Percutaneous Manipulation of Intra-articular Debris After Fracture-dislocation of the Femoral Head or Acetabulum

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Abstract: Traumatic fracture-dislocation of the hip usually warrants prompt management by closed manipulative reduction. In some patients, debris malpositioned between the femoral head and the acetabular dome obstructs a completely concentric reduction of the injured hip. To avoid damage to the articular surfaces, the debris between them should be removed in a timely fashion. Techniques for removal include open approaches with or without fracture fixation or hip arthroscopy. Fracture fixation and hip arthroscopy have associated risks and potential complications, may require special equipment, and may not be familiar to all surgeons. The authors present a simple fluoroscopically guided technique for the percutaneous removal of intra-articular debris between the femoral head and the acetabular dome after traumatic femoral head or acetabular fracture-dislocation. [Orthopedics. 2014; 37(9):603-606.]

Native hip traumatic orthopedic emergency. Prompt reduction of the dislocated femoral head is believed to relieve abnormal pressure on the femoral head cartilage and local soft tissue structures and restore femoral head blood flow, thus reducing the risk of aseptic necrosis.1-3 Most hip dislocations are reducible with closed manipulative techniques after sufficient muscle relaxation.4

In some patients, the presence of displaced debris from the fractured acetabulum or femoral head may prevent a concentric reduction of the hip joint. Some surgeons consider this scenario a continued emergency due to the sustained pressure on the articular cartilage of the cranial femoral head and acetabular dome. Skeletal traction can be applied in an attempt to disengage the articular surfaces from the debris by resisting normal and abnormal muscle contraction, but it may also have an adverse effect on femoral head blood flow. Intervention is needed to remove the debris and allow a concentric reduction. Although an open surgical approach permits removal of the debris as well as reduction and fixation of associated femoral head or acetabular fractures, surgeons are often reluctant to undertake such an operation acutely. Some authors5-7 have advocated hip arthroscopy as a means of extracting the debris. However, this technique is unfamiliar to most orthopedic surgeons, is technically challenging, requires specialized equipment, and presents significant risks acutely after fracture-dislocation.

The authors present a novel technique that allows percutaneous removal of “dome debris” from the hip joint using fluoroscopic guidance, permitting further evaluation and treatment of the patient under improved surgical conditions.

Surgical Technique

The patient is evaluated for other orthopedic and associated injuries and is adequately resuscitated. Closed manipulative reduction is performed under adequate analgesia and musculoskeletal relaxation. After reduction, a plain radiograph or computed tomogra-
A phy (CT) scan of the pelvis will reveal a non-concentric reduction of the hip due to interposed debris between the acetabular dome and the femoral head. Skeletal traction is applied and the patient is prepared for the operating room.

Under general anesthesia, the patient is placed on a radiolucent table that permits fluoroscopic imaging of the pelvis. The patient can be elevated on a soft lumbopelvic support to improve hip joint access. The operative field can be limited to the proximal anterior and lateral thigh, or can include the entire injured limb isolated from the perineum with barrier drapes, prepped with an appropriate surgical antiseptic, and then draped in a sterile fashion.

The traumatic hip dislocation or fracture-dislocation has an associated capsular and/or bony injury through which the proximal femur displaces. This traumatic soft tissue interval may be exploited for removal of the debris. Using an anteroposterior fluoroscopic image of the injured hip and a narrow-diameter Kirschner wire, the level of the acetabular dome is easily identified (Figure 1A). An incision is made over the mid-lateral aspect of the patient’s hip at the level of and in line with the acetabular dome. The incision is positioned to allow a sturdy right-angled instrument such as a nerve hook or a clamp to be placed through the incision to reach the cranial posterior hip joint. The fascia of the gluteus maximus is incised longitudinally so that the instrument can be easily inserted to the hip joint region. Using multi-planar fluoroscopy, the right-angled instrument is guided through the traumatic capsular defect and into the hip joint (Figure 1B). The instrument is then positioned and manipulated so the debris is removed from the acetabular dome region and displaced toward the traumatic capsular interval and out of the hip joint (Figure 1C). No attempt is made to clamp the debris or remove it from the wound.

Once the debris has been removed from the hip joint, the articular congruity of the femoral head and the acetabular dome is restored and hip joint instability can be assessed if the surgeon chooses. Skeletal traction may be necessary to maintain a concentric reduction in the presence of an acetabular or femoral head fracture. In the setting of smaller peripheral posterior wall fractures, a dynamic stress examination may be performed under the same anesthetic to assess hip instability and the potential need for operative treatment. A pelvic CT scan is performed if non-operative treatment is planned, or if the previously obtained images were insufficient for operative planning.

**RESULTS**

From October 2006 to December 2008, 3 patients underwent percutaneous manipulation of debris from between the femoral head and the acetabular dome after traumatic hip injuries. Two patients were skeletally mature men who had injuries to the pelvic ring as well as posterior hip fracture-dislocations. The other was a skeletally mature woman who was struck by a bus and sustained a comminuted transverse plus posterior wall acetabular fracture. The intra-articular debris was successfully removed in all cases. There were no wound infections or other early complications related to the technique.
Case Example

A 25-year-old man sustained a left posterior hip fracture-dislocation and a right anterior hip dislocation after he was run over by a car (Figure 2). He had numerous primary organ system injuries. His orthopedic injuries included an unstable pelvic ring injury consisting of right and left segmental pubic rami fractures, a right sacroiliac joint fracture-dislocation, and a left femur fracture. On admission, he underwent an emergent laparotomy. After bladder repair, the laparotomy wound was left open. Using the same anesthesia and with the patient positioned supine, the orthopedic consultant initially reduced the right hip joint anterior dislocation and then attempted manipulative reduction of the left posterior fracture-dislocation; however, the left femur fracture prevented successful manipulation of the dislocated proximal femur segment. Accordingly, a single-bar 4-pin lateral external fixator was applied to the left femur and the subsequent manipulative reduction was successful. Distal femoral traction was applied to both limbs. The displaced right hemipelvis was manipulated and reduced using distal femoral traction and an anterior pelvic external fixator.

A postoperative pelvic CT scan revealed the presence of intra-articular debris in the left hip joint that prevented a congruent reduction (Figure 3). The patient was kept in distal femoral traction until his overall medical condition allowed further surgery 3 days after the injury. During surgery, the patient underwent percutaneous fixation of the pelvic ring and then percutaneous manipulation of the hip joint debris posteriorly so that it was no longer obstructing a congruent reduction of the joint surfaces (Figure 4). After removal of the debris, the hip was stressed and noted to be stable.

Figure 3: Anteroposterior (A) and Judet (B and C) reconstructions from the postreduction pelvic computed tomography scan demonstrating a non-concentric reduction of the left hip joint. The debris is visible between the cranial femoral head and the acetabular dome on these views and an axial computed tomography slice (D).

Figure 4: Anteroposterior (A) and Judet (B and C) reconstructions from the postoperative computed tomography scan demonstrating a concentric reduction of the left hip joint. The debris is visible in the region of the peripheral posterior wall. Medullary nailing of the left femur and percutaneous fixation of the pelvic ring were also performed in the interim.
**Discussion**

This technique allows the surgeon to displace intra-articular dome-area debris that otherwise prevents concentric reduction after a hip dislocation. Prompt dome debris removal and thereby concentric reduction of the injured hip should diminish the risks of aseptic necrosis and further damage to the articular cartilage. Although the importance of obtaining a concentric hip reduction is well established, some authors disagree on the urgency of the situation. In this scenario, the surgeon can choose from several treatment actions: (1) placing the patient in traction in an attempt to distract the articular surfaces until definitive care can be undertaken by the surgeon or a colleague, (2) performing “dry” hip arthroscopy in an attempt to remove or displace the debris, (3) proceeding with open surgical removal of debris with or without fixation of associated fractures as indicated, or (4) using this fluoroscopically guided percutaneous technique to displace the debris so that a concentric reduction is achieved.

Although the Smith-Petersen and Kocher-Langenbeck surgical exposures are familiar to most orthopedists, some surgeons may be inexperienced in their application and the techniques for reduction and fixation of associated femoral head or acetabular fractures. With the emergence of damage-control orthopedics and dedicated trauma rooms, few surgeons perform difficult operations at night. This technique allows the treating surgeon to adequately treat the patient’s emergent problem. He or she may then transfer the patient’s care or perform the definitive reconstruction later under improved conditions.

Hip arthroscopy is presented as a “minimally invasive” alternative for debris removal. However, hip arthroscopy is a technically challenging operation with a steep learning curve. It also requires specialized arthroscopy equipment and a traction table or hip distraction device. In addition, there are several potential pitfalls, particularly in the traumatic setting. Due to the dislocation or fracture-dislocation, the hip capsule is traumatically disrupted, complicating the use of inflow fluid for irrigating the joint and distending the capsule during routine hip arthroscopy. As a result of intra-abdominal and local extravasation of fluid, laparotomy may be required. Such fluid leakage may also cause hemodynamic instability or even death.

Other reported complications include iatrogenic damage to cartilage or labrum, lateral femoral cutaneous and pudendal nerve palsies, avascular necrosis, and septic arthritis.  

**Conclusion**

Fluoroscopically guided percutaneous displacement of intra-articular dome-region debris is an effective way to remove an obstacle to concentric reduction of the hip after fracture-dislocation. It allows the surgeon to avoid performing a more extensive open procedure in an urgent manner and obviates one of the potential reasons to accept the inherent risks of hip arthroscopy.

**References**