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Case report

Posterior hip fracture-dislocation associated with posterior wall fracture of the acetabulum and ipsilateral comminuted trochanteric fracture of the femur: A case report

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ABSTRACT

Introduction and importance: Traumatic posterior dislocation of the hip is often associated with fractures of the femoral head and posterior wall of the acetabulum. However, hip fracture-dislocation that includes the posterior wall of the acetabulum and the ipsilateral femoral trochanter is rare. There is no consensus on the bone that should be operated on first, the operative position, and the choice of implant for femoral fixation.

Case presentation: A 67-year-old man was brought to our emergency department after a 2-m fall. He was diagnosed with a hip fracture-dislocation associated with posterior wall acetabular fracture and ipsilateral femoral trochanteric fracture. Surgical reconstruction was performed with intramedullary nail (IMN) fixation of the femoral trochanteric lesion, followed by anatomically rigid acetabular fixation in the lateral decubitus position. At the 5-year follow-up after the injury, the patient showed good objective and subjective clinical outcomes.

Clinical discussion: Fixing the femur first could allow an easier reduction and traction. The lateral decubitus position was useful, because fixation of the femur and the acetabulum could be performed without changing the position. When fixing the femoral trochanteric lesion, attention was paid to reduce the anteromedial cortex of the proximal fragment extramedullarly to the distal fragment to prevent complications such as cutout and implant breakage.

Conclusion: Anatomically rigid fixation of the posterior wall of the acetabulum secondary to IMN fixation of the femur, with anteromedial cortical support in the lateral decubitus position, could achieve good objective and subjective clinical outcomes.

1. Introduction

Traumatic hip dislocations are usually caused by high-impact trauma; 90% of these dislocations comprise posterior dislocations [1,2]. Traumatic posterior dislocations of the hip are often associated with fractures of the femoral head and posterior wall of the acetabulum [1]. However, hip fracture-dislocations that include the posterior wall of the acetabulum and the ipsilateral femoral trochanter are rare; only few such cases have been reported [3,4]. There is no consensus on the bone that should be operated on first (the acetabulum or the femur), the appropriate operative position (supine or lateral decubitus position), and the choice of implant for femoral fixation. Moreover, clinical evaluation and subjective outcomes (including patient satisfaction) have not been described before.

We present a case of posterior hip fracture-dislocation associated with posterior wall fracture of the acetabulum and ipsilateral comminuted trochanteric femoral fracture. The patient was successfully treated via intramedullary nail (IMN) fixation of the femoral trochanteric lesion, followed by an anatomically rigid acetabular fixation in the lateral decubitus position.

This report was made in line with the SCARE criteria [5].

2. Presentation of case

A 67-year-old man with no significant medical history was brought to our emergency department after a 2-meter fall. On admission, he was

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hemodynamically unstable and complained of severe pain in his right hip. Physical examination revealed that his right leg had shortened by 2 cm and was rotated externally without any open wounds. Vascular and neurological examinations were unremarkable. A plain radiograph revealed a posterior hip dislocation with posterior wall acetabular fracture and ipsilateral comminuted trochanteric fracture of the femur (Fig. 1). Computed tomography (CT) confirmed the findings of the hip (Fig. 2) and indicated cerebral contusion. First, we attempted a closed reduction of the dislocated hip joint with the Allis maneuver; however, we could not obtain a reduction. Because the patient's hemodynamic condition remained unstable, we decided against open reduction of the dislocated hip joint. We then applied direct traction from the thigh and postponed the operation until hemodynamic stabilization could be achieved.

When stabilization was achieved, the operation was performed under general anesthesia on the sixth day of hospitalization. The patient was then placed in the lateral decubitus position using a vacuum mattress; thereafter, surgical exposure was performed using the Kocher–Langenbeck approach. Upon exposure, the trochanter fragment was displaced posteriorly, and the joint capsule was ruptured. The dislocation was easily reduced by pushing the femoral head. The posteriorly displaced trochanter fragment was reduced under direct visualization, and the IMN was inserted. The anteromedial cortex of the proximal fragment was reduced extramedullary to the distal fragment; this was confirmed by palpating the steps between the proximal and distal fragments. A helical blade was inserted thereafter. After the femoral trochanteric fracture fixation, the posterior wall fragment was reduced and fixed with a lag screw and a plate in the same position (Fig. 3). Postoperative CT revealed an anatomically reduced posterior acetabular wall, and the anteromedial cortex of the proximal fragment was reduced extramedullarly to the distal fragment (Fig. 4).

The patient was mobilized with toe-touch-weight bearing of the right lower extremity on the first postoperative day. Toe-touch-weight bearing was instructed for 6 weeks. Partial-weight bearing was allowed at 6 weeks postoperatively, and full-weight bearing was allowed at 10 weeks postoperatively. At the 5-year follow-up, the patient was noted to have returned to his pre-injury activities and could walk and exercise without residual pain. The Japanese Orthopaedic Association Hip Score [6] was 95 points and the Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire score [7] was 63 points. Plain radiographs revealed that the helical blade had slid by only 2 mm, with evidence of fracture union and no signs of avascular necrosis of the femoral head (Fig. 5).

3. Discussion

We demonstrated that a posterior hip fracture-dislocation associated with posterior wall acetabular fracture and ipsilateral comminuted trochanter femoral fracture can be successfully treated by anatomically rigid acetabular fixation secondary to the IMN fixation of the comminuted femoral trochanteric fracture in the lateral decubitus position.

Due to the rarity of traumatic hip joint dislocations with posterior wall fractures of the acetabulum and ipsilateral femoral trochanteric fractures, only two related case reports are available in the literature [3,4]. Regarding the mechanism of a posterior hip fracture-dislocation [1], if the axial forces on the acetabulum are stronger than the adduction force, the acetabulum or femoral head fractures occur when the hip joint is dislocated. If the trochanteric fracture precedes the acetabular fracture, a force sufficient for injuring the pelvis would not be transmitted to the femoral head. In the present case, it was unlikely that the trochanteric fracture occurred prior to the acetabular fracture; we believe that the exertion of an axial force on the acetabulum after the fall, while the hip was in slight adduction, may have led to a hip fracture-dislocation encompassing the posterior wall. When the patient slammed on the ground, he sustained a direct blow to the trochanteric region, and the comminuted trochanteric fracture occurred consequently.

In one of the two afore-mentioned cases, one described that the posterior wall of the acetabulum was fixed first, and femoral trochanteric fixation in the lateral decubitus position was performed thereafter [4]. In the other case, the acetabulum fracture was fixed first in the lateral decubitus position, and femoral trochanteric fixation in the supine position was performed thereafter [3]. In both cases, the acetabulum was fixed with a plate, and the trochanter lesion was fixed with a dynamic hip screw (DHS). The importance of the lateral femoral wall for buttressing of the proximal fragment has been described, and lateral femoral wall thickness <20.5 mm is thought to be a risk factor for postoperative lateral femoral wall fractures and early DHS fixation failure [8]. The addition of a trochanter stabilizing plate has been proposed for the prevention of DHS fixation failure in such cases; however, this increases the blood loss and is invasive to the surrounding soft tissues [9]. Although an IMN is less invasive for soft tissues and the patient's hemodynamic condition as compared to DHS fixation with a trochanteric stabilizing plate, the risk factors for IMN fixation failure in unstable femoral trochanteric fractures have also been reported [10]. Loss of the anteromedial cortical support on the anteroposterior and lateral views during intraoperative fluoroscopy worsened the clinical outcomes and increased the complications (loss of reduction, cutout, excessive sliding of the cephalic nail, and implant breakage) [10,11].

Fig. 1. A plain radiograph of the pelvis in anteroposterior (AP) view shows posterior fracture-dislocation of the right hip joint and ipsilateral comminuted trochanteric femoral fracture.

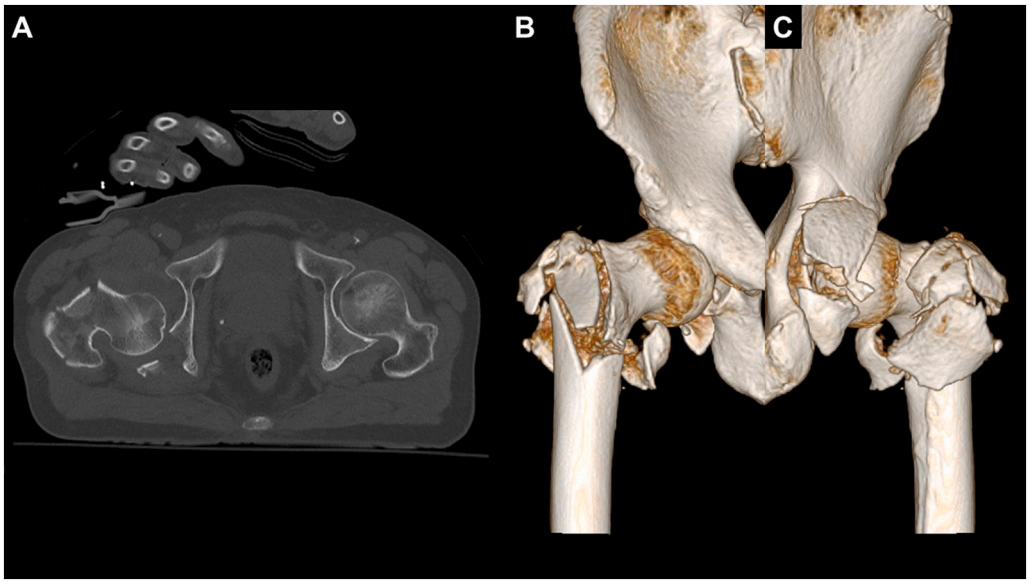

Fig. 2. Computed tomography (CT) in (A) axial view and (B, C) 3DCT images reveal posterior dislocation of the right hip joint and associated posterior wall fracture of the acetabulum and comminuted trochanteric femoral fracture.

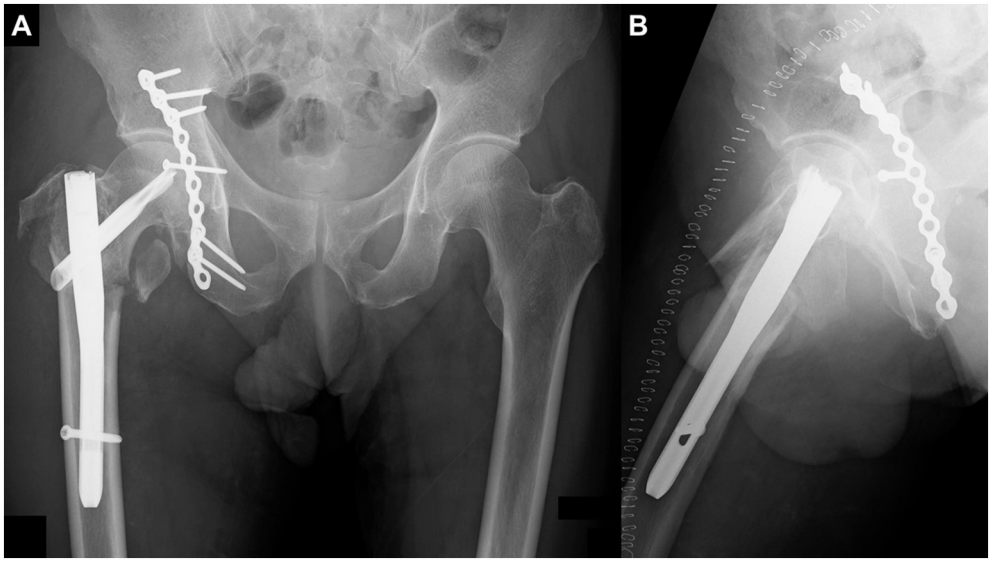

Fig. 3. Postoperative plain radiographs of the hip joint in (A) AP and (B) right lateral views. The posterior wall is fixed with a plate, and the trochanteric lesion is fixed with an intramedullary nail.

The order of facture fixation in the treatment of acetabular fractures associated with ipsilateral femoral fractures is controversial. Liebergall et al. [12] stated that fixing the femur first would allow an easier reduction and traction than fixing the acetabulum first. Regarding the patient's position, Doğan et al. [13] reported that for IMN fixation of unstable femoral trochanteric fractures, there were no significant differences in the operation time, intraoperative bleeding, reduction quality, and postoperative functional scores between the lateral decubitus position and the supine position with traction. The lateral decubitus position was deemed as a safe and effective alternative to when a traction table was unavailable. We treated our patient with femoral nailing, followed by anatomically rigid acetabular fixation in the lateral decubitus position. When fixing the femoral trochanteric lesion, attention was paid to reduce the anteromedial cortex of the proximal fragment extramedullarly to the distal fragment. Along with the two abovementioned cases [3,4], the present case also involved comminuted trochanteric lesions. Therefore, IMN is thought to be a more suitable implant in such cases, after considering the following factors: fracture configuration, effect on the patients' hemodynamic status, injury to the surrounding soft tissues, and postoperative complications.

It is well-accepted that dislocated hip-joint reduction should be performed as soon as possible to minimize the risk of avascular necrosis of the femoral head [14]. However, these dislocations and fracture-dislocations are usually caused by high-energy trauma and are accompanied by other thoracic and/or abdominopelvic injuries [2], thereby resulting in patients being too unstable to be operated upon. The optimal timing and processing method for each operation must be planned in relation to the patient's physiological status and other concomitant injuries. If the patient's hemodynamic condition can tolerate surgery, early open reduction of the dislocated hip joint with no attempts of closed manual reduction would be the treatment of choice. Closed reduction of hip-joint dislocations or fracture-dislocations associated with ipsilateral

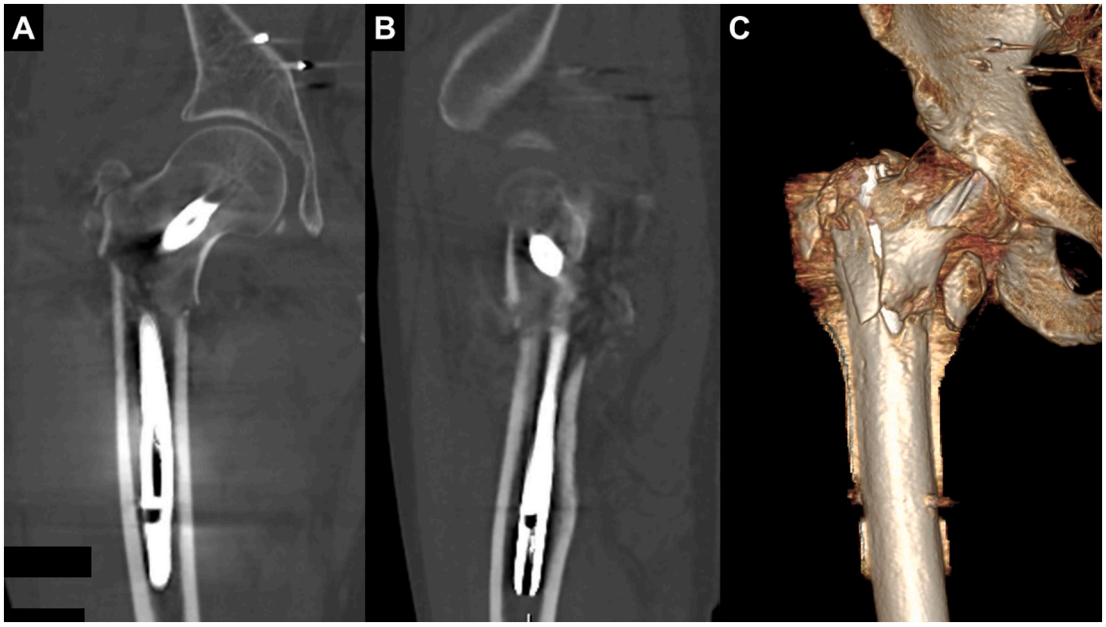

Fig. 4. Postoperative CT in (A) coronal and (B) sagittal views, and (C) 3DCT image of the right femur. The anteromedial cortex of the proximal fragment is reduced extramedullarly to the distal fragment.

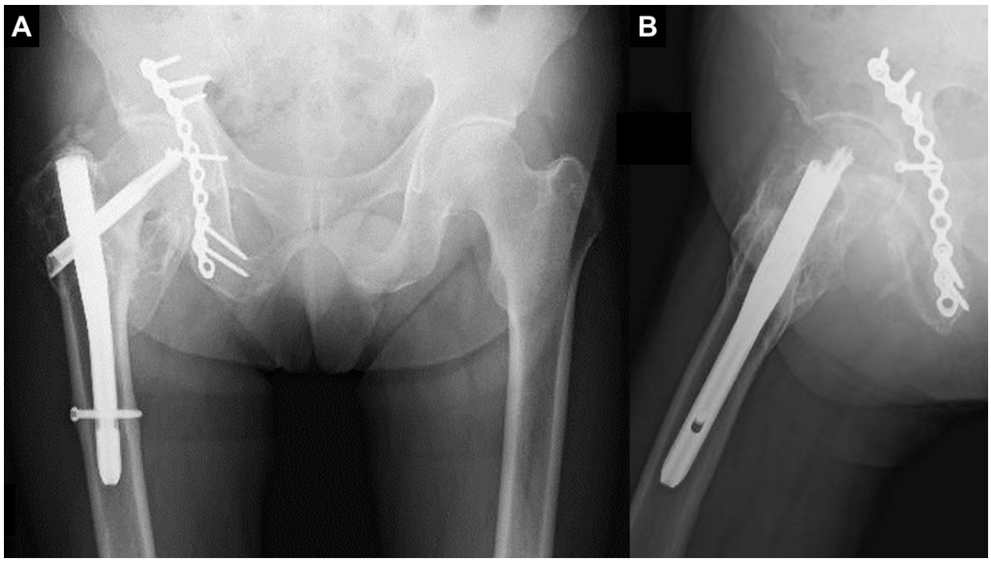

Fig. 5. Taken at 5-year postoperatively, plain radiographs of the hip joint in (A) AP and (B) right lateral views show bony union and no evidence of excessive sliding of the helical blade. Avascular necrosis of the femoral head is not observed.

trochanteric femoral fractures generally failed because the femoral traction force is not transmitted to the femoral head [4,15]. However, if the patient's hemodynamic condition is too unstable to operate, closed manual reduction of the dislocated hip joint should be attempted to minimize the risk of avascular necrosis of the femoral head. Despite a 5-day delay in the reduction of the dislocation, our patient achieved relatively good objective and subjective clinical outcomes and had no signs of avascular necrosis of the femoral head.

4. Conclusion

In conclusion, anatomically rigid fixation of the posterior wall of the acetabulum secondary to IMN femoral fixation, with anteromedial cortical support in the lateral decubitus position, achieved good objective and subjective clinical outcomes in a patient with a posterior hip fracture-dislocation associated with posterior acetabular wall fracture and ipsilateral comminuted trochanteric femoral fracture.

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Ethical approval

N/a.

Consent

Written informed consent was obtained from the patient for

publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contributions

Shuya Nohmi: Operation of the patient, writing—original draft.
Hirotaka Oishi: Writing—review and editing.
Yukiko Sakamoto: Investigation.
All authors read and approved the final manuscript.

Research registration

N/a.

Guarantor

The guarantor for the present case report is Shuya Nohmi.

Provenance and peer review

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Declaration of competing interest

Declaration of interest: all authors declare no conflict of interest.

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