Rotational Osteoplasty for Femoral Head Fracture With Cartilage Loss

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Abstract

Femoral head fractures often result in damage to the articular cartilage. This article describes a patient who sustained a femoral head fracture-dislocation with significant damage to the articular cartilage of the weight-bearing portion of his femoral head (A). After anatomic reduction of the fracture, a 2×4-cm osteochondral articular defect existed at the weight-bearing portion of the femoral head (B). The femoral head fragment was rotated such that the superior weight-bearing surface was congruent (C). This created a small gap at the inferior aspect of the femoral head, which was filled using a small corticocancellous graft harvested from the greater trochanter. The femoral head fragment was fixed with countersunk 3.5-mm screws. At 18-month follow-up, the patient had returned to full-time construction work with no limitations. He reported no pain in his hip or any activity limitations, and his Harris Hip Score was 91 points. Radiographs obtained 18 months postoperatively showed healing of the femoral head and preservation of the hip joint.

Figure: Intraoperative photographs showing the injury after anterior dislocation of the hip (A); the large femoral head fragment reduced anatomically, which resulted in a 2×4-cm osteochondral articular defect at the weight-bearing portion of the femoral head (B); and countersunk 3.5-mm cancellous screws (used for stabilization) after placement of inferior corticocancellous graft (C).

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Fracture of the femoral head is a rare but severe injury that is typically associated with a posterior hip dislocation.\textsuperscript{1,2} Indications for the operative management of these injuries include nonanatomic reduction of the femoral head, an unstable hip joint, and the presence of intra-articular fragments.\textsuperscript{1} Smaller fragments may be excised, but larger fragments are treated with open reduction and internal fixation (ORIF).\textsuperscript{3,4} The severity of this injury has been associated with historically poor outcomes,\textsuperscript{2,5,6} but more recent studies have demonstrated intermediate-term success with ORIF.\textsuperscript{3,4}

The severity of articular cartilage injury associated with femoral head fractures makes these injuries difficult to treat. For elderly patients with these injuries, total hip arthroplasty (THA) is a treatment option, but THA may not be appropriate for a young patient. The authors report a case of a femoral head fracture dislocation in a young patient resulting in significant cartilage injury to the weight-bearing surface of the femoral head. The injury was treated by performing a rotational osteoplasty of the femoral head combined with ORIF.

**Case Report**

A 33-year-old male construction worker sustained a left hip dislocation and associated femoral head fracture during a motor vehicle accident. His hip was reduced, and he was transferred to the authors’ institution for additional treatment. A normal neurovascular examination of the left lower extremity was performed, and no additional injuries were identified.

Radiographs and computed tomography scans demonstrated a comminuted displaced Pipkin type II femoral head fracture (Figure 1). The patient was treated with ORIF. The fracture was exposed through a modified lateral Hardinge approach. The hip was carefully dislocated, and the main femoral head fragment was identified. Several smaller fragments were removed from the joint. The main fragment was reduced anatomically to the remainder of the femoral head (Figure 2). Inspection of the reduced femoral head demonstrated a 2×4-cm area of cartilage loss at the weight-bearing portion of the femoral head. None of the fragments retrieved from the joint were able to fill this void.

Therefore, the femoral head fragment was rotated so that the superior weight-bearing surface was congruent (Figure 3). The fracture pattern allowed for a near perfect fit of the superior weight-bearing articular surface. This created a small gap at the inferior aspect of the femoral head. To fill this gap, a 2×1.5-cm corticocancellous graft was harvested from the greater trochanter. The graft was placed in the inferior gap, and the femoral head fragment was fixed using 3.5-mm screws countersunk below the articular cartilage of the femoral head. The hip was reduced,
and examination demonstrated stability and smooth motion. Postoperative radiographs are shown in Figure 4.

The patient’s weight bearing was protected for 6 weeks, and he was mobilized with physical therapy. At 18-month follow-up, the patient had returned to full-time construction work without limitations. He reported no pain in his hip or any activity limitations, and his Harris Hip Score was 91 points. Radiographs obtained 18 months postoperatively showed healing of the femoral head and preservation of the hip joint (Figure 5). At 13 months postoperatively, the patient underwent an unrelated computed tomography scan for evaluation of inguinal lymphadenopathy. Images of the patient’s left hip showed remodeling and healing of the femoral head (Figure 5).

**DISCUSSION**

This case illustrates a technique for the management of femoral head fractures with associated osteochondral injury. The described method is similar in principle to rotational osteotomies of the femoral head and proximal femur that have been described in the management of osteonecrosis of the femoral head.7-11

The goal of proximal femoral osteotomy for avascular necrosis of the femoral head is to transfer the weight-bearing forces to a less involved or normal portion of the femoral head by rotating the diseased areas away from the weight-bearing surface.7-11 Similarly, the current authors sought to reconstruct the destroyed articular surface by rotating the femoral head fragment such that the weight-bearing area had an intact and congruent articular surface. Unlike previously described osteotomies for avascular necrosis, the authors used the patient’s existing fracture line to perform the rotation.

The authors used a modified lateral Hardinge approach to expose, anteriorly dislocate, and repair the femoral head. Others have reported treatment through a posterior (Kocher-Langenbeck)2,6 or an anterior (Smith-Peterson)1,12 approach. More recently, a posterior approach combined with a trochanteric flip osteotomy (anterior surgical dislocation) has also been described.13 Earlier studies suggested that the approach choice may influence the rate of osteonecrosis,2,6,12 but more recent data suggest that the rates of osteonecrosis are similar regardless of approach.3,4

Few studies exist on outcomes after the treatment of femoral head fractures. Older studies suggested universally poor results regardless of treatment option.3,6 Epstein5 compared closed treatment and ORIF of femoral head fractures and reported a greater proportion of good outcomes with ORIF. More recent studies have demonstrated better intermediate-term results,3,4 but no long-term studies exist to date. Although the type and quality of surgical reduction likely affect outcome, data have shown that injury severity and Pipkin classification affect outcome.4

At 18 months postoperatively, the current patient had returned to construction work, and his Harris Hip Score was 91 points. The patient did not display signs of avascular necrosis at 18-month follow-up. Although displaced fragments are suspected to be avascular, the incidence of avascular necrosis after operative treatment of femoral head fractures is relatively low. Stannard et al14 reported 8 cases of avascular necrosis in 40 patients who underwent ORIF by a posterior approach and 2 cases of avascular necrosis in 32 patients who underwent ORIF by an anterior approach.

It is difficult to predict the long-term outcome of this injury because no long-term data exist in the literature. In addition, by rotating the current patient’s femoral head fragment, the authors changed the morphology and possibly the contact pressures at his hip joint.

**REFERENCES**


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**Figure 4:** Postoperative anteroposterior pelvic radiograph showing reconstruction of the femoral head.

**Figure 5:** One-year postoperative anteroposterior pelvic radiograph (A) and axial (B) and coronal (C) computed tomography images.


