip dislocation or acetabular fracture may be performed safely and effectively. The combination of arthroscope and modified Smith-Peterson approach allows for excellent visualization and easy fragment removal. Visualization of fovea and fragments, enhanced with the arthroscope, provides traumatologists with an alternative approach to managing this intra-articular pathology in the acute injury setting.

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