

# Obturator dislocation of the femoral head combined with ipsilateral femoral neck and pubic fractures

## A rare case report

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### Abstract

**Rationale:** Obturator dislocation of the femoral head combined with ipsilateral femoral neck and pubic fracture is a rare injury. We used cannulated screws combined with a femoral neck medial plate for the first time to treat this type of injury and achieved good follow-up results.

**Patient concerns:** The patient was hospitalized due to an accident resulting in swelling and deformity accompanied by limited mobility of the right hip and left knee.

**Diagnoses:** X-ray examination and computed tomography confirmed that the patient suffered from right hip obturator dislocation, femoral head and neck fracture, pubic fracture, as well as open fracture of the left femoral shaft.

**Interventions:** Open reduction and internal fixation with cannulated screws and a medial support plate of the femoral neck were performed for the right hip obturator dislocation, femoral head and neck fracture, and the pubic fracture. Artificial bone grafting was performed to support the femoral head defect. Debridement and the second phase of internal fixation were executed to cure the open fracture of the left femoral shaft.

**Outcomes:** The patient was followed-up for 6 months and showed good hip function. X-ray examination and computed tomography indicated that the fractures healed well without fracture displacement or loosening of the implants. Meanwhile, there were no signs of femoral neck valgus and femoral head necrosis observed.

**Lessons:** The combination of cannulated screws and medial support plate was suggested for the treatment of hip obturator dislocation and femoral head and neck fracture. Furthermore, partial weight loading exercise should be performed promptly to reduce the risk of muscular atrophy and myasthenia.

**Abbreviations:** CARE = case report, CT = computed tomography.

**Keywords:** femoral neck fracture, hip obturator dislocation, pubic fracture

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Written informed consent was provided by the patient for the publication of the clinical details and images.

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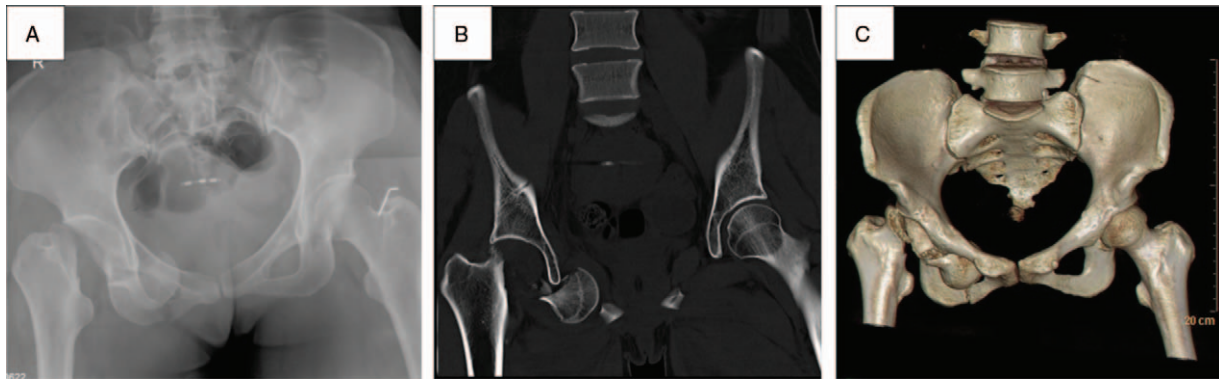
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## 1. Introduction

Owing to the protection of muscles and ligaments, as well as the unique structure of the acetabulum, most hip dislocations are caused by high-energy damage and may lead to serious injury. According to the positional relationship of the femoral head, hip dislocation can be divided into anterior, central, and posterior dislocation. Notably, the anterior dislocation can be further divided into pubic and obturator dislocation.<sup>[1]</sup> Anterior hip dislocation is rare, accounting for 7% to 13% of all hip dislocations, and the most important factor involves forced adduction.<sup>[2]</sup> The femoral neck or rotor hits the edge of the acetabulum, and the femoral head is dislodged through the anterior capsule. For hip joints in the flexion or extended position, the dislocation may become an obturator type or a pubic dislocation, respectively.<sup>[3]</sup> If energy continues to pass, hip joint dislocation may occur in conjunction with the femoral neck fracture, and potentially lead to pubic fracture. Obturator dislocation of the femoral head combined with ipsilateral femoral neck and pubic fractures is a rare injury. To the best of our knowledge, this type of injury has not been previously reported. We applied cannulated screws combined with femoral neck medial support plate to treat this rare injury for the first time, and achieved good follow-up results.



**Figure 1.** X-ray examination (A), CT scanning (B), and 3D reconstruction (C) of the pelvis and femur indicating obturator dislocation of the femoral head combined with ipsilateral femoral neck fracture and pubic fracture. CT=computed tomography.

This manuscript adheres to the case report (CARE) guidelines.<sup>[4]</sup> Written informed consent was provided by the patient for the publication of this manuscript and the accompanying images.

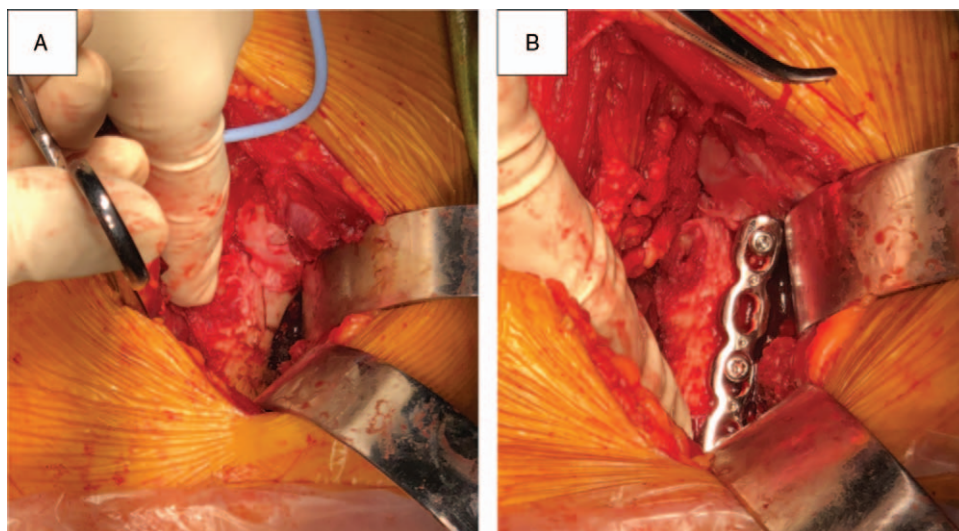
## 2. Case report

A 34-year-old female patient was admitted to the hospital with pain and slight swelling in the right hip and left knee due to an accident. Physical examination showed that the right lower limb was shortened with external rotation deformity and limited flexion. X-ray examination showed a vertical fracture line at the right femoral neck from the upper to the inferior direction, involving part of the femoral head. The fracture end was completely disconnected, and the femoral head was detached in the obturator with pubic fracture due to the violent impact (Fig. 1A). At the same time, an open comminuted fracture of the left distal femur with a 3-cm long wound was detected. Three-dimensional computed tomography (CT) further verified the dislocation of the femoral head into the obturator without involvement of the acetabulum (Fig. 1B and C). According to the

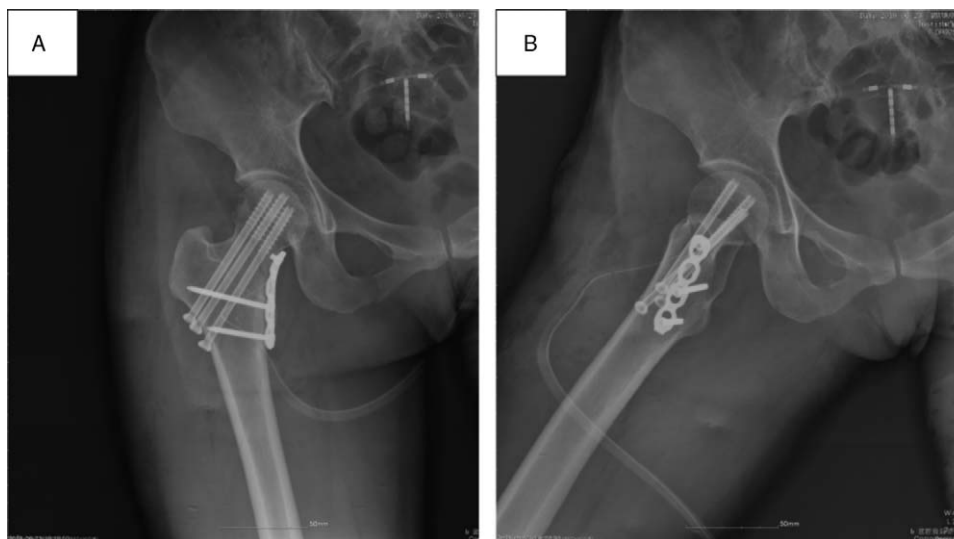
Rockwood classification, the femoral neck fracture was the head and neck type.

## 3. Surgical methods

After confirming the absence of surgical contraindications, emergency surgery was performed on the same day, and the short-sleeve Smith–Petersen approach was used for the operation. Briefly, an 8-cm incision was performed starting from the lateral and anterior iliac crest to the outer edge of the patella. Cutting the joint capsule along the femoral neck, we saw a proximal fracture line of the femoral neck involving a portion of the femoral head. The femoral head was detected by hand and locked in the obturator by the transverse ligament of the acetabulum. The acetabular transverse ligament was cut, the femoral head was removed, and 3 hollow nails were screwed in the direction of the femoral neck. The 4-hole reconstruction plate was bent accordingly, and was placed on the inner side of the femoral neck (Fig. 2). A single cortical locking screw was placed near the fracture line, and 2 long locking nails were screwed into the fracture line (Fig. 3). Passive active hip joints, flexion, extension



**Figure 2.** Reduction of the femoral neck fracture was performed, and a medial plate was used to support the femoral neck avoiding fracture displacement.



**Figure 3.** Postoperative x-ray examination showing good location and reduction of the femoral neck and head.

abduction, adduction, and rotation did not show abnormal activity at the fracture. The size of the femoral head defect was approximately  $0.5\text{ cm} \times 0.9\text{ cm}$ . The defect was filled and compacted with allogeneic cancellous bone. After rinsing the incision, we placed a drainage tube and sutured the incision.

The left femur fracture was completely debrided and sutured. Specimens were obtained from various sites of the wound for bacterial culture examination, and the external fixation was fixed.

#### 4. Postoperative functional exercise and follow-up

Postoperatively, the patient was allowed to perform hip flexion, abduction, and external rotation exercises in bed on the third day. Muscle strength exercise was encouraged to prevent muscle atrophy. Low molecular weight heparin sodium was administered to prevent venous thrombosis in the lower extremities. X-ray imaging or CT scanning were required at 1, 3, and 6 months after surgery to examine the fracture displacement, implant loosening, internal and external femoral neck valgus, and determine the time point of weight-bearing activities. Meanwhile, the hip function was also evaluated using the Harris score at each visit.

#### 5. Results

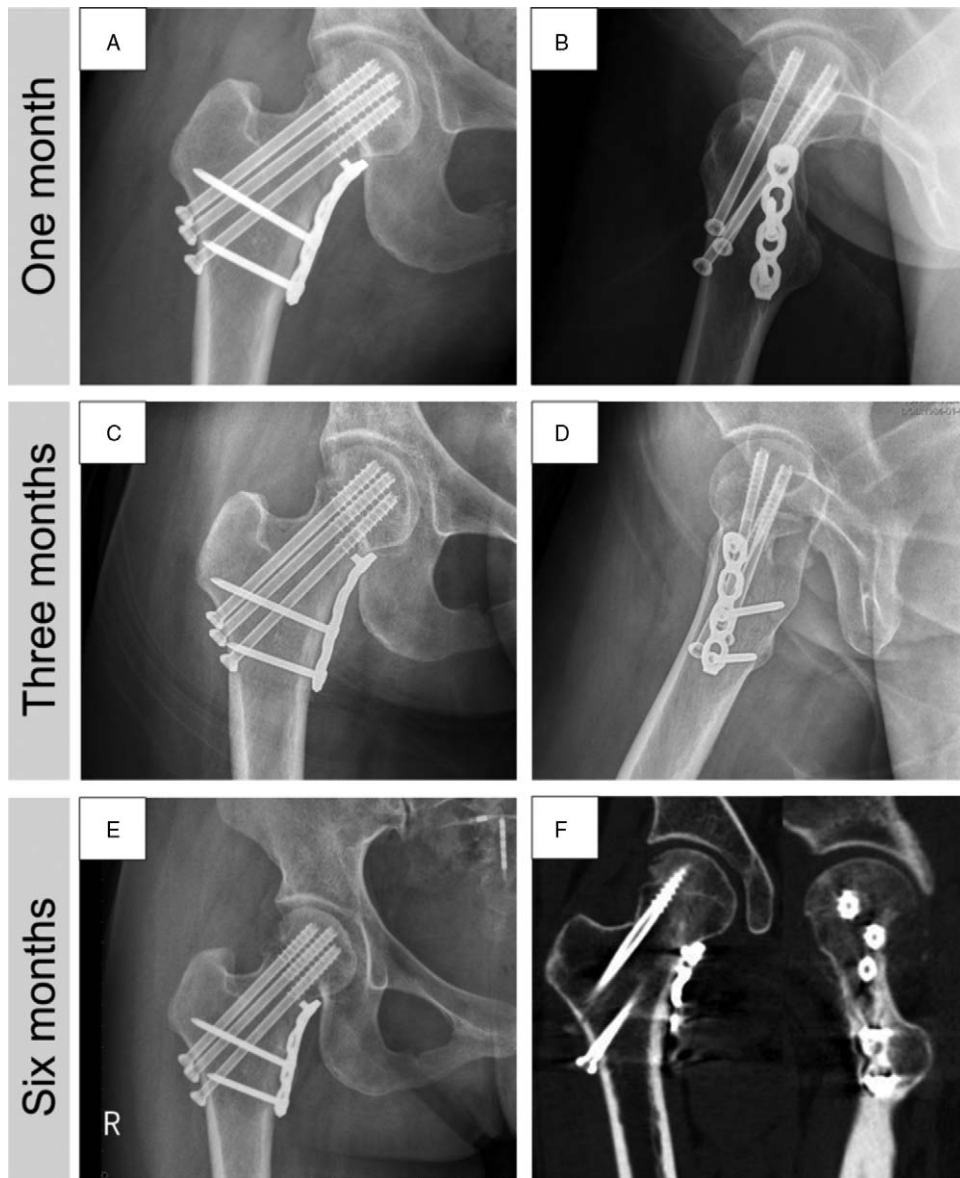
The radiographic findings at each time point after surgery did not show signs of fracture displacement, implant loosening, femoral neck valgus, or femoral head necrosis (Fig. 4). The fracture line became blurred with time, especially at 6 months following surgery. Although bone grafting was performed to fill the femoral head defect, small defects were observable at 6 months after surgery (Fig. 4F). Due to the lower extremity fractures and severe fracture of the left femur, the patient was able to only perform partial weight-bearing with good hip function (flexion:  $95^\circ$ , abduction:  $40^\circ$ , external rotation:  $30^\circ$ , adduction:  $20^\circ$ ) (Fig. 5). Affected by the multiple fractures, the Harris score was 51 points at 3 months, and improved to 66 points at 6 months. Subsequently, we ask the patient's lower limbs to carry 15 kg, and added 5 kg per week until it increased to body weight.

#### 6. Discussion

Hip anterior dislocation with ipsilateral femoral neck fracture in young patients is a rare injury. In the present case, the right knee of the patient was injured in an accident, and the affected limb was in the abduction, external rotation, and hip flexion position. We analyzed that the violent impact initially resulted in hip anterior dislocation (obturator), followed by femoral neck fracture due to the obstruction of the pubic symphysis and shearing force. The residual violent impact finally caused a lower pubic fracture. The fracture line of the right femoral neck was vertical and involved part of the femoral head, which was also confirmed through intraoperative examination.

Reports on hip anterior dislocation and ipsilateral femoral neck fracture in young patients are limited. Previously, Jain et al<sup>[5]</sup> reported a case using uncemented total hip arthroplasty for the treatment of hip dislocation with ipsilateral femoral neck fracture, achieving good hip mobility at week 6. They concluded that the choice of surgery should consider the time of injury, age, preference of the patient, and the size of the femoral head cartilage defect. Due to the moderate size of the femoral head cartilage and the preference of the patient, they did not choose an internal fixation and performed a joint replacement. However, hip replacement in young patients is associated with a potential risk of secondary or multiple revision surgeries.<sup>[6]</sup> Hence, although the femoral head of this patient exhibited a small cartilage defect in the no weight-bearing area, we recommended and finally selected open reduction and internal fixation—rather than joint replacement—for this patient.

The healing of a femoral neck fracture requires good reduction and absolute stability. Robust stability can promote the revascularization of the femoral head, thereby promoting fracture healing and reducing the occurrence of femoral head avascular necrosis.<sup>[7]</sup> Alternative internal fixation grafts for femoral neck fractures include parallel cannulated screws, dynamic hip screws, dynamic locking blade plates, etc. To our knowledge, a single graft cannot avoid the potential complications.<sup>[8–14]</sup> Recently, Allagui et al<sup>[15]</sup> reported a patient with anterior hip dislocation and ipsilateral femoral neck fracture without avascular necrosis of the femoral



**Figure 4.** Postoperative x-ray examination and CT scanning of the positive and lateral positions of the femur at 1 month (A, B), 3 months (C, D), and 6 months (E, F). CT=computed tomography.

head during the 3-year follow-up period after receiving dynamic hip screw fixation. However, significant femoral neck shortening and an increased neck shaft angle were observed at 12 weeks after surgery, which may be attributed to unstable fixation. Parallel cannulated screws possess the ability of flexible fixation along the axial direction of the femoral neck to promote fracture healing. However, they are also associated with a risk of femoral neck shortening.<sup>[16]</sup> In this case, the femoral neck fracture was vertical with a large shear force. It was difficult to achieve a satisfactory fixation effect by simply using cannulated screws, which could compromise the stability of the fracture. Finally, the internal fixation was probably invalid. This further affected fracture healing and even led to femoral head necrosis. Liporace et al<sup>[17]</sup> studied 75 patients with Pauwels type III femoral neck fracture. Of those, 37 patients underwent simple internal fixation with cannulated screws. The results showed that 19% of the patients had femoral neck fracture nonunion.

The combination of cannulated screws with a medial support plate may be an alternative method. In addition, a biomechanical study conducted by Kunapuli et al<sup>[18]</sup> demonstrated that the treatment efficacy and feasibility of the combination of cannulated screws with a medial support plate of the femoral neck were better than those observed for the combination of dynamic hip screws with a support plate. On average, the medial support plate increased failure loads in both constructs by 83%. Femurs instrumented with cannulated screws exhibited a 26% higher failure load than those instrumented with dynamic hip screws. Therefore, 3 cannulated screws for intramedullary fixation were implanted for the reduction of the femoral neck fracture through a short version of the Smith–Petersen approach to fully expose the fracture site. Subsequently, a reconstructed steel plate was used on the inner side of the femoral neck. In addition, a femoral neck medial support plate was used for external fixation, which supported the medial femoral head and





Figure 5. Hip function examination at 6 months follow-up indicating good joint mobility.

greatly reduced the shearing force. Furthermore, a single cortical screw was used at the proximal end of the medial supporting plate, which enhanced the fracture compression along the long axis of the femoral neck. The follow-up results at 6 months postoperatively showed satisfactory healing of the femoral neck fracture and hip joint activity, and absence of complications, such as femoral head necrosis and fracture displacement.

To be honest, our therapeutic schedule had a shortcoming of this therapeutic approach was the late weight loading in the lower limbs. Due to the severely fragmented left distal femur, we did not require the patient to bear weight early after surgery, and required partial weight-bearing activity at 6 months after surgery. Early-stage partial weight bearing may increase the axial pressure at the femoral neck and promote fracture healing, resulting in prompt recovery of the lower limb function.

## 7. Conclusion

We reported a rare case with hip obturator dislocation, femoral head and neck fracture, and pubic fracture. Cannulated screws and a medial support plate were used for the fixation of the femoral neck fracture. This treatment achieved a good fracture healing effect and satisfactory hip joint activity. There were no complaints (e.g., hip pain or discomfort) or femoral head necrosis

observed. This case also provides a new reference for the treatment of vertical instability femoral neck fractures.

## Author contributions

**Conceptualization:** Yuchen Hu, Chengdong Piao.

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**Formal analysis:** Feng Gao, Chao Huang.

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**Resources:** Yang Wang.

**Software:** He Liu, Liangshi Chen, Yunlong Li, Yang Wang.

**Supervision:** Chengdong Piao.

**Visualization:** Liangshi Chen.

**Literature review:** He Liu, Yun-long Li, Zheng-wei Li.

**Data analysis:** Zheng-wei Li, Yang Wang, Feng Gao.

**Writing – original draft:** Yuchen Hu.

**Writing – review & editing:** Chengdong Piao.

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