Laporan Kasus

FEMORAL HEAD FRACTURE WITH DISLOCATION OF FEMORAL HEAD TO POSTERIOR SITE : CT EVALUATION

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ABSTRACT

Background: Femoral head fracture is a rare traumatic injury that is usually associated with hip dislocations.[1]

Case Presentation: We present a 19-years old man who could not walk after traumatic vehicle injury 2 months ago. He has got tibial operation at his left lower limb. He felt pain with his right lower limb. But after days, his right lower limb became numb and he could not move it.

The result of x ray pelvis and CT pelvis revealed non-union old femoral head fractures with dislocation femoral head to posterior site.

Conclusion: the case is a typical of fracture caput femur with dislocation caput femur to posterior site (Pipkin type 2).

Keywords: Femoral head fracture, dislocation, x ray, CT, Pipkin type 2, case report

CASE PRESENTATION

Introduction

Hip joint is based on articulation of the femoral head and the acetabulum of pelvis, and it is a synovial ball-and-socket type joint. The femur is held in the acetabulum by 5 separate ligaments as follows: The iliofemoral ligament attaches to the anterior inferior iliac spine of the pelvis and the intertrochanteric line of the femur; the pubofemoral ligament originates at the superior ramus of the pubis, also attaching to the intertrochanteric line of femur; the ischiofemoral ligament connects the ischium to the greater trochanter of the femur; the transverse acetabular ligament consists of the labrum covering the acetabular notch; and the femoral head ligament joints the femoral head with transverse ligament and acetabular notch.[1]

More than 70% of all hip dislocation are due to motor vehicle accidents.[1] Femoral head fracture are seen approximately in 15 – 15% of posterior hip dislocations and are thought to occur due to either *(a)* mechanical shearing of the femoral head on the wall of the acetabulum or *(b)* avulsion of the ligamentum.[2–4] This situatiun are uncommon and generally caused by high-energi.[4] The mechanism of hip dislocation associated with fracture of femoral head and acetabular frature is very compliated. Acetabular fracture is duet in external forces acting on lateral trochanter of the femur which is transmitted along the axis of femoral neck. The femoral neck fracture is often caused by continued transmission of the force which firstly makes the femoral head fracture.[5]

Delays in appropriate surgical treatment are associated with increased complication and mortality rates. Suboptimal treatment of hip fractures may result in debilitating complications such as avascular necrosis (AVN), fracture nonunion or malunion, or fixation hardware failure.[6] Femoral head fracture are still difficult to be tread because of their intra-articular involvement with complex approaches for anatomic fixation.[4] Therefore, early detection and classification of hip fractures are essential for guiding early appropriate treatment. The anatomy of the region is important when considering fractures of the proximal femur. Blood supply for the femoral head is

derived from vessels within the hip capsule. When a fracture of the femoral neck occurs, disruption to these blood vessels can occur result in devascularisation of the femoral head and resulting avascular necrosis.[6]

Diagnosing and correctly treating these injuries to avoid long-term sequelae of avascular necrosis and osteoarthritis is imperative.[1] Recently of the bone microarchitecture by micro-computed tomography has evaluate the morphological features of cancellous bones.[7]

Standard Radiographic Techniques

The fracture pattern is an important consideration when deciding upon treatment for femoral head fractures.[2] In plain radiography (x-ray), anteroposterior and lateral hip radiograph includes images of both sides of the hip on the same film and projects towards the middle of the line connecting the upper symphysis pubis and anterior-superior iliac spine.[8] A fracture-dislocation of the hip is often evident and first realized on a routine trauma anteroposterior (AP) pelvis radiograph.[2] If anteroposterior hip radiographs are taken in a supine position, one of the most common mistakes is image distortion as the hip is externally rotated. In lateral hip radiographs, the shape and offset of the femoral head-neck junction as well as the offset alpha angle are assessed.[8]

There are multiple imaging techniques for lateral hip radiography including the frog-leg lateral view, Lowenstein view, and cross-table lateral view.[8] Computed tomography (CT) of the pelvis should also be routinely performed following successful closed reduction as well as before opren reduction of an irreducible hip dislocation.[2] Recenlty, examination of bone microarchitecture by microcomputed tomography (CT) has been used to evaluate the morphological features of cancellous bones.[9] Digital radiohgrapy is a widely available imaging modality that, with a spatial resolution of up to 40 μm, has the potential to reflect bone microarchitecture. The combination of bone mineral density and bone texture analysis on the calcaneus has even been shown to improve the fracture risk evaluation by adding

information related to microarchitecture. In the proximal femur, although two studies conducted on cadaveric specimens have demonstrated correlation between 2D textural analysis on radiographic images and 3D.[10]

Classification

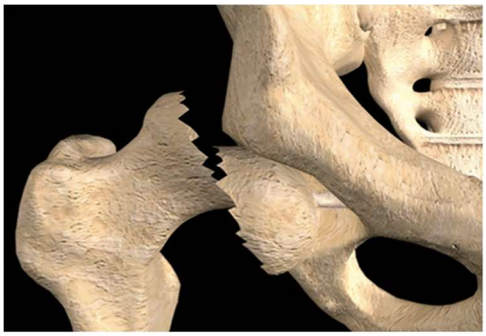
Multiple classification systems for proximal femoral fracture-dislocations have been described in the literature, but the morphologic system classifies femoral proposed by Pipkin that relatively simple from a radiographic standpoint.[11,12] The pipkin system classifies femoral head fracture-disclocations into four types, depending the morphologic features of the femoral head fracture and the presence or absence of an associated femoral neck or acetabular fracture.[11]

In 1957, Garret Pipkin, an orthopedic surgeon from Kansas City, developed this calssification system based on lohis obeservation of 24 patients with 25 fractures. The Pipkin classification is widely used in the femoral head fracture-dislocation into four type, depending on the morphologic features of the femoral head fracture and the presence or absence of an associated femoral neck or acetabular fracture.[7,12] Delays in appropriate surgical treatment are associated with increased complication and mortality rates. Suboptimal treatment of hip fractures may result in debilitating complications such as avascular necrosis (AVN), fracture nonunion or malunion, or fixation hardware failure. Therefore, early detection and classification of hip fractures are essential for guiding early appropriate treatment.[11]

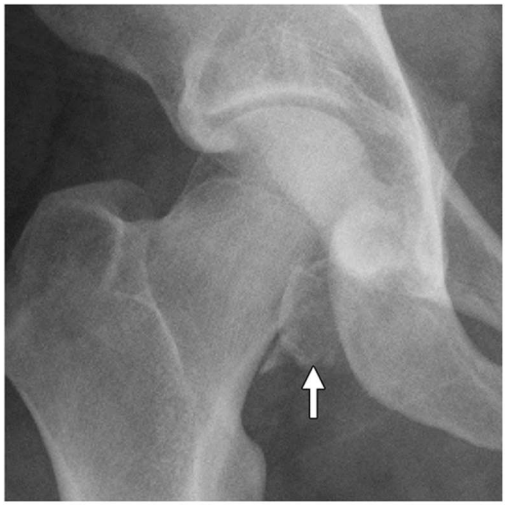
Type 1 is defined as a hip dislocation with a femoral head fracture caudal to the fovea central or capitis femoris, no acetabular fracture, no femoral neck fracture, and small other fracture fragments are seen within the hip joint.[12,13] Type 1 not involved the weight-bearing portion of the femoral head and may be successfully treated more frequently by closed means alone.[11,12] The other cases, whose fracture belonged to type 1 and 2 were treated with open reduction and absorbable screws fixation.[7]

Gambar 1. Type 1 of Pipkin Classification.[11]

Type 2 of Pipkin Classification fractures that extend superior to the fovea centralis and defined as a hip dislocation with femoral head fracture cephalad to the fovea capitis femoris and ligamentum teres often remains attached to the fracture fragment.[11,12] Type 1 and 2 are treated by excision of fragment in case of small osteochondral piece but large ones are internally fixed.[14]



Gambar 2. Type 2 of Pipkin Classification.[11]



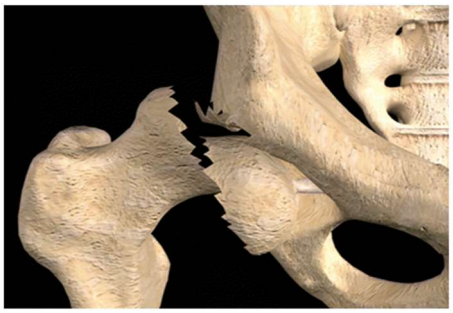
Gambar 3. A Pipkin type 2 fracture following posterior hip dislocation show a large, displaced intrarticular fracture fragment (arrow) that has maintained it is attachment to the ligamentum teres and subsequently flipped, resulting inadequate closed reduction. This radiographic taken by coronal computed tomographic (CT) obtained 28-years-old male..[11]

Type 3 fractures are a type 1 or 2 femoral head fracture with an associated femoral neck fracture.[2,11,12] This type is characterized by high risk of vascular necrosis of the femoral head. As the complexity is difficult to reconstruct into the natural hip joint, type 3 injuries have worse functional outcomes in contrast to the relative simpler injuries of Papkin type 1 or 2.[5,14]

Type 4 fractures combine a type 1 or 2 femoral head fracture with an acetabular posterior wall fractures

and management depends on their size and location.[11,14] This type is believed to have poorer prognosis because there are several surgical approaches for the treatment of Pipkin type 4 including the Watson-Jones approach, Smith-Peterson approach, the Kocher-Lagenbeck approach with a trochanteric flip osteotomy and the modified Heuter approach.[14,15]

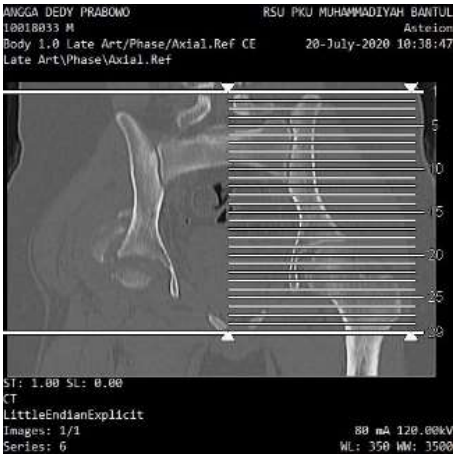
Gambar 4. Type 3 of Pipkin Classification.[11]



Gambar 5. Type 4 of Pipkin Classification.[11]

Case Presentation

A 19-year-old man, reported to the orthopedic department that he had complains of pain and difficult movements of two months duration with his right lower limb. He had got tibial operation after vehicle injury. Vital sign of patient is normal. No fever. The orthopedist sent him to radiology department to get examination of x ray pelvis. CT pelvis, CT axial and 3D to find dislocation of right femoral head with fracture of head femoral at fovea site.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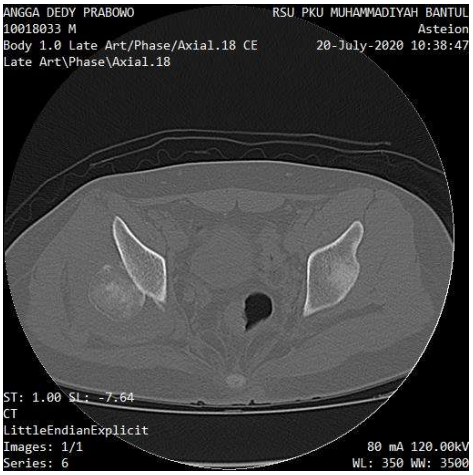
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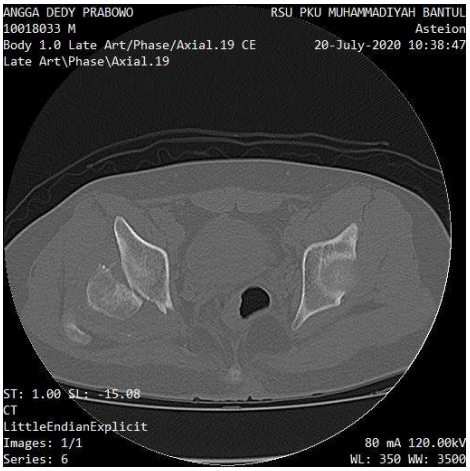
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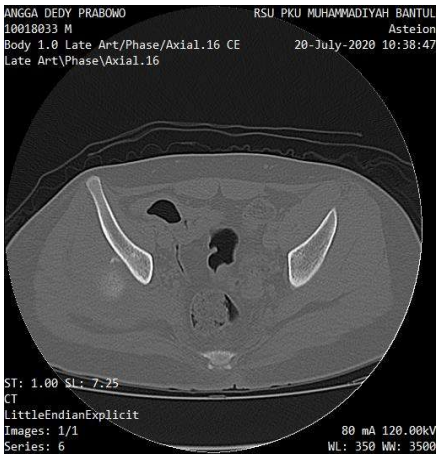
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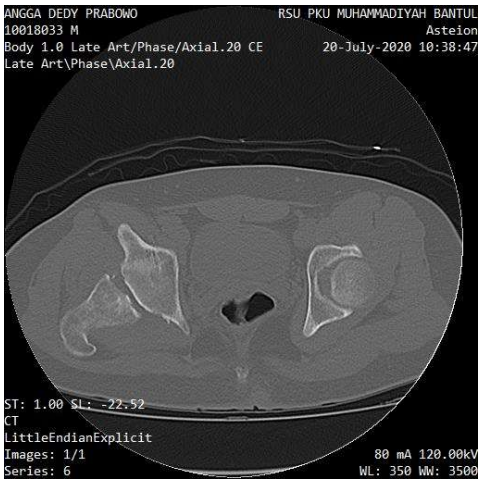
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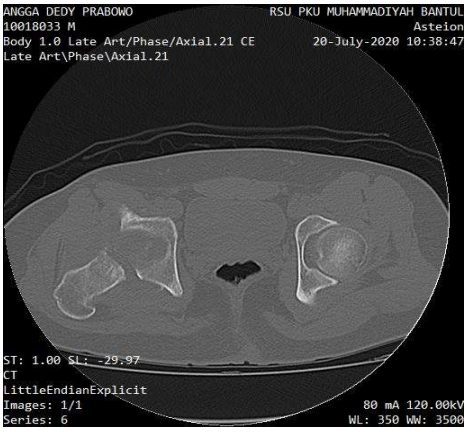
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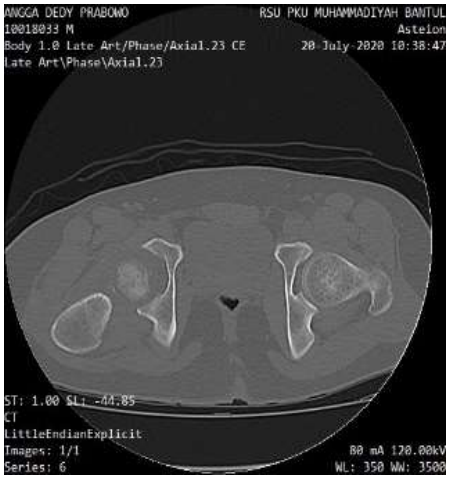
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Discussion

The hip is a ball-and-socket joint composed of the femoral head and acetabulum.[15] The femoral head necrosis occurs due to lack of bloody supply resulted from prolonged dislocation of the hip joint and accelerates if the femoral head ligament is cut in operation to deteriorate the blood supply. Traumatic arthritis may develop due to poor reduction of fracture on the weight bearing area of the articular surface. Anatomic reduction and effective fixation of femoral head fracture can reduce traumatic arthritis rate.[7]

Surgical treatment for injuries involving the hip joint are generally complex duet to it is deep location, massive soft tissues in situ, and vulnerable femoral head vascularity.[4] Alexander Gibson described the posterior approach for hip fracture in 1950.[16] Traditionally, surgical treatment of femoral head fractue may use an anterior or posterior approach and each approach has unique advantages and disadvantages.[4,7] Choice of approach is controversial.[7] Femoral head fracture can be easly fixed by the anterior approach in patients but is prone avascular necrosis of the femoral head.[5] The approaches often used are anterior approach Smith-Peterson and posterior approach Kocher-Langenbeck.[7] If the fracture fragment is large enough to allow internal fixation and should attempt to make anatomical reduction of the femoral head fracture which can make the femoral head articular surface smooth.[5]

Anatomically and biomechanically fragments of the femoral head are pushec anteriorly during hip injury in sitting position duet o the backward forces of the femur. With hip abduction, forces transferred from the knee will cause the femoral head impacting on the acetabulum and central dislocation occurs. With hip adduction, femoral

head fracture below or above fovea may closely related to the angles of hip flexion in sitting position.[4] The most common complication are nonunion, necrosis of femoral head, heterotopic ossification, traumatic osteoarthritis, and stiffness.[5]

Conclusion

Femoral head fractures caudal to the fovea centralis are Pipkin 2 lesions and involve the weight-bearing portion of the femoral head.

This CT scan is not only important for assessing the femoral head fracture pattern (size, location, comminution), but also to evaluate the congruity of the hip joint and determine the presence or absence of intra-articular loose fragments.[2] Pipkin was hopeful that his classification system would shine further light on Grade IV injuries, as there had been little published regarding the outcomes and sequelae of these injuries. Highlighted sequelae include posttraumatic arthritis, osteonecrosis, heterotopic ossification, and sciatic nerve injury.Additionally purpose, he was able to provide a management scheme for these injuries with the use of his classification.[12]

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