



Surgical Treatment of Iatrogenic Femoral Neck Fracture during Closed Reduction for Posterior Fracture Dislocation of the Hip: A Technical Note

Chun-Liang Hsu¹, Jung-Jui Chang¹, Sin-Jhang Wang¹, Chun-Chi Hung¹, Leou-Chyr Lin¹, Ru-Yu Pan¹, Chia-Chun Wu¹,
Tsu-Te Yeh¹

¹Department of Orthopaedics, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, Republic of China

Fracture-dislocation of the hip is a rare event that usually results from high-energy injury. These patients require a systemic trauma survey to uncover concomitant injuries. Early closed reduction within 6 h is recommended to decrease the incidence of avascular necrosis of the femoral head. Iatrogenic complete femoral neck fracture during closed reduction for posterior dislocation of the femoral head is a rare complication. A modified technique, the Kocher–Langenbeck approach, for open reduction of the femoral neck fracture using antegrade guide pins and retrograde cannulated screws fixation can resolute this situation in one stage. This method provides an anatomic reduction and stable fixation for this kind of injury.

Key words: Closed reduction, iatrogenic femoral neck fracture, posterior hip dislocation

INTRODUCTION

Hip dislocations are infrequent, and 82-94% of them are posterior dislocations.¹ Massive force is required to dislocate a hip. Systemic survey of associated injuries is necessary. Complex fracture-dislocations include fractures of the femoral head, femoral neck, acetabulum, or a combination of these.^{2,3} Emergent reduction of the femoral head is indicated. The incidence of osteonecrosis of the femoral head is increased if the reduction is delayed for more than 6 h.^{4,5} A closed reduction under anesthesia should be performed unless there is associated femoral neck fracture. Iatrogenic femoral neck fracture during closed reduction for posterior fracture-dislocation of the hip is a rare complication. The management of ipsilateral femoral head, femoral neck, and acetabulum fractures at the same time is very complicated. The purpose of this report is to describe a surgical method that can deal with this situation of the femoral head, femoral neck, and acetabulum fractures in one stage by using a single surgical incision.

CASE REPORT

A 36-year-old man was seen in the emergency department of our hospital because of right hip pain after falling down injury during a basketball sport. The patient played basketball in the morning. He jumped to save the basketball and the foot hit the ground directly during hip flexion and with the knee in full extension. Subsequently, he was unable to move his right leg. On examination, the right leg presented shortening, internal rotation, adduction and flexion deformity. Right hip posterior dislocation was suspected. Radiographs of the right hip demonstrated posterior dislocation with infrafoveal femoral head fracture and acetabulum posterior wall fracture [Figure 1a and b].

He was sent to the operating room and underwent emergent closed reduction in supine position under spinal anesthesia. We performed a Bigelow reduction maneuver. The pelvis was fixed by one orthopedic surgeon, while another surgeon applied longitudinal traction on the right lower limb. The adducted and internally rotated thigh was then flexed. However, during hip flexion to 50°, there was an audible “crack” sound. The procedure was halted and a subcapital femoral neck fracture was noted by fluoroscopic examination. An emergent computed tomography (CT) scan and radiographic examinations were arranged and demonstrated fracture of the right femoral head, femoral neck, and posterior wall of the acetabulum, combined with posterior dislocation of the hip [Figure 1c-f].

The patient was prepared for emergent open reduction and internal fixation. He was positioned on the left lateral decubitus position and the Kocher–Langenbeck approach was

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Corresponding Author: Dr. Tsu-Te Yeh, Department of Orthopaedics, Tri-Service General Hospital, National Defense Medical Center, No. 325, Section 2, Cheng-Kung Road, Taipei 114, Taiwan, Republic of China.

Tel: +886-2-8792-7191; Fax: 886-2-8792-7372.

E-mail: tsutey@gmail.com

used. The large fragment of the femoral head was found within the gluteus medius, and another femoral head fragment was found within the hip joint, with some soft tissue attachment. The two femoral head fragments were taken out first. Then, the smaller femoral head fragment was fixed to the larger fragment with two 2.7 mm countersink screws. The femoral neck was then accurately reduced and fixed via the antegrade placement of three guide pins in an upside down triangular configuration, exiting through the lateral femoral cortex [Figure 2]. Subsequently, the guide pins were buried under the cartilage surface of the femoral head to achieve temporary stabilization of the fracture. The hip was then gently reduced into the joint and the position of the guide pins was checked by fluoroscopy and made sure that its position and length to be satisfactory. The femoral neck was fixed with three 7.5 mm retrograde cannulated screws along with the guide pins that had been placed previously. Then the guide pins were removed. The posterior wall of the acetabulum was reduced and fixed with a spring plate and a buttress plate.

Postoperative radiography showed an anatomic reduction of the fracture site and satisfactory fixations [Figure 3]. During his hospitalization, the patient's clinical condition continued to improve for 7 days. He was then discharged.

DISCUSSION

Hip fracture-dislocations occur mostly in young adults as a result of major trauma in high-energy motor vehicle accidents.⁶ It is usually associated with systemic and other musculoskeletal injuries. Once the hip joint is dislocated, early reduction in an atraumatic fashion is necessary to reduce the period of avascularity to the femoral head.^{4,5} Nevertheless, sufficient radiographic imaging is required prior to the performance of any reduction maneuver.⁶ Moreover, it can exclude the presence of an associated femoral neck fracture. According to the severity of the injury, avascular necrosis of the femoral head has been reported in 11-34% of hip dislocations.^{7,8} The patient should be counseled regarding avascular necrosis of the femoral head as a potential complication within 2 years.⁹ Hip reduction in the operating room under anesthesia is a good approach to minimize further damage to the articular cartilage.⁶

The reduction methods that are used in the management of posteriorly dislocated hips include the Allis method⁸ and the Bigelow method, etc.¹⁰ In each technique, a palpable and an audible clunk may be noticed after successful reduction. However, 2-15% of hip dislocations are irreducible.¹¹ Irreducible dislocations may be caused by bony or soft tissue interposition, including that of the rectus femoris, piriformis, gluteus maximus, labrum, capsule,

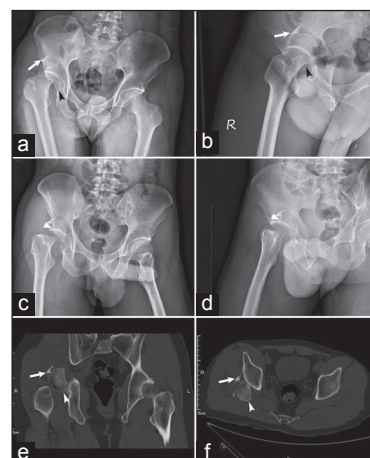


Figure 1. (a and b) Posterior dislocation with infrafoveal femoral head fracture (black arrow head) and acetabulum posterior wall fracture (arrow). (c-f) Right femoral head fragment (white arrow head) and neck fracture-dislocation and fracture of the posterior wall of the acetabulum (arrow)

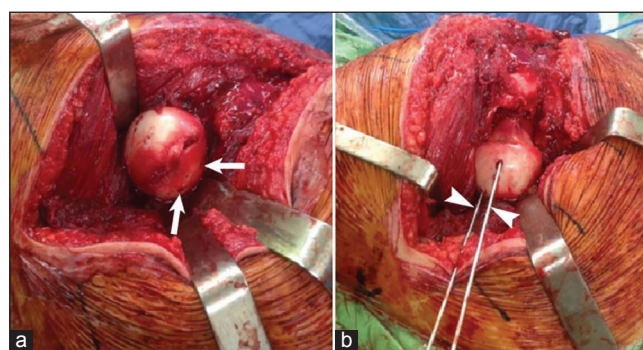


Figure 2. Right – The femoral head fragment was fixed with two 2.7 mm countersink screws (arrow). Left – The femoral head and neck were fixed via antegrade placement of guide pins (arrow head) that exited through the lateral femoral cortex

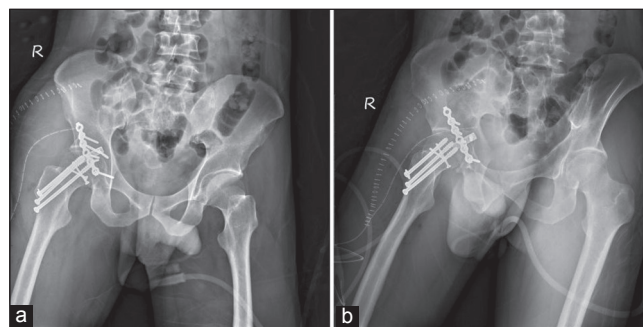


Figure 3. Postoperative radiography showed anatomic reduction and satisfactory internal fixation of all fractures

iliopsoas, ligamentum teres, or bone fragments from the acetabular wall or femoral head.⁶ Subsequently, emergent open reduction should be performed to decrease the blood flow obstruction to the femoral head. It is better to perform a CT scan before the operation for a full evaluation and

preparation of the surgical plan. With the exception of irreducible dislocations, surgical indications include nonconcentric reductions with intra-articular fragments of cartilage or bone, associated fracture of the femoral neck or femoral head, and associated acetabular fracture combined with hip joint instability.¹¹

This patient sustained posterior hip dislocation with ipsilateral femoral head and acetabular fractures. Iatrogenic femoral neck fracture was noted during closed reduction of the hip. A CT scan of this patient showed that the fractured femoral head was located in the gluteus medius, similar to a buttonhole. The surgeon applied longitudinal traction in line with the deformity, and the adducted and internally rotated thigh was then flexed to 90°. The cause of the femoral neck fracture may have been the application of a traction force that was insufficient to allow the femoral head to leave the buttonhole of gluteus medius; the acetabulum rim may act as a fulcrum when the hip was flexed.

During the traditional operation technique for femoral neck fracture, the patient is positioned supine or prone with the fracture table assisted. In our case, we used a posterior approach in the lateral decubitus position. The advantages of the posterior approach are: (1) The same direction as that of the dislocation, which preserves the anterior structures, residual blood supply, and hip stability; and (2) a better visual field to access all the fractures.¹² However, this approach is associated with the difficult technical issue of maintaining the reduction of the fracture of the femoral head prior to the definitive stabilization of the hip joint. Another problem associated with this procedure is the difficulty in obtaining a good fluoroscopy survey with the leg in a flexed and internally rotated position. This problem can be overcome via a technique that uses three antegrade guide pins buried deep into the articular surface. This provides (1) temporary stabilization of the reduction of the femoral neck and head, (2) accurate placement of three parallel cannulated screws without the need for intraoperative C-arm fluoroscopy, and (3) a well-localized entry point of the cannulated screws.^{13,14}

Although, this is a very difficult and complex fracture pattern that is associated with a high incidence of very poor clinical outcomes,¹⁵ we propose emergent internal fixation and gain an anatomic reduction and stable internal fixation for this young patient.¹⁶ This method provides safe and reliable fixation, which overcomes the operative difficulties in surgical access and use of intraoperative C-arm imaging.

CONCLUSION

Fractures-dislocations of the hip are complex conditions that are usually associated with poor outcomes due to avascular

necrosis of the femoral head, posttraumatic osteoarthritis and functional disability. We can only do our best to provide anatomic reduction and rigid fixation in a timely fashion to minimize the sequela for young active patients. This method of antegrade placement of three guide pins and fixation with three 7.5 mm retrograde cannulated screws to fix the femoral neck fracture allows us to deal with this difficult situation more easily.

DISCLOSURE

All authors declare no competing financial interests.

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