

# Treatment of the Bullet, Traversing Femoral Neck, Lodged in Hip Joint: Initial Arthroscopic Removal and Subsequent Cartilage Repair

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## What to Learn from this Article?

Hip arthroscopy is a proper technique for removal of the foreign materials from the joint, and open surgery must be reserved for further complications as in this case report.

## Abstract

**Introduction:** There have been several reports on arthroscopically assisted removal of the bullet imbedded in hip joint in the literature. Similarly, in this case, a bullet lodged in acetabulum was extracted with arthroscopic technique. What makes this case unique in the literature is that the bullet removed from the acetabulum traversed the femoral neck.

**Case Report:** Male patient aged 32 years with a low-velocity gunshot wound was referred to the emergency room on August 28, 2012. The projectile was lodged in acetabular side of the hip joint transversing through the femoral neck. A hip arthroscopy was performed for bullet removal. Two years after surgery, the patient had groin pain and underwent a safe dislocation for femoral chondral injury. In the last follow-up in the second post-operative year, the patient had no clinical complaint.

**Conclusion:** Hip arthroscopy is a minimally invasive and proper procedure for removal of foreign materials such as a bullet in the hip joint. Arthrotomy can be reserved for further complications such as chondral injury as in this case.

**Keywords:** Hip joint arthroscopy, wound, safe surgical dislocation.

## Introduction

Low-velocity gunshot wound has been encountered with increasing frequency. Foreign materials in the soft tissue caused by gunshot wound can be managed with antibiotic treatment and superficial debridement [1]. However, it is suggested that foreign materials sucked into joint be removed in an attempt to prevent joint arthropathy, cartilage damage, and septic arthritis [2]. Not long ago, arthrotomy was a technique

used to remove intra-articular foreign materials. At present, arthroscopic methods are opted for the removal of intra-articular foreign body. Arthroscopic methods for the removal of intra-articular foreign material are described for the knee, hip, ankle, and shoulder [3]. We are unaware of any report describing removal of a bullet imbedded in acetabulum passing through the femoral neck. This makes our report unique when compared with the other reports on arthroscopically assisted bullet removal.

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## Author's Photo Gallery



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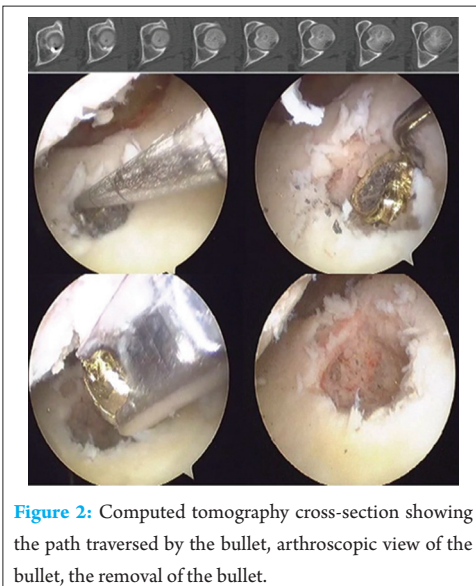
### Case Report

A male patient aged 32 years with a low-velocity gunshot wound was referred to the emergency room on August 28, 2012. Wound debridement, tetanus prophylaxis, and antibiotic treatment were initially administered for the management of the wound. Physical examination showed that entry wound was placed 1 cm lateral to femoral artery, 10 cm distal and 5 cm medial to spina iliaca anterior superior (Fig. 1). There was no exit wound. The patient had limited and painful hip joint movements. His neurovascular condition was intact.

The relation of the projectile lodged in acetabulum with the joint and its path through the femoral neck was seen at radiography and computed tomography (CT) scanning (Fig. 2). The patient was operated 2 days after the gunshot wound. Hip arthroscopy was performed using the supine position with the extremity in traction on a fracture table with general anesthesia. Traction weight of 30 kg was applied to the left hip joint of the patient. Hip joint was entered by making anterior and anterolateral portals. The projectile was found to be subchondrally



**Figure 1:** Entry wound, X-ray view of the bullet and its computed tomography cross-section within the hip joint.



**Figure 2:** Computed tomography cross-section showing the path traversed by the bullet, arthroscopic view of the bullet, the removal of the bullet.

located in posterior superior acetabulum, relating with the joint (Fig. 2). Exit point of the projectile was seen on the femoral side and chondral damage was treated with debridement. The surrounding of the projectile lodged in the acetabular side was enlarged with a probe for the removal of it. Projectile loosened with a probe was safely removed with a grasper (Fig. 2).

Following the debridement of the chondral damage occurred in the femoral and acetabular sides and the application of microfractures for the appropriate areas, the joint was washed out and the procedure was terminated. No complication was observed post-operatively. Limited mobilization with double crutches was permitted for 6 weeks. Then, full weight bearing was initiated.

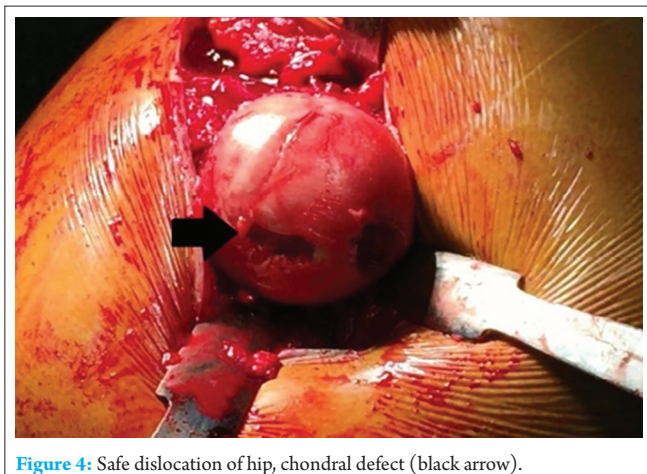
In the 2<sup>nd</sup> year of follow-up period, the patient appealed to hospital with groin pain. The patient had full range of motion but had hip pain, especially with weight bearing. Magnetic resonance images (MRIs) were taken and the path traversed by the projectile through the femoral neck and 4 cm × 2 cm chondral defect on the femoral head was apparent (Fig. 3). No signs of osteoarthritis were detected.

The patient was re-operated on March 2014. He was put on surgery table in lateral decubitus position with general anesthesia, and safe surgical dislocation of the hip was applied (Fig. 4). Dissolved cartilage was removed and microfracture was applied to subchondral bone. Acellular collagen scaffold (CaReS®-1S Arthro Kinetics, Esslingen, Germany) was implanted on chondral defect area and fixed with fibrin glue (Fig. 5). No complication was observed post-operatively. Passive motions were allowed after 2 days and weight bearing was prohibited for 6 weeks.

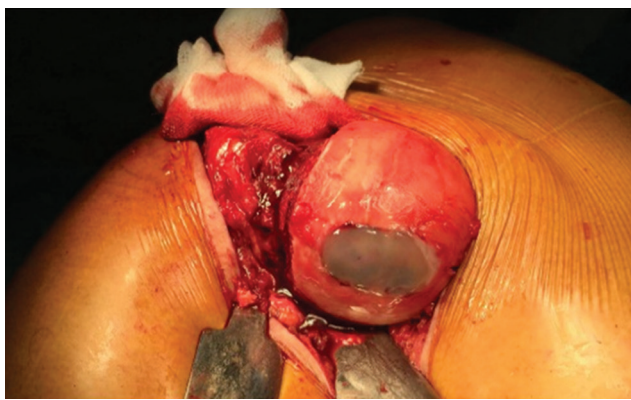
On May 2015, 1 year after second surgery, the patient had full range of motion and had no hip pain.



**Figure 3:** Magnetic resonance image in the second post-operative year.



**Figure 4:** Safe dislocation of hip, chondral defect (black arrow).



**Figure 5:** Acellular collagen scaffold implanted on defect.

### Discussion

Gunshot wounds to the hip joint account for 2% of all extremity gunshot wounds and 4% of lower-extremity gunshot wounds [4, 5]. Considering this frequency, it is a low possibility for the bullet to be imbedded in acetabulum, passing through the femoral neck. There is no report in literature reporting a projectile passing through the femoral neck. It is a unique case and the pathway of the bullet is really interesting. To the best of our knowledge, there are no published reports describing the arthroscopic removal of a bullet imbedded in acetabulum, passing through the femoral neck.

When left in the joint, the bullet may cause complications such as deep infection, lead intoxication, synovitis, and traumatic arthritis in the long-term [1, 2, 6]. Thus, the projectile imbedded in the hip joint is required to be removed and the joint to be irrigated.

The location of the bullet needs to be determined with CT scanning in the pre-operative period and surgical operation should be planned accordingly. In the report by Delaney *et al.*, they opted for safe surgical dislocation to retrieve a bullet from the femoral head since fragmentation at the femoral head was observed from CT image and the bullet was located posterior to the femoral head [2]. An experienced surgeon is able to access a satisfying view over the hip joint with arthroscopically assisted technique. Compared to arthrotomy, this technique which is less invasive allows the patient to return daily activities more rapidly [7]. In our case, having established the location of the projectile with the help of pre-operative radiography and CT we opted for hip arthroscopy.

Hip arthroscopy has recently become popular to treat many pathologies regarding the hip joint. Hip arthroscopy was first described by Burman in

1931 [8]. Arthroscopic technique for the extraction of the bullet from the hip joint was applied for a number of cases in the literature [9, 10, 11]. In the case report by Singleton *et al.*, it was noted that a gunshot wound entered the abdomen, traversed the rectum, and ended up in the weight-bearing dome of acetabulum, and the bullet was extracted with an arthroscopically assisted technique. They noted that this procedure can be performed safely, quickly and with minimal complications [3]. In our report, the bullet traversed the femoral neck before lodging in acetabulum. Cory and Ruch reported on the arthroscopic removal of a 0.44 caliber bullet from the femoral head using debridement of the articular surface [10]. In our case, debridement was required both on femoral head and acetabular side of the hip joint.

In contrast with arthrotomy, hip arthroscopy prevents blood loss, causes less osteonecrosis of femoral head, and yields better cosmetic appearance with shorter rehabilitation time [4, 12]. However, infection was the most expected complication in the cases reported in the literature since an accompanying abdomen wound existed. Osteonecrosis of the femoral head affected by the projectile and hip joint arthrosis were potential complications in our case. MRI, taken in the second post-operative year, revealed that chondral defect of the femoral head was observed. Moreover, an arthrotomy with safe surgical dislocation was needed for chondral defect treatment. After 1 year of arthrotomy, the patient had full range of motion and had no hip joint pain.

### Conclusion

Arthroscopically assisted technique allows minimally invasive access to hip joint for the retrieval of foreign material lodged in minimizing possible complications. Arthrotomy can be reserved to deal with further complications such as chondral problems as this case. We suggest using arthroscopic techniques for initial bullet removal, and open surgery may be reserved to handle further complications as chondral injury like in this case. At the same time, we can conclude that acellular collagen scaffolds may be useful for chondral injuries caused by bullets.

### Clinical Message

It is suggested to remove foreign materials sucked into joint to prevent joint arthropathy, cartilage damage, and septic arthritis. Arthroscopy is a proper procedure for removing foreign materials from the hip joint. Open surgery may be reserved to handle with complications as chondral injury or osteoarthritis.

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