

Management of a Pipkin Type I Femoral Head Fracture-Dislocation: A Case Report

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ABSTRACT

Femoral head fracture constitutes a significant injury to the joint of hip and has traditionally been related to poor functional outcomes. The predominant categorization is that of Pipkin, which is predicated on positioning of the fracture of head of femurs regarding the fovea, as well as any additional lesions on the femoral neck or acetabulum. This report describes a 28-year female case showed to the Emergency Department (ED) following 3 hours from road traffic accident, with a shortened, externally rotated left lower limb but intact neurovascular status and stable vital signs. X-ray revealed a left hip fracture-dislocation. Closed reduction was successfully performed. Subsequent internal fixation and open reduction via a Smith-Petersen anterior approach, with anatomical reduction achieved using three headless compression screws without redislocation. At six-month follow-up, the patient was ambulating fully weight-bearing, with pain-free range of motion and normal muscle strength. This case report demonstrated the successful management of a Pipkin Type I fracture of head of femurs -dislocation through prompt diagnosis, early closed reduction, and definitive open reduction and internal fixation using the Smith-Petersen approach. Our findings highlight the importance of early diagnosis and rapid reduction in managing complex hip injuries to ensure favorable functional outcomes. Our report supports the utilization of the anterior approach for achieving stable fixation and favorable functional outcomes.

Keywords: *Pipkin Type I; Femoral Head Fracture; Hip Dislocation; ORIF; Smith-Petersen Approach.*

1. INTRODUCTION

In 1869, Birkett initially identified and recorded a femoral head fracture throughout cadaver dissection (1).

Around ninety-three percent of these fractures generally arise from high-impact motor vehicle accidents, particularly in cases of polytrauma (2).

Head of femurs fracture constitutes a significant lesion to the joint of hip and has traditionally been related to poor functional outcomes. It has been found that between five and fifteen percent of posterior dislocations of hip are related to fractures of head of femurs (3).

The predominant categorization is that of Pipkin, which is predicated on positioning of the fracture of the head of femurs regarding the fovea, as well as any concomitant additional on the acetabulum or femoral neck (4).

Fractures of Pipkins are articular fractures of the head of femurs primarily resulting from high-energy traumas like sports injuries, falls from heights, or motor vehicle accidents (dashboard injuries), with a frequency of two occurrences per million. The first type involves a fracture located inferior to the capitis femoris, which is the non-weight bearing region of the head of femurs. (5).

Radiology is fundamental to accurate evaluation. The pelvic X-ray won't reveal the fragment in each case, as this is dependent upon its size and placement. Therefore, the pelvic computed tomography is essential for confirming the diagnosis (6).

Open reduction and internal fixation (ORIF) are required for any fractures exhibiting a residual displacement of one millimeter or greater, as well as for fractures of the femoral neck or acetabulum, and for those involving significant head of femurs fragments. The anterior Smith-Petersen technique is applicable for the majority of Pipkin type I & II fractures (7).

Fractures of the head of femurs have historically been associated with poor functional results and elevated rates of complication, particularly avascular necrosis and following traumatic arthritis of joint of hip.

2. CASE PRESENTATION

A twenty-eight-year-old female case showed to the ED after 3 hours from road traffic accident. Upon initial assessment, the patient was conscious with stable vital: blood pressure 110/70 millimetres of mercury and temperature were 36.9 degree Celsius, and pulse was 97 beats per minute. The airway was clear, and there was no clinical evidence of head trauma or active haemorrhage.

Physical examination revealed a shortening & external rotation of the left lower limb. Distal neurovascular examination of the left lower limb, including peripheral pulses and sensory-motor function, was intact.

After assessment of the patient with x-rays portable of the pelvis (Fig 1) exhibited a fracture dislocation of the left hip. After stability of the patient and Intravenous access was established, and fluid resuscitation was initiated. Initial laboratory investigations included a hemoglobin level of 10.5 g/dL, patient was prepared for shifting to the OR for closed reduction of the left hip dislocation.

Closed reduction done in the OR under general anaesthesia. The procedure successfully achieved decrease of the hip dislocation. Post-reduction, the case has been admitted to the orthopedic ward, and temporary stabilization was provided using skin traction applied to the left lower limb with approximately 3 kg of weight.

Postop CT was done to assess the fracture of the left hip which was fracture head of left femur Pipkin type I. (Fig 2)

ORIF of the left head of femur through Smith-Petersen anterior hip approach was planned.

Preoperatively, the case had a transfusion of 2 units of packed RBCs, resulting in a pre-operative hemoglobin level of 12.0 g/dL. Prophylactic intravenous antibiotics (Cefazolin 2g) were administered 30 minutes preoperative.

The ORIF procedure was performed utilizing a Smith-Petersen (anterior) approach to the left hip (Fig 3). Exposure of the fracture of the head of femur was done without left hip redislocation. Anatomical reduction of the fragment of fracture was accomplished and subsequently stabilized using three headless compression screws. Intraoperative assessment confirmed stable fixation and maintenance of hip joint reduction. The surgical wound was closed in layers.

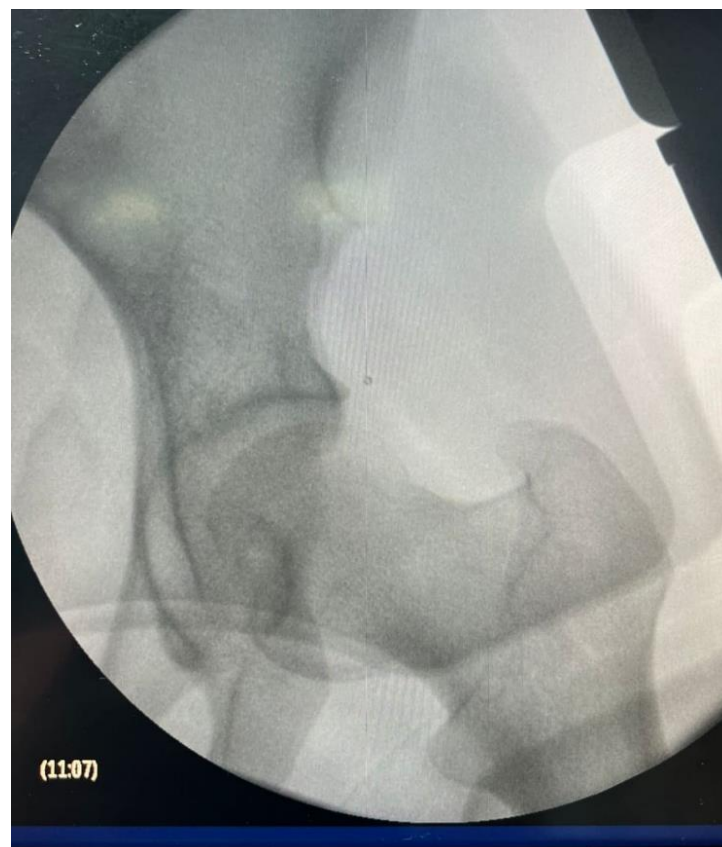


Figure 1: Preoperative anteroposterior view of the left hip showing superior & posterior displacement of head of femurs relative to the acetabulum, consistent with fracture-dislocation.



Figure 2: Following-reduction coronal computed tomography scan demonstrating the left Pipkin Type I fracture of head of femurs prior to surgical fixation.

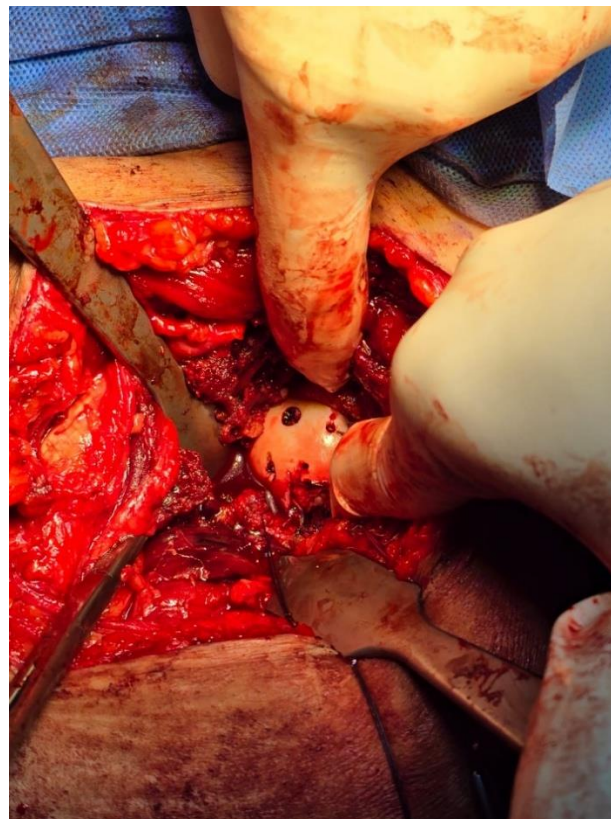


Figure 3: Intraoperative View of ORIF of a Pipkin Type I fracture of head of femurs.

Postoperative CT imaging (Fig 4) confirmed anatomical reduction of head of femurs fracture with appropriate hardware placement and maintained concentricity of the hip joint. The case has been followed clinically and radiographically for six months postoperatively (Fig 5). At the final monitoring, she was asymptomatic, ambulating with full weight-bearing without

assistive devices, and demonstrated a complete, pain-free range of motion and normal (5/5) muscle power in the left hip.



Figure 4: Postoperative three-dimensional (3D) computed tomography reconstruction demonstrating anatomical ORIF of the left Pipkin Type I fracture of head of femurs.



Figure 5: Anteroposterior pelvic radiograph obtained postoperatively, demonstrating stable internal fixation of the fracture of left head of femurs with screws and maintained joint congruity.

3. DISCUSSION

Femoral head fractures are frequently related to traumatic dislocations of the joints of hip, with a frequency of roughly seven percent of all hip dislocations (2). This report details a twenty-eight-year-old female who had a Pipkin Type I fracture of head of femurs -dislocation because of a road traffic accident, initially treated with closed reduction and then managed successfully with ORIF using the Smith-Petersen approach.

The postoperative result was stable, with anatomical reduction attained with the utilization of headless compression screws.

Wang CG et al. (9) examined the efficacy of both posterior and anterior operating techniques to treat Pipkin I & II fractures of head of femurs in our case report. This constitutes the 1st meta-analysis of operating methods for fractures of the head of femurs. Their findings revealed that the posterior approach significantly reduced the probability of heterotopic ossification than the anterior approach in treating Pipkin I & II fractures of head of femurs. No more complications have been associated with the anterior and posterior methods. The frequency in the group of anterior approaches was significantly above in the group of posterior approaches, potentially due to significant dissection of tenotomy and soft tissue of gluteal fibers. The anterior method demonstrated equivalent efficacy to the posterior approach regarding functional outcomes.

Femoral head fractures typically result in poor hip function and may lead to persistent impairment post-surgery (10). Post-traumatic arthritis commonly arises after fractures of head of femurs because of the deterioration of articular cartilage, particularly in the knee or hip, leading to dysfunction and discomfort (11). Reducing the duration of the procedure & initiating early functional rehabilitation are advised to enhance the prognosis.

Additionally, another investigation concurred with Sallameh J et al. (12), demonstrating an uncommon case with Pipkin type I fracture and emphasizing the necessity of precise clinical radiology for accurate diagnosis. This approach resulted in significantly improved outcomes, including the prevention of femoral head necrosis and enhanced long-term mobility for cases.

An operation is generally advised for types I & II Pipkin fractures involving significant fragments, particularly those associated with the weight-bearing region of the head; however, this does not apply to types III and IV. (13).

Furthermore, an essential factor in the management of dislocations of joint of hip, achieving a successful result, and preventing necrosis of head of femurs is the interval among the reduction and injury (14).

The optimal timing for surgery remains controversial; however, numerous investigations indicate that timing is an essential factor in influencing prognosis and reducing complications. The case has been released with very good results and has had no complications to today.

Early and effective reduction can better protect the residual blood flow to the femoral head. Prompt reduction should occur quickly, ideally within six hours, to lower the probability of femoral head osteonecrosis (15).

A recent report indicated that Pipkin injuries with repair of the articular surface within forty-eight hours yielded better results (16).

All traumatic hip dislocations must be treated as operating emergencies, & repeated attempts at closed reduction must be eschewed to reduce the possibility of avascular necrosis, which has an frequency ranging from eight percent to twenty-six percent (5).

Optimal outcomes are dependent upon achieving an anatomical reduction of the fragments, which is challenging with closed reduction. Henle P et al. (17) advocated for an operation to enhance reduction when the space among fragments exceeded two millimeters, as only one in twelve cases in their study achieved anatomical reduction by closed manipulation.

The functional outcome regarding pain and hip joint range of motion in our case was satisfactory, likely due to the Pipkin type I fracture. The selection of safe operating hip dislocation might have impacted on this outcome, since the technique reduces the possibility of vascular injury to the head & the previously traumatized soft tissue (5).

Regarding another investigation, Sarkar R et al. (18) found that closure reduction was successful in five out of six patients within three to five hours post-injury.

Shakya S et al. (19) analyzed the outcomes of femoral head fractures in cases managed using various non-surgical and operational methods, including open reduction and internal fixation (ORIF).

4. CONCLUSION

This case report demonstrated the successful management of a Pipkin Type I fracture of head of femurs -dislocation through prompt diagnosis, early closed reduction, and definitive ORIF using the Smith-Petersen approach. Early surgical intervention, appropriate imaging, and careful intraoperative techniques were key in achieving anatomical reduction and stable fixation, thereby minimizing the probability of complications like post-traumatic arthritis and avascular necrosis. This case highlights the importance of a multidisciplinary and timely approach in managing complex hip injuries to ensure favorable functional outcomes.

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