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## Treatment of Pipkin type II fracture dislocation of the femoral head: A case report and literature review

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### Abstract

**Rationale:** Fractures of femoral head associated with a hip dislocation are relatively rare and often associated with a poor functional outcome. Fractures are characterised by a high risk of avascular necrosis of femoral head, is extremely rare. It is more difficult to treat and has a worse prognosis.

**Patient concerns:** A 18 year old male with history of sustained injury over his left hip due to jump from running tractor that turned turtle. Pelvic radiograph and 3-D reconstruction computed tomography revealed characteristics of fracture dislocation of femoral head before the elective operation.

**Diagnosis:** Pipkin type II fracture dislocation of femur head.

**Interventions:** Firstly, dislocation was corrected by closed manual reduction under anesthesia. Secondly we used lateral approach to fix the femoral head fracture. Then we completed anatomical reduction of fractures with countersunk head screw.

**Outcomes:** At 4 months follow up the patient could walk and perform activities of daily living without pain, limp, signs of necrosis of femoral head and heterotopic ossification.

**Conclusion:** Treatment aim should always be the anatomical reduction of fragments with minimal soft tissue injury. Sometimes closed reduction is enough, but in the presence of large fragments, the fracture-dislocation is better treated by ORIF. We should not forget that half of these patients will have good outcomes no matter the treatment strategy. This result depends upon general health of the patient, the severity of the injury, associated cartilage injury, and timing of admission to hospital.

**Lessons:** Although there are serious complications in Pipkin II fractures early surgical treatment with appropriate approach and fixation could get satisfactory results.

**Keywords:** Hip fracture dislocation, Pipkin type II fracture, ORIF

### Introduction

Fracture of the femoral head associated with hip dislocation is relatively rare, With poor functional outcome in the fracture. These injuries occur in 6 of 15 cases of traumatic dislocation and found to be complicated. Kelly and lips comb reported about this type of femoral head fracture in 2cases/million per year. These fracture occurs as high energy injuries with increase in hip complicated fractures, treatment of injuries depends on age of the patient and extent of injury.

Fracture in femoral head was first reported by birkett in 1869, pipkin divided Epstein Thompson type 5 fracture dislocations into four subtypes according to the type of fracture in 1957, and depending on the location the posterior fracture fragment type is more complicated than the anterior. Main causes of these injuries are RTA. Posterior dislocation occur as shearing injuries as a flexed hip injury dislocation, it is driven across the acetabulum.

Treatment strategies in femoral head fracture-dislocation are very controversial and represent one of the few true orthopedic emergencies, reduction must be done as soon as possible under general anesthesia with good muscle relaxation to prevent further damage after reduction Judet oblique view makes it possible for complete evaluation. CT scan is sometimes difficult to obtain in emergencies but should be made systematic. Careful examination of multi-slice CT should be performed for assessing reduction quality, comminution and free intra articular fragments. Conservative treatment is accepted only when post reduction CT demonstrates anatomical reduction.

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Closed non-surgical treatment can be the best option for pipkin type I and II fracture, if closed reduction is not appropriate ORIF should be choice of treatment. Type IV pipkin fractures should be treated surgically by ORIF of the acetabular fracture and fixation (or) excision of the femoral head fragments.

Management of femoral head fractures remain controversial, if operative treatment is chose discussion on question, whether the approach should be anterior/ posterior/ medial/lateral? There is also no consensus should the fracture be fixed or removed from the joint. Total hip arthroplasty as a reasonable option would be applied in elderly patients. Arthroscopy is new in this field but will be the best treatment for some cases. The aim of our study is to provide technical and anatomical support for the reduction of type II pipkin fracture. The commonly used classifications are pipkins old classification, and new Chiron, assessing reproducibility and prognostic value. Pipkin type I and type II fractures are treated by excision of fragment in case of small osteochondral piece, but larger ones are internally fixed.

We operated an 18 year old male who suffered from such a serious injury after surgical intervention and follow-up patient showed excellent clinical function and remained satisfied surgical outcome.

### Case Report

An 18 year old male patient with 60 kgs weight presented in the emergency department with h/o RTA while a tractor turned turtle (toppled). The mechanism of injury goes as follows: axial force and flexion in the hip caused by impact of tractor. Patient complaints of injury sustained to his left hip and left leg associated with pain and swelling. The patient was admitted to hospital after midnight, the left leg clinically observed limb attitude in flexion, adduction and internal rotation, shortened leg with strong pain. There was no history of injury elsewhere. On examination, the patient was conscious oriented and vital parameters stable. There was swelling and tenderness over the left hip, there was no distal

neuro-vascular deficit.

The radiograph of pelvis with both hips, left hip with thigh was taken, which showed posterior dislocation of left hip. Under anesthesia urgent closed manual reduction was done by ALLI's maneuver. Reduction x-ray was taken. Dislocated head was relocated, fracture head of femur was suspected. 3-D CT reconstruction was taken which revealed Antero-medial head of left femur fracture with inferior displacement. Patient was put on skin traction and patient was advised for surgery, complication and risks explained to the patient and the relative, patient was reluctant to undergo surgery. Then patient was discharged at request and after two weeks patient came to OPD with pain and patient was willing for surgery at this time.

### Operative Procedure

Patient was planned for elective surgery. During the operation patient in floppy lateral position was adapted for the exposure of the fracture site. Through lateral approach (trans-gluteal approach/handridge approach) trochanteric osteotomy was done. Safe surgical dislocation was done, head was dislocated, antero inferior fragment of femoral head was identified and it was found that the fracture occurred at weight bearing area, fovea and diagnosed as pipkin type II fracture. Fracture fragment was reduced and fixed with three long titanium locking screws with countersunk head screw, below the articular surface after which there was still an osteo chondral defect in femoral head. Two wires were fixed for trochanter and fixed with cortical screws.

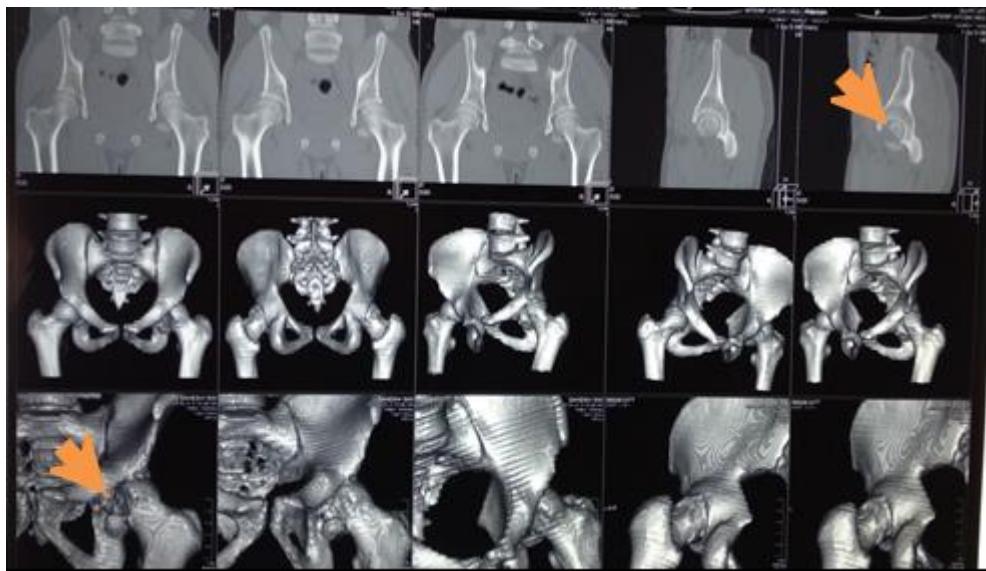
Post op x-ray was taken and reduction was satisfactory, confirms good position of hip joint and fixed fracture fragment. Post operatively patient was on skin traction for 20 days. Patient was discharged and weight bearing was advised after three months. After three months the post op x-ray showed union of fracture, the patient started daily activity with no pain. Patient at last visit was walking painless without limping.



Pre - Reduction X-Ray



Post-Reduction X-Ray



CT 3D reconstruction images

#### MULTISLICE CT – PELVIS

*Multislice plain helical CT study done of the pelvis followed by 3D and multiplanar volume reconstruction.*

*Fracture of antero-medial part of left femoral head with inferior displacement of the fragment.*

- The neck, intertrochanteric region and the upper shaft of the femur and the acetabulum appear normal bilaterally.

Remaining underlying bones including the ilium, sacrum, and the L5 vertebra appear normal with no evidence of destructive / sclerotic lesions identified. No significant periosteal reaction noted.

The right hip joints and the sacroiliac joints appear normal. No significant joint effusion seen.

Underlying soft tissues appear normal.

Urinary bladder partially distended. No fluid collection seen in the pelvis.

#### IMPRESSION:

- Plain CT study of pelvis showing antero medial head of left femur fracture with inferior displacement.

#### CT Report

#### Intra Operative Procedure



Right lateral position

Trochanteric osteotomy

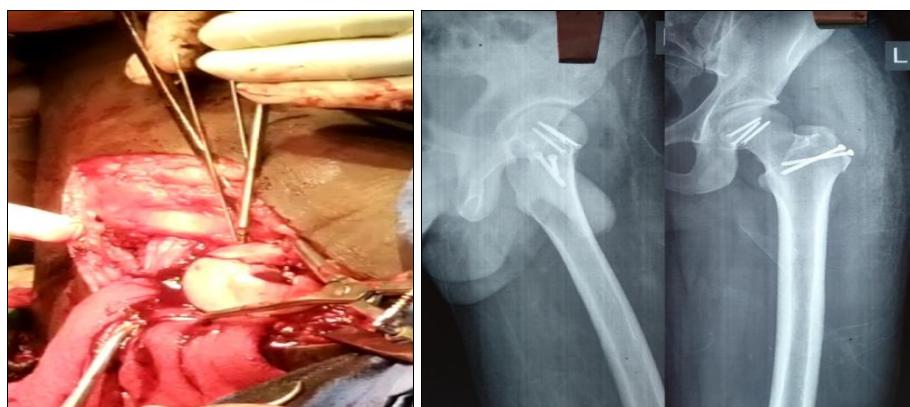
Safe surgical dislocation



Fracture Fragment

Fracture Reduced

Stabilised With K Wires



Screw Fixation

Post OP X-ray



3 Month Post OP X-Ray



Weight bearing

Extension

Flexion



External rotation

Internal rotation

## Discussion

Posterior dislocation of hip joint with femoral head fracture is not common. Because of intrinsic stability of the hip, high energy is required for a dislocation or fracture dislocation to occur<sup>[1]</sup>. The position of the femoral head in relation to the acetabulum and the vector of the force at the time of impact determine the type of injury produced<sup>[1]</sup>. Injuries may include pure hip dislocations, dislocations with fracture of the femoral head, and dislocations with fracture of the acetabulum. The dislocations and fracture dislocations of the hip have been classified by various authors.

Amstrong classified hip dislocations into simple hip dislocations, dislocations associated with fracture of acetabular rim, dislocations associated with fracture of acetabular floor and dislocations associated with fracture of the femoral head<sup>[2]</sup>. Thompson and Epstein included fracture of femoral head in their classification as type but did not include injuries with fractures of the femoral neck<sup>[3]</sup>. Stewart and Milfor included fractures of femoral head or neck in their classification as type IV<sup>[4]</sup>. Pipkin further classified into 4subtypes.X ray diagnosis is never enough for decision for treatment, so CT scans will reveal susceptible bone fragments or large osteochondral fragments that need to be fixed surgically.

Pipkin fracture is often due to serious traffic accidents. Therefore, we must verify combined injuries, such as thoracic injur, abdominal injury, and traumatic brain injury, which may lead to life threatening conditions<sup>[8]</sup>. Xrays and CT scan evaluation were necessary to define the exact pattern of the fracture classification as soon as possible, which can help the surgeon to plan the operative approach<sup>[9]</sup>.

Epstein advocated fragment excision, stating that up to one third of the non-weightbearing portion of the femoral head can be excised without compromising the function. However, maintaining joint congruity is a prerequisite for a good outcome, which is reinforced by the more recent literature. The authors discussed Henle perception in treating such injury and mentioned that closed reduction is very difficult in Pipkin fracture dislocation.

Henle could achieve only one proper closed reduction in his seriesof twelve cases. The remaining cases needed surgical intervention for reduction. The other authors stated that closed reduction was successful in their sixteen cases. Some cadaveric biomechanical Studies indicate that excision of small part (1/3) of the non weigh bearing surface of the femoral head, does not lead to adverse long term clinical implications. However these cadaveric studies only consider the force acting on the hip joint but do not consider *in vivo* surgical morbidity, soft tissue handling and consequence of the surgical approach.

The time elapsed between traumatic dislocation of the hip joint

and reduction of iso a key element for a good outcome. Epstein *et al.* indicated that early reduction (within 24 hours) is associated with better results than late reduction<sup>[8]</sup>. McMurry and Quaile<sup>[9]</sup> showed that the joint should be relocated within 6 hours; failureto do so increases the risk of avascular necrosis of the femoral head. Our study shows that anatomical reduction of dislocation in the first12 hours of injury is associated with good functional results, The size and location of the fractured fragment significantly impacts the outcome.

An exact anatomical reconstruction of the femoral head, especially if the weight bearing part is involved, is absolutely necessary<sup>[10]</sup>. Patients with type II Pipkin fractures can be treated either by closed reduction or open reduction. If the fragment is large earlyreduction and internal fixation iso recommended in order to produce good results<sup>[11]</sup>.

Regarding the effect of timing of large fragment fixation in patients with type I Pipkin fractures, Lin *et al.*<sup>[12]</sup> suggested that surgical reduction and fixation should be performed shortly after injury to improve treatment outcome. For small fragments, surgical fragment excision after closed reduction is an effective treatment for type 1 Pipkin fractures.

For type II Pipkin fractures of the femoral head associated with posterior dislocation of the hip, recommended treatment methods have varied from primary closed reduction, ORIF. Epstein *et al.*<sup>[14]</sup> suggested that all traumatic dislocations of the hip must be treated as surgical emergencies and multiple attempts of closed reduction are contraindicated. His studies indicated that results after primary open reduction were better t han after closed reduction or after closed reduction followed byopen reduction. Butler<sup>[15]</sup> and Chakraborti<sup>[16]</sup> suggest that conservative methods should be considered per primam, although treatment of this injury is difficult. The key is to obtain anatomic reduction of all fragments but this is difficult by closed reduction. Henle *et al.*<sup>[4]</sup> showed that only 1 in 12 patients obtained an anatomic fracture position after closed reduction; in his study, if the fracture gap within the joint showed a displacement of > 2 mm, operative treatment was indicated to improve reduction.

The optimal surgical approach in the treatment of femoralohe ad fractures remains controversial. Some studies advocate the use of Kochero Langenbeck, others the Smitho Peterson approach orpercutaneous fixation after a successful closed re duction<sup>[1, 8, 14, 17]</sup>. In several cases the femoral head component of the fracture is small and has an in frafoveal location and can either be ignored or simply excised through a Kocher Langen beck approach while address ing the posterior wall component. However, when the femoral head component requires fixation, surgical dislocation of the hip allows for simultaneous treatment of both fractures<sup>[18]</sup>. Solberg *et al.*<sup>[19]</sup> reported the outcome of 12 type IV Pipkin fracture

dislocations treated through a surgical hip dislocation. The authors reported a 100% union rate, while only 1 out of 12 patients developed osteonecrosis.

## Conclusion

Treatment aim should always be the anatomic reduction of the fragments with minimal soft tissue injury. Sometimes closed reduction is enough, but in the presence of large fragments, the fracture dislocation is better treated by ORIF. We should not forget that half of these patients will have good outcomes no matter the treatment strategy; this result depends on the general health of the patient, the severity of the injury, associated injuries, associated cartilage injury, and timing of admission to the hospital. Appropriate approach and fixation could get satisfactory results with a long term follow-up. The goal is to do earlier reposition of the hip joint and to get the congruence. If it cannot be done by closed reduction, and get the desired result, it is necessary to do the surgery.

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