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Case Report

Simultaneous ipsilateral hip and knee fracture-dislocations☆

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A B S T R A C T

Simultaneous ipsilateral hip and knee fracture-dislocations are orthopedic emergencies requiring immediate management. Delayed or inadequate treatment usually results in an extremely poor outcome. Reduction of the dislocated hip can be difficult because of the ipsilateral knee dislocation and instability. We report a case involving a 46-year-old man with simultaneous ipsilateral hip and knee fracture-dislocations. He underwent closed reduction for the knee fracture in the emergency department but required open reduction and internal fixation of the unstable hip fracture-dislocation with a distal femur skeletal traction pin under general anesthesia.

1. Introduction

Simultaneous ipsilateral hip and knee dislocations are rare and represent orthopedic emergencies. Most of these cases, which may occur with or without bony fracture of the hip or knee, result from high-energy traffic accidents. The outcomes can vary widely from no significant neurovascular sequelae to through-the-knee amputation from distal ischemic complications.[1–5] Such dislocations combined with hip and knee fractures are even rarer and have not been previously reported. We report the case of a patient with traumatic hip fracture-dislocation accompanied by ipsilateral knee fracture-dislocation that required immediate closed reduction under sedation.

2. Case report

A 46-year-old male truck driver with medically controlled hypertension was involved in a major traffic accident while driving his truck. The dashboard crushed his left knee while in 90° of flexion, and he presented to the emergency department with painful deformities of the left hip and knee. Further examination revealed no other associated problems, such as intracranial hemorrhage, hemopneumothorax, or abdominal internal bleeding. Physical examination of the extremities revealed a flexed, adducted, and internally rotated left hip and a left knee maintained in 45° of flexion. Neurological examination revealed absence of sensation and active motion below the knee. Dorsalis pedis artery and posterior tibial artery pulses were not palpable. However, the foot was warm and well perfused, with a capillary refilling time less than 2 seconds. Radiographic examinations (Figs. 1–3) showed a posterior hip fracture-dislocation and a posterolateral knee dislocation with a left patellar transverse fracture. The patient underwent immediate closed reduction of the left posteriorly dislocated knee under intravenous sedation. The knee was easily reduced after application of gentle traction anteriorly, and the dorsalis pedis artery and posterior tibial artery pulses returned but remained weak. However, sensation and mobility below the knee did not return. The posteriorly dislocated hip was gently reduced manually with hip flexion, traction, and external rotation. The knee was kept in full extension with a long leg splint for temporarily immobilization throughout the manipulation process. The fracture-dislocation pattern of the hip was unstable after closed reduction because of the fracture of the posterior wall of the acetabulum. No significant change was observed in the neurovascular pattern after hip manipulation. Computed tomography angiography (CTA) of the pelvis and both legs was performed after left long leg splitting. This procedure identified the fracture of the posterior wall of the left acetabulum with posterior dislocation of the femoral head, as well as the patellar fracture with posterior knee subluxation. No active bleeding or pseudoaneurysm of the popliteal artery was identified, and the weakness of the distal pulses was attributed to transient vessel spasm (Fig. 4). Magnetic resonance imaging (MRI) was performed, which revealed a tear of the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), and lateral collateral ligament, accompanied by tears of the lateral meniscus and medial meniscus (Fig. 5). The findings were

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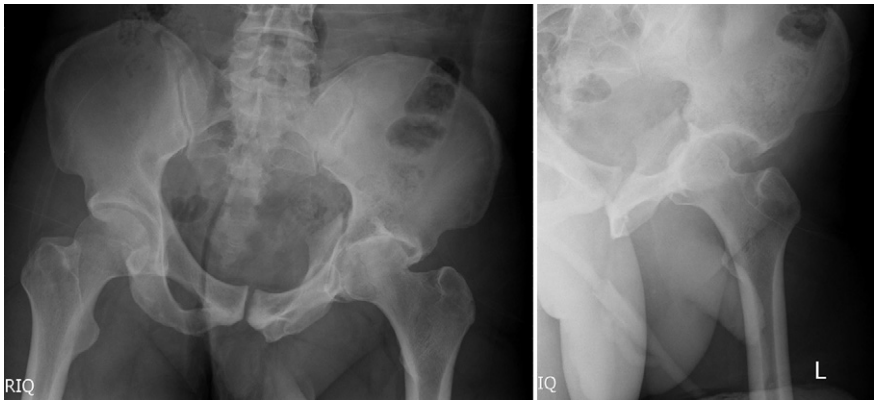

Fig. 1. Anteroposterior radiograph of the pelvis with left hip fracture-dislocation. Chip fragment of the posterior wall of the acetabulum and dislocation of the femoral head from the acetabular socket are evident.

compatible with the multidirectional instability of the left knee found on physical examination.

Because of the numerous structural injuries of the left extremity, surgery was performed immediately following the MRI examination. First, the patient was arranged in the prone position, and a traction pin was placed in the distal femur to minimize unnecessary manipulation of the injured knee. Open reduction and internal fixation (ORIF) of the fracture involving the posterior wall of left acetabulum was performed with two reconstruction plates using the Kocher-Langenbeck approach. Ecchymosis and swelling of the sciatic nerve and surrounding tissues were noted, but the nerve was intact without incarceration or compression by surrounding bony structures. The patient was then turned into the supine position. The traction pin was removed, and the knee was opened with a midline incision. The ruptured end of the ACL near the femoral origin site and the ruptured end of the PCL near the tibial insertion site were observed. The ACL and PCL were repaired with Ethibond (nonresorbable, braided suture, manufactured by Ethicon Inc., Somerville, New Jersey) using the pull-through method to bone, and the lateral collateral ligament was repaired with Vicryl (resorbable, braided suture, manufactured by Ethicon Inc.). The fracture of lower pole of the patella was managed with ORIF with Ethibond pull-through suture, and the wound was then closed.

Following surgery, the circulation status recovered fully. The distal arterial pulses were palpable and equal to those of the opposite side; however, the patient still had an absence of sensation and motion below the knee (muscle power grade, 0/5). Corticosteroids were prescribed starting on postoperative Day 1, beginning with hydrocortisone (100 mg every 6 hours for 3 days), then changing to oral prednisolone (10 mg twice a day for 1 week). Muscle power improved only slightly after 1 week; the patient could extend his big toe slowly (muscle power grade, 1/5). The long leg splint was maintained for 4 weeks to allow healing of the repaired structures and then was removed to permit both active and passive range of motion.

At the 2-year follow-up visit, the patient's sensation below the knee had improved only slightly, and numbness with diminished sensation persisted. Long-term medication with 300 mg of gabapentin once daily before sleep was required for the persistent below-knee paresthesia. Radiographs taken 1 year after surgery showed good alignment of the left acetabulum and some callus formation around the patellar fracture site (Figs. 6 and 7). There was no evidence of dislocation or subluxation of either hip or knee joint. The anterior tibialis muscle was atrophied, and the muscle power grade was 3/5 for both ankle dorsiflexion and big toe extension. The quadriceps muscle was also atrophied because of deconditioning,

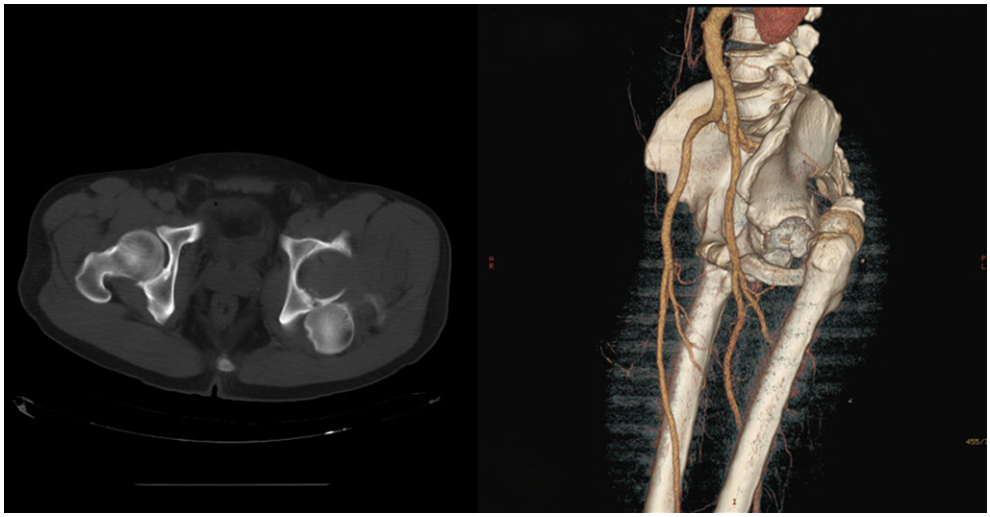

Fig. 2. Two-dimensional and three-dimensional computed tomography scans of the pelvis showing fracture of the posterior wall of the acetabulum and posterior dislocation of the femoral head.

Fig. 3. Anteroposterior and lateral radiographs showing posterolateral dislocation of the left knee accompanied by a lower-pole transverse patellar fracture.

and the muscle power grade was 4/5 for knee extension. The knee range of motion was 0°–120°. The varus and valgus stress tests were Grade 0/3, and both the anterior drawer and posterior drawer tests were also Grade 0/3. The patient was free of hip pain, and there was no evidence of avascular necrosis of the femoral head or osteoarthrosis of the hip. Nerve conduction velocity revealed sciatic nerve and peroneal nerve injuries without reinnervation. The whole duration of postoperative rehabilitation program was 2 years. After intensive rehabilitation training for the first 1 year, the patient could walk slowly with the aid of a crutch. At the end of 2-year follow-up, he could walk without using the crutch but still presented with mild limping gait.

3. Discussion

Simultaneous ipsilateral hip and knee fracture-dislocations are rare events and represent true orthopedic emergencies.[1–5] They usually result from high-energy traffic accidents where the force directly impacts the knee and is then transferred to the ipsilateral femur and hip, resulting in severe injury. The physical examination and appropriate radiographs of the patient's injuries should be performed initially on the arrival of the emergency room. Closed reduction should be done immediately when dislocation is confirmed by either physical examination or plain films. The neural and vascular status before and after manipulation should always be monitored.

A knee dislocation can be accompanied by popliteal vascular injury. McDonough and Wojtys[6] reported 16.9% (12/71) of knee dislocations were associated with injuries to the popliteal artery. Within this group, up to 66.7% (8/12) had normal pulses on physical examination. Therefore, physical examination for evaluation of vascular status is not sufficient, and routine arteriography is necessary for cases of knee dislocation with suspected popliteal artery injury. Conventional angiography has a 1%–3% complication

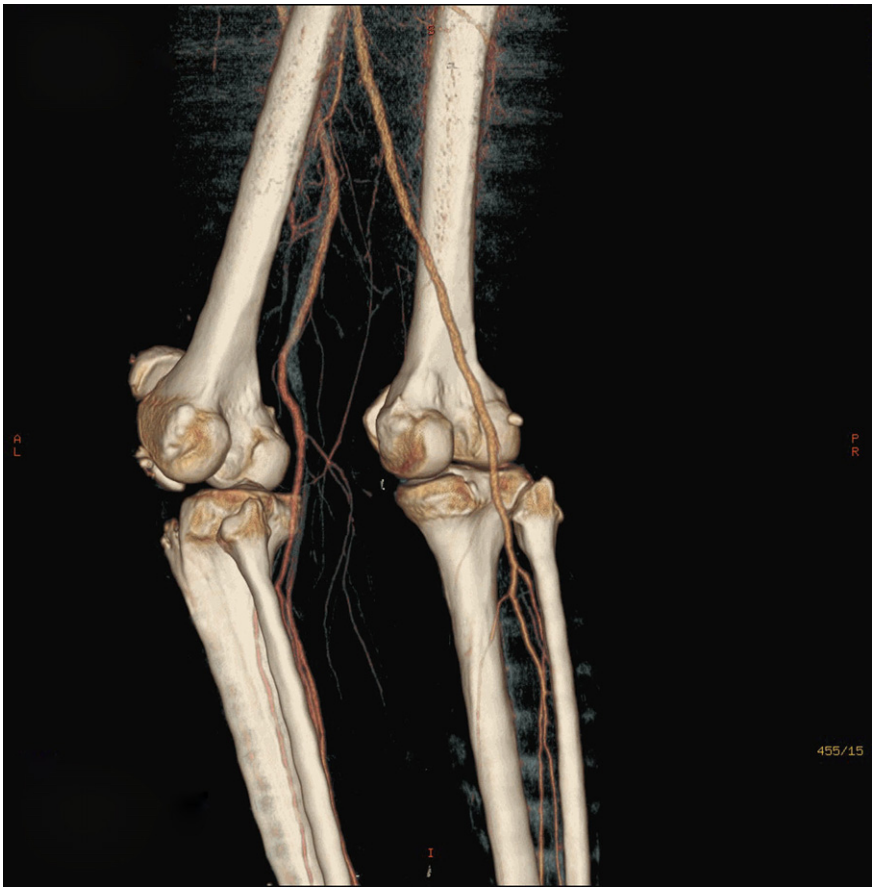

Fig. 4. Computed tomography angiography showing smooth contrast runoff through the knee without evidence of active bleeding or pseudoaneurysm involving the left popliteal artery.

Fig. 5. (A) Magnetic resonance imaging of the knee findings: disruption of the anterior cruciate ligament and posterior cruciate ligament; (B) tear of the lateral collateral ligament from the femoral origin site (*gray arrow*); and (C) tears of the lateral meniscus and (D) medial meniscus.

rate and does take time to complete.[7] CTA is another choice for evaluation of the vascular status. Seamon et al[7] reported that the sensitivity rates of CTA versus conventional angiography are equal. Compared with conventional angiography, CTA is a less invasive, less expensive, and has more rapid examination. Furthermore, CT may also help evaluate skeletal structures. Therefore, we recommend CTA over conventional angiography for evaluation of fracture-dislocations of the knee and hip.

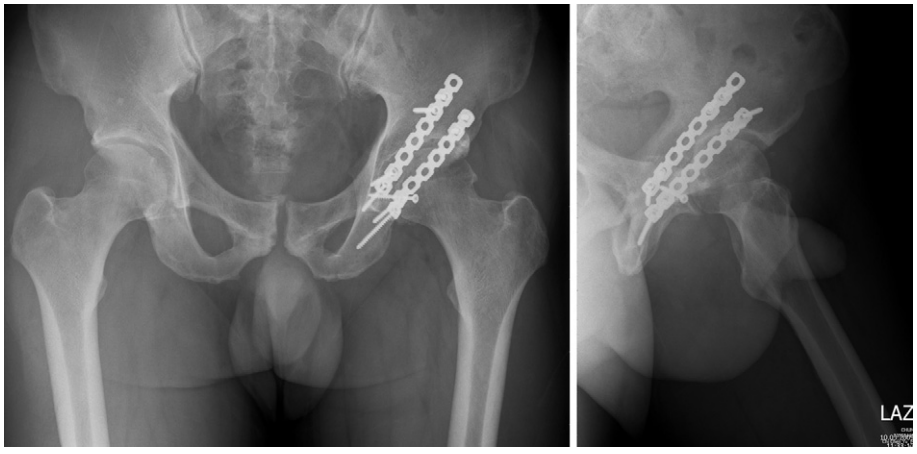

Fig. 6. X-ray of the pelvis 1 year after surgery showed good alignment of the left acetabulum. There is no evidence of dislocation or subluxation of the femoral head.

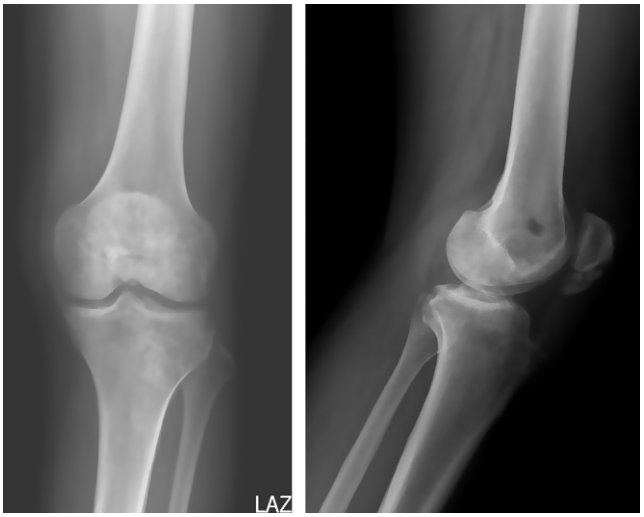

Fig. 7. X-ray of the left knee 1 year after surgery showing some callus formation around the fracture site.

The optimal time to perform an MRI of the knee would be after assuring neurovascular stability. The MRI could show both the anatomical and histological condition of the intra- and extra-articular soft tissues and help identify major causes of instability.

Hip dislocations should be reduced as early as possible to decrease the incidence of avascular necrosis of the femoral head, hip arthrosis, and neurovascular compromise. Generally, the hip should be reduced by constant, powerful lower-limb traction. Many reduction methods have been reported. Most cases can undergo closed reduction under adequate sedation or anesthesia, but some require open reduction.[1,3–5,8] Some authors have reported application of a Schanz screw at the proximal femur to act as a joystick to assist with reduction.[1,9] In the present case, ORIF with plate for the acetabular fracture was indicated because of significant instability after closed reduction. Constant, powerful traction was required, but the general methods of hip and knee flexion to 90° were not suitable because of the knee injury and associated instability. A skeletal traction pin was applied to the distal femur during surgery for traction and to assist reduction. This is a simple technique that can be performed without fluoroscopic assistance. The use of this traction pin also minimized further injury to the neurovascular bundle of the knee.

Approximately 50% of knee dislocations are associated with tears of the ACL, whereas 75% are associated with tears of the PCL.[10] Early stabilization of the ACL improves stability and reduces the rate of secondary meniscal injury.[11,12] Repair of the ruptured ACL at the acute stage results in better stability and a lower rate of secondary meniscal tear when compared to nonsurgical treatment, although no statistically significant difference was observed in the incidence of secondary osteoarthrosis.[13] In our case, the knee was exposed for patellar fracture management, and the intra-articular structure was exposed easily by extending the wound. The ACL and PCL were repaired with nonresorbable suture using the pull-through method, and stability was restored after surgery.

Sciatic nerve injury occurs in approximately 10% of hip dislocations, and at least partial recovery occurs in 60%–70% of cases. The peroneal branch is most commonly injured.[14] Approximately 26%–40% of knee dislocations are complicated by common peroneal nerve palsy, and recovery to useful motor and sensory function may not occur in up to 50% of those patients.[15–17] In this case, both levels of the peroneal branch may have been injured, and the prognosis is fairly poor.

4. Conclusion

Simultaneous ipsilateral hip and knee fracture-dislocation is a rare event that should be treated as an orthopedic emergency. Delayed or inadequate management usually results in an extremely poor outcome.

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