

Novel Technique for Femoral Head Reconstruction using Allograft following Obturator Hip Dislocation

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What to Learn from this Article?

This is a rare injury that can be a challenge to manage. If identified appropriately, surgical hip dislocation with use of femoral head allograft to fill the bone void on the posterior femoral head is a viable treatment option with acceptable clinical results.

Abstract

Introduction: Obturator hip dislocations with an associated osteochondral fracture of the femoral head are uncommon. The treatment of these injuries is challenging and the functional outcomes are poor. Though the injury pattern has been described previously in literature, there are few published reports regarding treatment options. This case report illustrates a novel technique for fixation and stabilization for an unusual injury involving an obturator hip dislocation and an osteochondral impaction fracture of the femoral head.

Case Presentation: A 30-year old African American male, involved in a motor vehicle collision, sustained an obturator dislocation of the left hip with a large posterior osteochondral fracture of the femoral head. An emergency closed reduction procedure was performed followed by a computed tomography (CT) scan of the hip joint which demonstrated a large osteochondral defect (25 x 10 mm, depth: 5 mm) of the femoral head, visualized within the weight-bearing area. Surgical intervention was planned as a fracture of the femoral head with a defect deeper than four millimeters has been shown to be a risk factor for the development of post-traumatic arthritis, often with onset of symptoms within 5 years of the date of injury.

Following surgical hip dislocation, the defect of the femoral head was reconstructed with implantation of a femoral head allograft and internal fixation. At the six months follow-up, the patient could ambulate with minimal pain and without assistive devices. Radiographs demonstrated maintenance of articular congruity with no evidence of implant failure, post-traumatic arthritis or avascular necrosis.

Conclusion: Surgical hip dislocation and reconstruction using femoral head allograft used to treat obturator hip dislocations with concomitant femoral head impaction fractures can lead to satisfactory short term functional outcomes.

Keywords: obturator hip dislocation, surgical hip dislocation, femoral head allograft, femoral head impaction fracture.

Introduction

Obturator hip dislocation was first reported in the German literature at the turn of the century [5]. Presently, these remain unusual injuries, comprising only 4-24% of all traumatic hip dislocations [2,3,6-8]. The direction of dislocation depends upon the position of the femoral head in the acetabulum at the time of

injury, with anterior pubic dislocations occurring with the abduction, external rotation and extension of the lower extremity, while the obturator dislocation occurs with flexion [3, 9]. Fracture of the femoral head is commonly associated with such dislocations and can vary from shallow indentations to transchondral fractures [3,7,8,10,11]. It has been reported that a femoral head defect deeper

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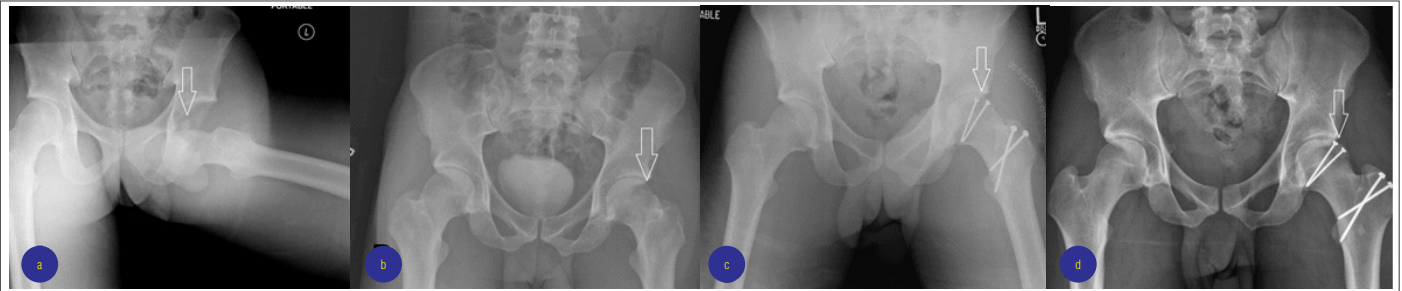


Figure 1: Anteroposterior radiographs of the pelvis.

than four millimeters is a risk factor for developing post-traumatic arthritis and that these degenerative changes can cause symptoms within 5 years of the date of injury [3,6,7].

Bastian et al examined the outcomes of nine patients with obturator hip dislocations [8]. Four out of nine had impaction fractures of the femoral head, and one of those four had a transchondral fracture of five millimeters in depth. Based on historical evidence regarding the risk for post-traumatic arthritis [11], the authors believed surgery was indicated for a patient with a femoral head defect greater than four millimeters [8]. Accordingly, one patient with a defect of five millimeters in depth was treated with an osteochondral autograft which was harvested from the ipsilateral femoral neck and placed into the defect [12]. The harvest of osteochondral autograft however results in donor site morbidity which may lead to iatrogenic fracture. The case reported here presents an alternative surgical technique which can be used to treat a femoral head impaction injury after a traumatic obturator hip dislocation by using femoral head allograft as a reconstructive option.

Case Presentation

A 30-years old African American male, with no medical comorbidities, presented to the emergency department after being involved in a high-speed motor vehicle collision. Radiographic assessment of the pelvis revealed a left obturator dislocation of the femoral head (Fig. 1A). Closed reduction was performed successfully in the emergency department. Radiographs and CT scans identified a 25 x 10-mm osteochondral defect of the posterosuperior quadrant of the femoral head near the head-neck junction with an impaction depth of 5 mm. In addition, a small, comminuted, minimally displaced anterior acetabular wall fracture was also identified but was not amenable to fixation (Figs. 1A-1B and 2).

Surgical Technique

In the operating room, the patient was placed in the right lateral

decubitus position. Utilizing a straight lateral incision centered over the greater trochanter, left hip was exposed using a digastric trochanteric osteotomy as previously described by Ganz *et al* [13]. Direct visualization of the femoral head revealed a comminuted impaction type fracture that was consistent in size and shape with the defect identified on pre-operative imaging studies (25 x 10 mm, thickness: 5 mm) that was located on the posterosuperior weight bearing area near the head-neck junction (Figs. 4A-4B). As the impacted chondral surface and underlying bone of the femoral head were not amenable to internal fixation secondary to extensive comminution, it was decided to proceed with excision of the fragments and reconstruction of the residual defect with congruent, structural allograft. An oscillating bone saw, a high-speed bur and a rongeur were used to contour a block of fresh-frozen cadaveric femoral head allograft to match the native articular surface. Once the allograft fragment was appropriately reduced, it was provisionally secured with two .062 in Kirschner (K)-wires (Fig. 3C). Following confirmation of the reduction using the image intensifier, the graft was secured to the native femoral head with two countersunk 2.7mm cortical lag screws (Fig. 3D). The K-wires were removed and the hip joint was reduced. Fluoroscopy confirmed concentric reduction. Range of motion intraoperatively demonstrated a stable and smooth arc of motion with no impingement. The osteotomy was fixated with 3.5 mm cortical screws placed in compression. Following closure of the capsulotomy, the wound was closed in a standard layered fashion.

Post-operative radiographs demonstrated an anatomic reconstruction of the articulating surface of the femoral head (Figs. 1C-D). The patient was discharged three days following surgery, after demonstrating safety and compliance with physical therapy as well as all other post-operative instructions. Ambulatory status was restricted to non-weight bearing using two crutches for a period of three months to allow for incorporation of the graft.

The patient returned for follow-up at the eighth postoperative week, having missed his previously scheduled appointments. Despite strict instructions regarding weight bearing, he was

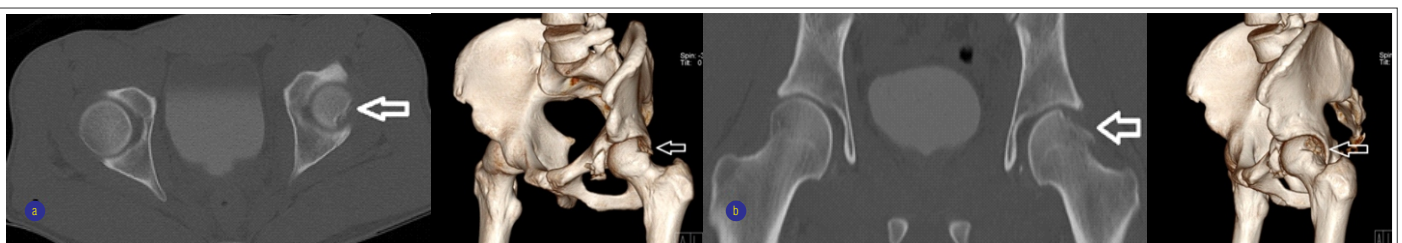


Figure 2: Computed tomography (CT) scans performed after closed reduction.

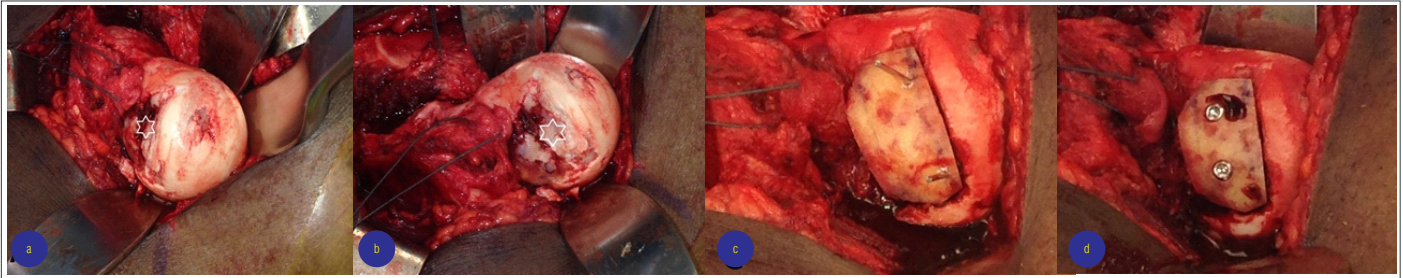


Figure 3: Intraoperative view of the femoral head after surgical dislocation of the left hip

ambulating with full weight on the operative extremity, without assistive devices and complaining of minimal pain. The patient endorsed non-compliance with activity restrictions, beginning approximately two weeks after surgery, secondary to a decrease in pain, improved range of motion and his being unable to take additional time off work. Physical exam of the left hip revealed a well-healed incision without clinical signs of post-operative infection. Examination of hip range of motion demonstrated flexion of 0-110°, internal rotation of 15°, external rotation of 20° and abduction of 15°. Radiographs demonstrated maintenance of alignment and congruity of the left hip joint with stable internal fixation of both the graft and trochanteric osteotomy. As the patient had been performing well despite non-compliance with restrictions, his activity was advanced to weight-bearing as tolerated.

At six months post-operatively, the time of last follow-up, the patient endorsed minimal pain, no limitations with regard to his activities of daily living or his ability to perform the duties of his occupation as a manual laborer. The pain was localized primarily to the greater trochanter, which subsequently improved after a local injection of 40mg of triamcinolone acetonide. A Harris Hip Score of 83 was calculated (good = 80-90). Range of motion about the left hip demonstrated 0-120° of flexion/extension, internal rotation of 40°, external rotation of 40°, abduction of 40° and adduction of 30°. Radiographs demonstrated a concentric hip joint with interval healing without evidence of collapse, implant loosening, implant failure or secondary arthritis (Fig. 4).

Discussion

Obturator hip dislocations with an associated osteochondral fracture of the femoral head are uncommon. The treatment of these injuries is challenging and the functional outcomes are poor. Though the injury pattern has been described previously in literature, there are few published reports regarding treatment options. The first mention in the literature of an obturator hip

dislocation being associated with a femoral head fracture was in 1969, when Scham and Fry described a patient who had sustained an obturator hip dislocation with an associated shear fracture of the anterosuperior femoral head [14]. In 1972, Brown and Simmonds described a patient with an obturator hip dislocation, in which the trauma had caused the femoral head to protrude through and become lodged in the obturator foramen. Upon reduction, a notch lesion in the anterosuperior part of the femoral head, where it had engaged the inferior acetabulum, was noted [15]. Similarly, the femoral head lesion of the patient presented here was visible on plain radiographs, though femoral head injuries such as these are frequently missed on plain radiographs, with up to 88% overlooked on initial readings [11].

In 1980 Dussault *et al* published a radiographic study in which eight of eleven patients with obturator hip dislocations had associated impaction fractures of the posterosuperior aspect of the lateral-most portion of the femoral head, where it had lodged onto the anteroinferior acetabulum. The authors likened this injury to the Hill-Sachs lesion of the humeral head that can result from anterior shoulder dislocations [10]. This description can be aptly applied to the injury pattern for the case presented here.

Overall, non-operatively treated obturator dislocations of the hip joint (with or without associated fractures) yield fair to poor results in 0-37% of patients [2,3,6,8-11]. In these patients, the rate of post-traumatic arthritis ranges from 0-47%, with a higher incidence associated with transchondral and indentation fractures of the femoral head [2,3,8-11]. Specifically, Delee *et al* reported that those with impaction fractures of greater than four millimeters in depth had a higher risk of post-traumatic arthritis [11]. Delee *et al* went on to show that the symptoms of post-traumatic arthritis following these injuries can develop rapidly, reporting on seven of fifteen patients with obturator hip dislocations followed for greater than two years who developed post-traumatic arthritis within two years of their injury [11]. Sahin *et al* reported evidence of post-traumatic arthritis in 10% of their mixed group of patients (posterior and

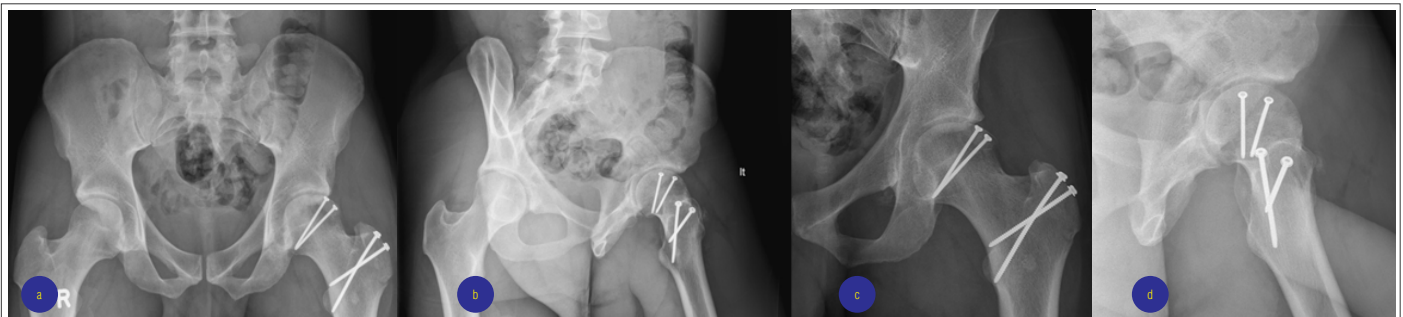


Figure 4: Postoperative anteroposterior and iliac oblique radiographs of the left hip and pelvis

anterior hip dislocations) and noted that symptoms and radiographic changes were seen within five years of injury [7]. Bastian et al reported a case in which they harvested an osteochondral autograft from the ipsilateral femoral neck in an attempt to reduce this risk for post-traumatic arthritis in one patient, and at two years, they reported excellent outcomes using this technique [8, 10].

After reviewing literature, we advocated for surgical treatment for our patient [8,11]. Given the size and depth of the lesion, we opted to pursue a different approach from the one utilized by Bastian et al [12] in an effort to reduce the associated morbidity of autograft. While allograft is associated with possible increased risk of fracture, infection, and longer healing time, it was felt that the donor site morbidity and subsequent risk of iatrogenic fracture associated with harvesting osteochondral autograft from the femoral neck outweighed the risks associated with the use of structural allograft. Unfortunately, there is little information in literature to guide management decisions for these patients, and we hope to contribute an alternative method of fixation and stabilization to the literature. Further investigation is needed to better guide surgical treatment of these uncommon and challenging injuries.

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Conclusion

Anterior dislocations of the hip account for only 4-24% of all hip dislocations with few reports in the literature [2,3,6-8], and those studies that do exist often consist of small numbers of patients. Patients with associated transchondral femoral head fractures and impaction fractures deeper than four millimeters are at risk of developing post-traumatic arthritis within two to five years from injury [3,6-8,11]. Surgical hip dislocation with a trochanteric flip osteotomy is a simple, one-step technique that allows the ability to fully inspect the hip, as well as treat large osteochondral femoral defects. The present technique of the use of frozen femoral head allograft as a salvage procedure in a patient with a large femoral head defect yielded good clinical and satisfactory radiologic outcomes in the short term.

Clinical Message

These are challenging and rare injuries that the surgeon can successfully manage with surgical hip dislocation and contouring an allograft to fill the bone defect.

Conflict of Interest: Nil
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