

Bullectomy by Surgical Dislocation of the Hip

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Introduction

Historically, the hip joint has been difficult to safely access due to the potential for avascular necrosis of the femoral head. However, based on detailed anatomy of the hip joint vascularity provided by Gautier et al [2], a safe dislocation of the hip can be accomplished when appropriate technique, that respects femoral head blood supply, is utilized. Ganz et al [1] have reported 213 surgical dislocations utilizing a trochanteric osteotomy without a single case of avascular necrosis. Their technique allows both complete inspection and full access to the acetabulum, and almost circumferential inspection of the femoral head (Fig 1). Utilizing the technique of Ganz et al [1], we were able to safely surgically dislocate the hip of a young male and remove a large bullet fragment lodged in his acetabulum. Thus, articular congruity was restored and damage to the soft metaphyseal bone of the femoral head was limited.



Figure 1 Volume Rendering image of Pelvis.

Case Report

The patient is a male, aged 22. He was presented to our Level One trauma center after being shot in the upper left buttock. On physical exam, a 0.5 cm wound was observed on the upper left buttock. This was presumed to be the entrance wound, with no exit wound evident. The patient's left hip was tender to internal and external rotation. The extremity was neurovascularly intact.

Radiographs (Figs 2 and 3) revealed a retained bullet fragment that appeared to be intraarticular in the left hip joint.



Figure 2 Radiograph of Pelvis. AP view..

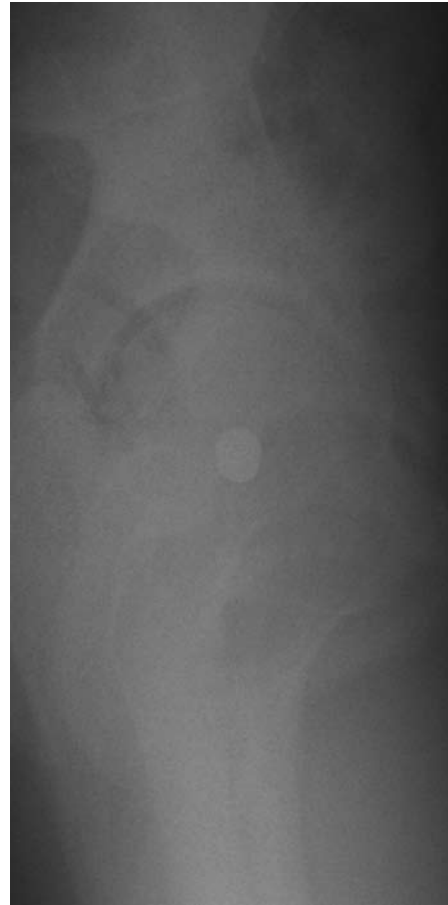


Figure 3 Radiograph of Femor head lateral view..

Two-dimensional computed tomography (Figs 4 and 5) confirmed the bullet's intra-articular location, positioned against the intact posterior wall of the acetabulum of the left hip joint.

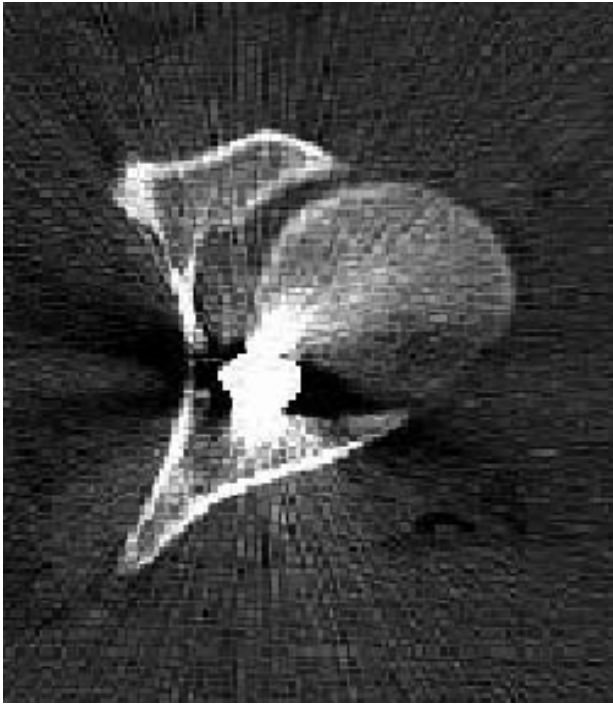


Figure 4 Axial view of CT scan. Bullet fragment location is identified.

A fuller appreciation of the injury and location of the bullet was obtained by utilizing reconstructed three-dimensional images that ultimately dictated the operative technique (Fig 6). The Aquarius Workstation from TeraRecon, Inc., was used for image reconstruction. The clarity of images and quality of the three-dimensional reconstructed images was an important adjunct to pre-operative planning, selecting the appropriate surgical approach and to better understand the anatomy involved in this complex procedure.

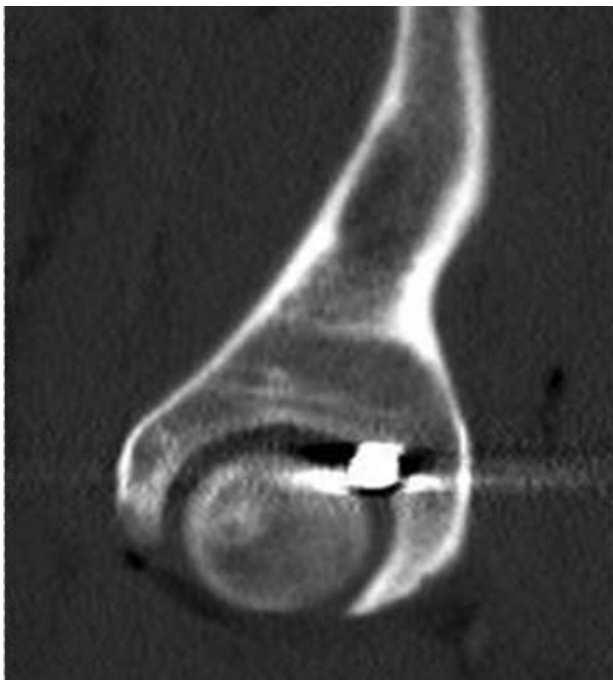


Figure 5 Sagittal view of CT scan.

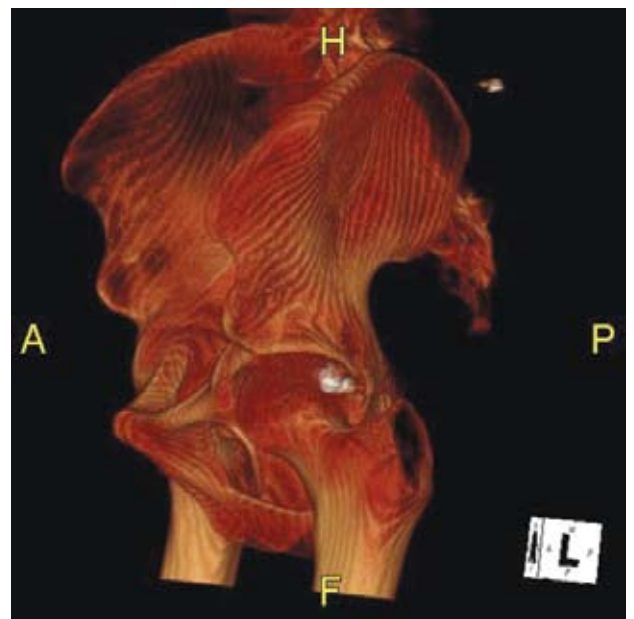


Figure 6a Volume Rendering image of Pelvis. Bullet fragment is found between posterior wall of the acetabulum of the left hip joint and femoral head.

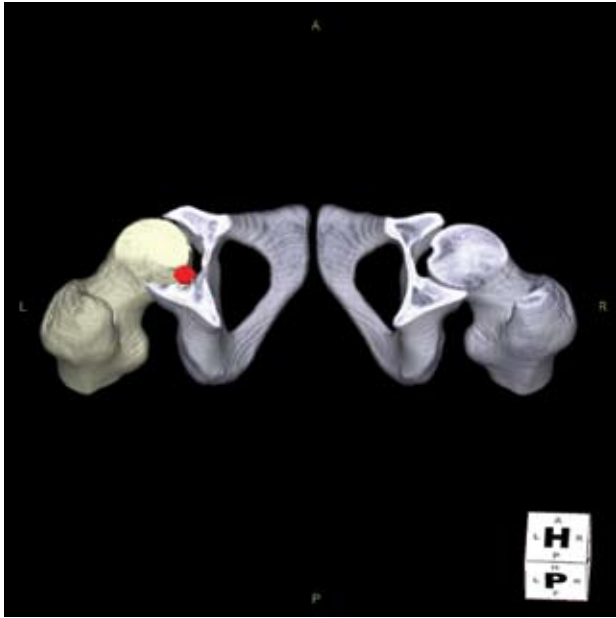


Figure 6b

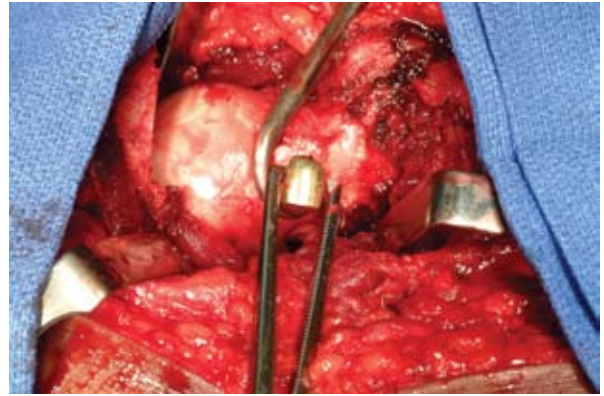


Figure 7 Utilizing the surgical hip dislocation technique as described by Ganz et al, a safe dislocation of the hip is accomplished

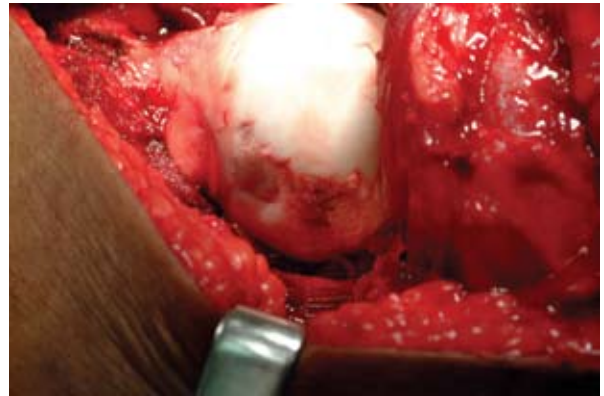


Figure 8 The impact to the femoral head by bullet fragment is clearly exposed.



Figure 6c (Left lateral view showing bullet fragment is found between posterior wall of the acetabulum of the left hip joint and femoral head.)

The patient was taken the next day to the operating room by the senior author (M.S.) for removal of the bullet utilizing the surgical hip dislocation technique as described by Ganz et al. After 9 months of follow up, the patient is doing well with excellent range on motion of the left hip. He has a slight antalgic gait without significant impairment. X-rays show trochanteric osteotomy site healed with intact screw fixation (Figs 9 and 10). Additionally, there is no evidence of avascular necrosis by plain radiograph and magnetic resonance imaging.



Figure 9 X-rays show trochanteric osteotomy site healed with intact screw fixation

Discussion

When operative treatment is necessary, fractures of the femoral head and intra-articular loose bodies within the hip joint are traditionally exposed utilizing an anterior approach with subluxation, as described by Smith-Petersen et al. Posterior approaches are typically avoided for these indications due to the perceived and real threat of avascular necrosis. Hip arthroscopy has improved visualization but procedures are technically demanding and limited by tight capsular constraints. Unfortunately, the anterior Smith-Petersen approach can achieve only partial visualization and access unless extensive detachment of tensor fascia lata and gluteus medius are performed. This is particularly problematic for pathology located in the posterior aspect of hip joint, as in this case.

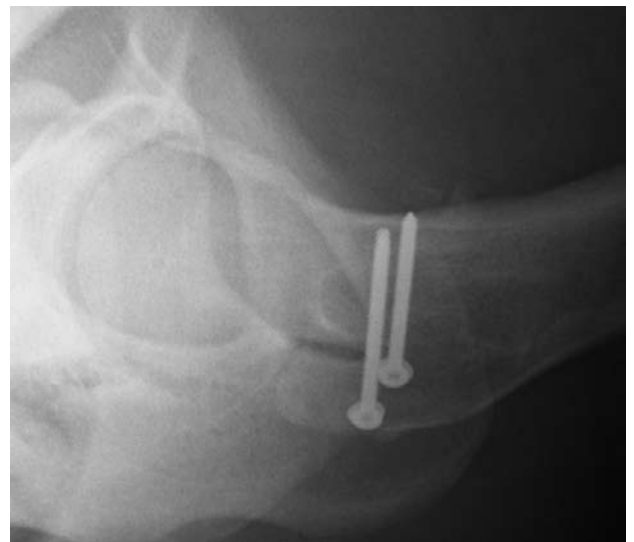


Figure 10 Lateral view of Hip x-ray

Conclusion

With a better understanding of femoral head blood supply, a safe technique for gaining complete acetabular access can be performed by an anterior dislocation through a posterior approach utilizing a trochanteric osteotomy. This technique, as described by Ganz et al, provides complete visualization, access to the acetabulum, and nearly 360-degree access to the femoral head and the acetabulum. We have illustrated one potential application of this technique to orthopaedic trauma. Multiple long-term applications of this approach include reductions under direct visualization, femoral resurfacing and cartilage transplantation, improved labral repair, and an improved understanding of hip joint pathology.

References:

1. Ganz, R; Gill, TJ; Gautier, E et al. "Surgical dislocation of the adult hip a technique with full access to the femoral head and acetabulum without the risk of avascular necrosis" *JBJS (Br)* 2001; 83:1119-1124.
2. Gautier,E; Ganz, K; Krugel, N et al. "Anatomy of the medial femoral circumflex artery and its surgical implications" *JBJS (Br)* 2000; 82: 679-683.
3. Gardner, MJ; Suk, M; Pearle, A; Buly, RL; Helfet, DL; Lorch, DG. "Surgical Dislocation of the Hip for Fractures of the Femoral Head" *J Orthop Trauma*. 2005; 19:334-342.