



Case Report

Treatment of A Posterior Hip Dislocation Associated with A Femoral Head Fracture By A Direct Anterior Approach

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Abstract

Background: Posterior hip dislocation combined with a femoral head fracture is difficult to reduce and fix. Although there are many methods available, no single method has been shown to achieve the best results with the least trauma.

Methods: We consulted a healthy, 47-year-old male who sustained a dislocation of the left hip accompanied by a fracture of the femoral head in a car crash. Obstruction and tamponade of the bone fragment from the femoral head interfered with non-operative hip reduction. Using a direct anterior approach to expose the hip that allowed direct vision with the minor muscular trauma, we relocated the dislocated femoral head into the acetabulum and mobilized the femoral head anteriorly to allow fixation of the fracture fragment with Hebert screws, thereby restoring the normal anatomy of the hip joint; this was confirmed by intraoperative and postoperative fluoroscopy.

Results: Postoperative CT showed that the fracture was reduced and fixed firmly. At 6, 12, and 24 months post-operation, the Harris scores of the patient were 70, 72, and 81, respectively. After 5 years of follow-up, no dislocation of the hip joint had occurred, and no femoral head collapse was found. Although the patient has mild pain when the hip joint is completely loaded (a VAS pain score of 3 out of 10), there was no claudication, and unlimited mobility.

Conclusions: We suggest a direct anterior approach to reduce the posterior dislocation of the hip and fix the femoral head fracture, which is convenient and effective for repair of selected patients in whom the fracture dislocation cannot be reduced nonoperatively.

Keywords: Direct anterior approach; Femoral head fracture; Posterior hip dislocation

List of abbreviations: VAS: Visual Analogue Scale; AP: Anteroposterior; TFLM: Tensor Fascia Lata Muscle; RF: Rectus Femoris; DAA: Direct Anterior Approach

Background

Posterior dislocation of the hip joint is usually caused by a high-energy injury that often results in long-term morbidity. Early reduction of the femoral head into the hip joint, fixation of fracture fragments, and reconstruction of the articular surface are critical. Delayed reduction and an uneven articular surface can easily lead to avascular necrosis of the femoral head and posttraumatic arthritis [1,2]. This type of posterior dislocation tends to be accompanied by some form of fracture of the hip joint. The most common clinical scenario is hip dislocation with a fracture of the posterior acetabular wall. Posterior dislocation of the hip joint with a femoral head fracture is rare and difficult to treat. For dislocation with a femoral head fracture, a closed reduction is almost impossible due to the impaction and obstruction of the fracture fragments, and open reduction and internal fixation are usually required [1,3,4]. The conventional approach is to enter the hip joint posterolaterally for reduction and fixation; however, this approach creates considerable trauma to the hip muscles and does not provide full and optimal exposure and visualization for the reduction and fixation of the femoral head. In addition, the medial circumflex femoral artery may be injured, which increases the risk of avascular necrosis [1]. A popular technique in recent years has been surgical dislocation, in which the femoral head is dislocated anteriorly after a greater trochanteric osteotomy, allowing reduction and fixation under direct vision before the greater trochanter is re-approximated and fixed in place by a screw. While this procedure provides an excellent view and is less invasive to the gluteus muscles [5-7], we question whether it is necessary or even advisable to create a new fracture to fix a preexisting fracture. This article presents an operative procedure in which we dislocated the femoral head and fixed the fracture fragment via a direct anterior approach without need of an osteotomy of the great trochanter. We illustrate this procedure with the case of a patient who had an excellent, durable outcome at 5 years.

Case Presentation/ Surgical technique

A 47-year-old man was involved in a car accident. Fortunately, there were no associated injuries other than the

fracture-dislocation of his left hip. He complained of severe pain in his left hip upon admission. Physical examination showed an adduction and internal rotation of the left hip, no movement, and no signs of nerve injury in the left lower limb. Evaluation of plain radiographs and CT images demonstrated a Pipkin I fracture of the femoral head [8]. The medial fragment constituted approximately 15-20% of the diameter of the head of the femur and appeared to still be partially attached to the ligamentum teres. The fracture fragment was in the acetabulum, and the posterior wall of the acetabulum was embedded into the femoral head, preventing the reduction of the femoral head. A closed reduction was attempted three times under general anesthesia by the emergency physicians in the trauma bay, but the procedure was not successful. Therefore, open reduction and fixation via a Direct Anterior Approach (DAA) was chosen. This operative approach exposes the hip joint through the space between the Tensor Fasciae Lata Muscle (TFLM) and the Rectus Femoris (RF) [9-11]. Although this approach requires transecting the ascending branch of the lateral femoral circumflex artery, the medial femoral circumflex artery, which is the main source of blood supply to the femoral head, is preserved [12,13].

With this approach, the hip joint is exposed under direct vision. The posterior wall of the acetabulum is imbedded in the femoral head, separating the femoral head into two portions. This approach provided superb visualization of the entire procedure that followed. The circular osteochondral fragment, which was attached to the ligamentum teres, was approximately 5 cm in diameter and inferior and medial to the femoral head. We released the attachment from the circular osteochondral fragment and removed the fragment. Thereafter, it was straightforward to restore the femoral head back into the acetabulum using a periosteal detacher (Figures 1-3). After reduction of the femoral head, we identified a tear in the posterior labrum and another, separate tear in the posterior articular capsule; the surface of the fracture presented an adequate blood supply. The femoral head was easily dislocated to the front by downward traction and external rotation of the affected limb; this maneuver required use of any instruments or a traction table device. Under direct vision, a somewhat larger area of defect of the femoral head than the fracture fragment was noted related to the bone loss of the fracture. Although the bone and cartilaginous surfaces were carefully preserved while the fracture plate was irrigated, the resulting fragment was 5-10% smaller than the defect on the femoral head as expected (Figure 4). Although there was a serrated defection between the fracture fragment and the cartilaginous surface, the femoral head remained intact and appeared well-vascularized.

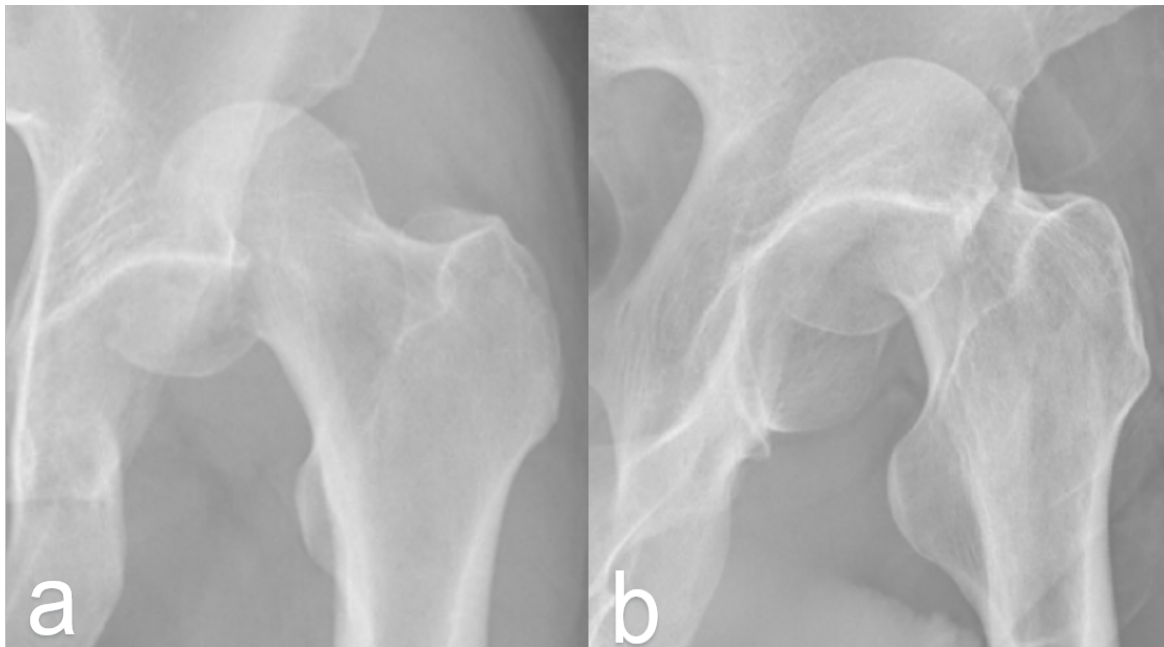


Figure 1: (a) AP of the left hip revealing a Pipkin type 1 fracture of the femoral head; the femoral head is embedded in the posterior wall of the acetabulum. (b) Oblique view of left hip showing the posterior subluxation of the femoral head.

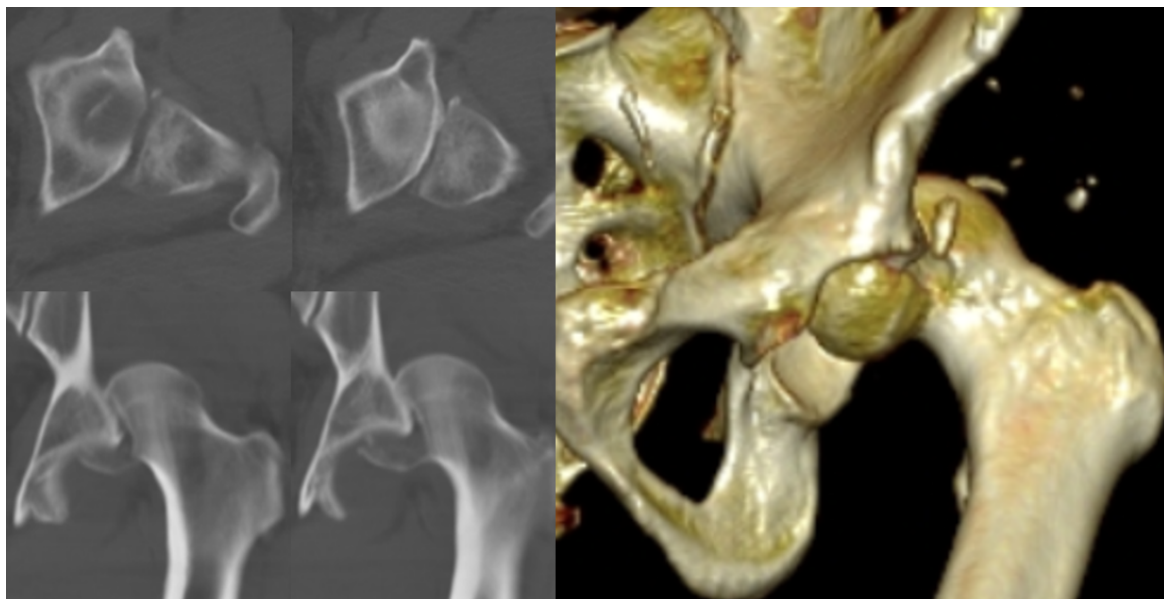


Figure 2: Computed Tomography (CT) confirmed a Pipkin type 1 fracture of the femoral head and posterior dislocation of the hip; the femoral head is incarcerated on the posterior rim of the acetabulum.

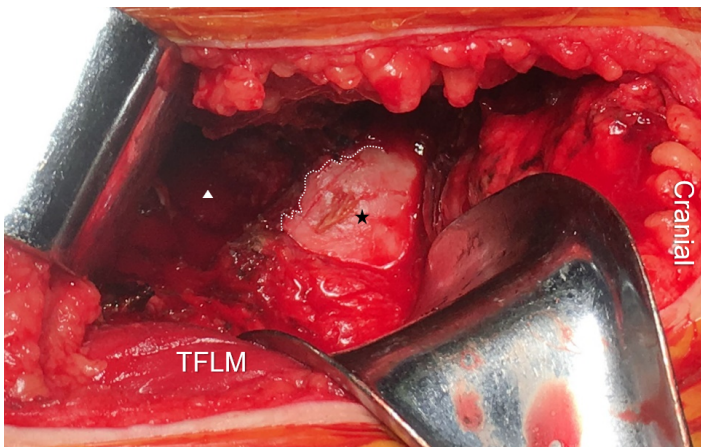


Figure 3: The hip joint is readily seen via the direct anterior approach. The femoral head was dislocated to the upper and posterior of the acetabulum. The white dotted line represents the fracture line, the black star indicates the femoral head, and the white triangle indicates the acetabulum.

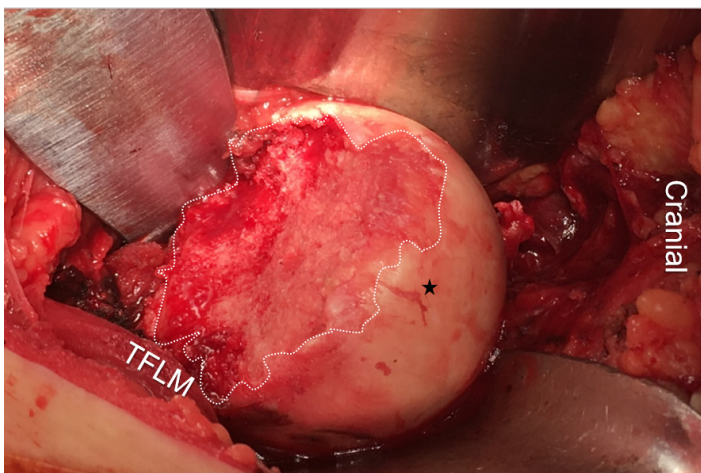


Figure 4: Anterior dislocation of the femoral head. The white dotted line represents the fracture line, and the black star indicates the femoral head.

Six 3-mm diameter Herbert screws were used to fix the fracture, and the normal shape of the femoral head was left intact (Figure 5). All these maneuvers were easy to perform because of the excellent view and operating space obtained by the anterior dislocation of the hip joint. After anatomic reconstruction of the femoral head, we replaced the femoral head back into the acetabulum via downward traction of the limb and internal rotation. These

processes of dislocation and reduction were accomplished by a single assistant. After restoration of the anatomy, a 5-mm diameter rivet was used to fix the torn labrum in place. Intraoperative fluoroscopy confirmed that no screws penetrated the articular cavity or the anatomic reconstruction of the femoral head (Figure 6). The anterior capsule was sutured, and the soft tissue was closed in layers. Prophylactic antibiotics and antithrombotic therapy were given after the operation. The procedure went smoothly and took approximately one hour. The patient recovered well without any complications. The postoperative CT on postoperative day 3 indicated that the femoral head had a nearly anatomic reduction, the acetabulum was intact, the screw fixation was stable, and the cavity was not disturbed (Figure 7); however, the defect in the bone and cartilage were obvious between the fracture and the femoral head in cross-section. The rivet was in a suitable position to secure the torn labrum in place. Immediately postoperatively, the patient was encouraged to initiate hip activity in bed, but keeping the affected limb maintained in an external rotation. The first time the patient walked was three days after the operation, when he used the toilet with the help of his family without telling any doctors or nurses. Although we disallowed this mobilization while in the hospital, the patient related no obvious pain when loading restrictively, and only mild pain in the hip when the hip was flexed more than 90°. Five days after the operation, the patient was discharged from the hospital and told to stay in bed at home for at least three weeks.

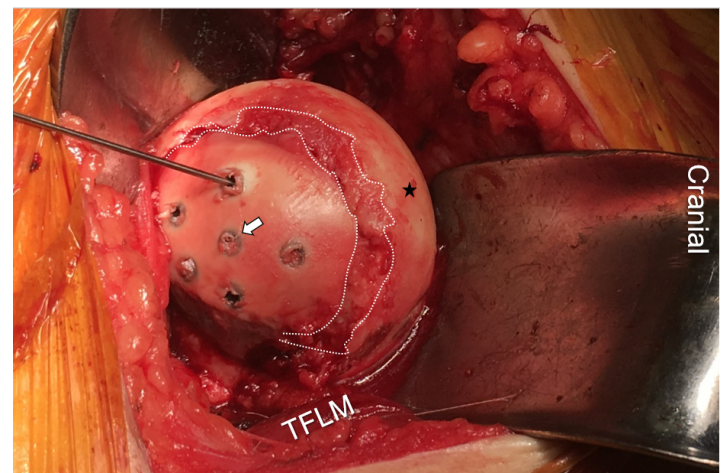


Figure 5: The fracture was fixed to the femoral head with Hebert screws. The white dotted line represents the fracture line, and the area between the two dashed lines represents the area of bone defect. The black star indicates the femoral head. The white arrow indicates the Hebert screws.



Figure 6: Intraoperative fluoroscopy demonstrating the anatomic reconstruction of the head. The Hebert screws and the rivet were in the appropriate position and did not enter the articular cavity.

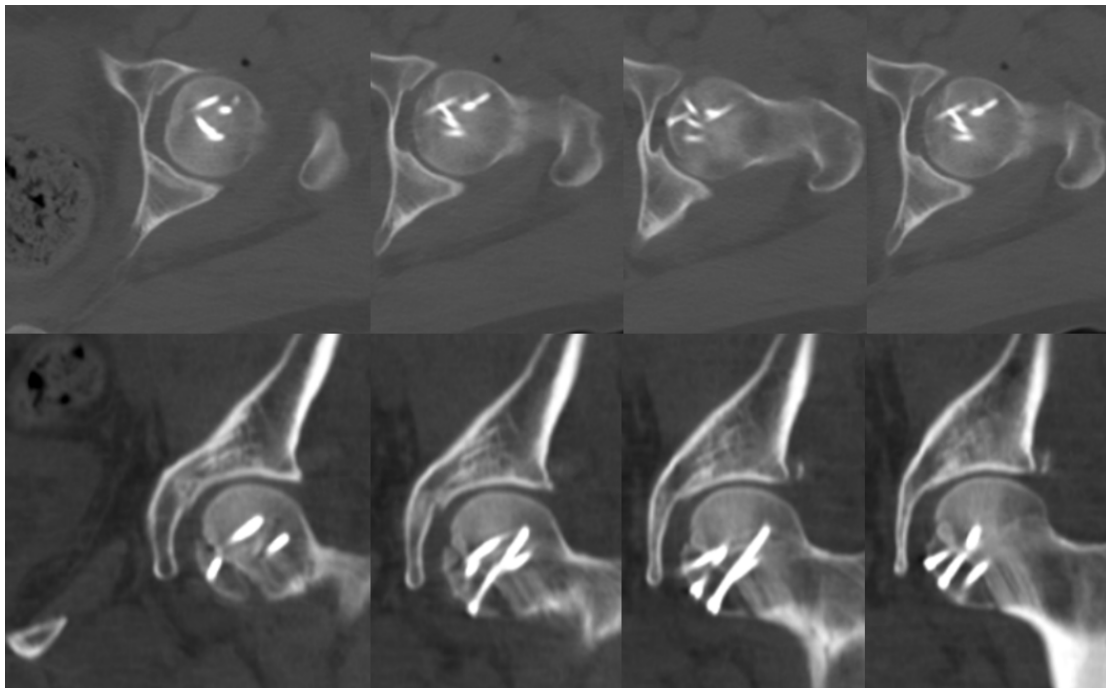


Figure 7: CT performed 3 days postoperatively confirmed the near anatomic reconstruction of the femoral head and an intact hip joint.

Rehabilitation, Follow-Up And Outcome

One month postoperatively, the patient walked into the clinic on his own with a walking aid. The patient reported mild pain requiring only oral, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) for pain relief. He reported walking with a walker two weeks after surgery. His Harris score was 65. An Anteroposterior (AP) pelvic radiograph indicated no collapse of the femoral head. At follow-up 5 years later, the patient was able to walk without claudication. He experienced mild hip pain when standing on one leg or with a full load on the left hip, but flexion and extension of the hip were not limited. His Harris score was 81. Pelvic X-rays showed no bone resorption or femoral head collapse (Figure 8).



Figure 8: At two years follow-up, the femoral head had a normal appearance with no collapse or bone resorption. No loose internal fixation was observed.

Discussion

Femoral head fractures can prove difficult to treat and can be associated with a high rate of disability. Pipkin classified femoral head fractures into 4 types [8]. Inadequate exposure of the fractures during operative repair is one reason why treatment is difficult. At present, the most popular surgical method is hip dislocation. The surgeon exposes the hip joint from the lateral side of the hip, and after osteotomy of the greater trochanter, the femoral head is dislocated for fixation. This technique has been used in hip operations to treat avascular necrosis of the femoral head and in the treatment of femoral head fractures. Good results for this technique have been reported, and it has become a popular approach [5-7,14,15]. The use of a subsequent fracture to treat

a fracture may not a good option, however, although it does not appear to disadvantage the patient's recovery. The DAA is an accepted operative approach for total hip arthroplasty with which we have had good success. Due to its convenient position for intraoperative fluoroscopy and excellent visualization of the hip joint, DAA is becoming more popular worldwide. The DAA, which utilizes the plane between the Tensor Fascia Lata Muscle (TFLM) and the Rectus Femoris (RF) to enter the hip joint, also causes less muscular trauma [9-11,16-19]. After opening the anterior capsule, the femoral head can be dislocated anteriorly with downward traction and external rotation of the lower extremity applied only by a single assistant without the need for instruments or a traction table. This maneuver does not require an additional osteotomy or muscle injury, which offers substantial advantages in the treatment of femoral head fractures.

The DAA does, however, require ligation of the ascending branch of the lateral circumflex femoral artery to expose the hip joint, and in theory this will affect the blood supply of femoral head [20-22]. In contrast, however, there is no relevant literature or research showing that injury to the ascending branch of the lateral circumflex femoral artery leads to necrosis of the femoral head. It has been shown that the medial circumflex femoral artery is the main source of blood supply to the femoral head [13,23-27]. Three cases of fracture-dislocation have been treated via a DAA, including two cases of Pipkin type 1 and one case of Pipkin type 2 fractures. The longest follow-up was 5 years. Among them, one case of a Pipkin type 2 femoral head fracture developed collapse of the femoral head 6 months after the operation, although it is questionable whether this was related to injury of the lateral femoral rotation artery during the operation. The DAA is an approach that offers considerable advantages for Pipkin type 1 and type 2 fractures. For type 3 fractures, it is feasible to use the DAA to perform anterior fixation after a closed reduction with percutaneous hollow nail fixation of a femoral neck fracture. Although total hip arthroplasty via a DAA is also accepted, this approach is not recommended for type 4 fractures. The DAA does not allow a satisfactory repair of column fractures or fractures of the posterior wall of the acetabulum. The follow-up of the treatment of this type of femoral head fracture repaired by a DAA described herein and in the literature has been relatively short in its long-term effects. A longer follow up and additional experience need to be observed.

Conclusion

In this study, we suggest a direct anterior approach to reduce the posterior dislocation of the hip and fix the femoral head fracture, which is convenient and effective for repair of selected patients in whom the fracture dislocation cannot be reduced nonoperatively.

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