Ipsilateral fracture dislocations of the hip and knee joints with contralateral open fracture of the leg: a rare case and its management principles

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**Abstract** This paper discussed the injury mechanism and management of a patient who had concomitant ipsilateral hip and knee dislocations and contralateral open leg fracture.

A 32-year-old man presented with ipsilateral fracture-dislocations of the left hip (Pipkin’s type IV) and knee (Moore II) joints and contralateral open fracture of the leg bones after a car accident. After emergency resuscitative measures, the hip joint was reduced and Pipkin’s fracture was fixed using Ganz approach with lag screws; knee joint was reduced closely and tibial plateau fracture was stabilized with lateral buttress plate and a transarticular spanning fixator. The open fracture on the other leg was debrided and fixed with an external fixator. There was no instability in both joints after fixation when he was examined under anesthesia. The fractures united after 3 months and the patient had no residual instability of hip and knee. There was no clinical or radiological evidence of osteonecrosis in the hip joint after 6 months. At one-year follow-up, he had satisfactory functional outcome with almost normal range of motion at both joints.

Ipsilateral hip and knee dislocations are rare injuries and more caution is needed for early diagnosis. A timely appropriate intervention can provide good functional outcome to the patient in this situation.

**Key words:** Hip dislocation; Knee dislocation; Fractures, bone

Dashboard injury is a common mode of trauma following high velocity road traffic accidents and results in a variety of serious lower limb injuries. Severe disruption of osseous and soft tissue framework around hip and knee occurs. Such injuries pose a great challenge to the specialists and the aftermats of these injuries can be terrible and morbid.1,2

Concomitant fracture dislocation of the hip and knee is rare and only about 4 cases have been reported in the literature so far.3-5 The rarity and complexity of this injury poses a unique challenge for surgeons. We discussed a case with similar injury mechanism, resulting in concomitant fracture-dislocations of the hip and knee joints and contralateral open fracture of the leg bones. We also discussed the management aspects in such injuries, possible complications that the surgeons should be aware of and the prognoses and outcomes.

**CASE REPORT**

A 32-year-old man was referred to our emergency services after sustaining injury to his left hip and knee joints following a road accident. The patient was a car driver by profession and sustained the injury when his car underwent an end-on collision against a tree. The injury mechanism described was typical of dashboard injury. The patient simultaneously got thrown off his seat (the patient was unrestrained and was not wearing his seat belt during the impact). He was urgently referred to our trauma centre with suspicion of an associated vascular compromise of the affected limb.

The patient’s vital signs were stable at admission. On examination, his left lower limb was in an attitude of flexion, adduction and internal rotation with painful restriction of all active and passive movements of the hip joint. A globular bony mass was palpable in the gluteal area. The left knee joint was grossly deformed and tibia
was dislocated posteriorly. Movements around the knee joint were restricted. There was an open fracture of both bones of leg on the right side. No other significant systemic or associated musculoskeletal injuries were noted. The limb was splinted appropriately and the patient was adequately resuscitated. The distal pulses were present (though feeble) on both legs and capillary flow was adequate. Regular monitoring of the capillary blood flow using continuous pulse-oximetry was carried out.

After emergency stabilization, urgent X-rays of the affected limbs (radiographs of the pelvis with bilateral hip joints and left knee joint, chest, entire spine and skull) and other routine blood investigations were performed. The radiographs showed a dislocated hip joint with associated fractures of the femoral head and posterior-superior acetabular wall (type IV Pipkin’s fracture\(^1\)). The knee X-rays showed a posterior dislocation of the joint with associated tibial plateau fracture (Hohl and Moore\(^7\) type II fracture-dislocation with comminution of the intercondylar fragment, Figure 1). A closed reduction of the hip joint was attempted, but it was unsuccessful. The knee joint was reducible, but unstable. An emergent CT scan of the hip and knee joints and CT angiography of the affected limb were carried out (Figures 2, 3). The CT scan of hip showed a dislocated hip joint with fracture of posterior wall of acetabulum and fracture of the femoral head. CT scan of knee showed a sagittal split and displaced lateral tibial condyle fragment (Figure 3). CT angiogram of the affected limb showed normal patency of the lower limb vessels (Figure 4).

An urgent open reduction and internal fixation of the fracture-dislocation were planned and the patient was evaluated for surgical fitness. The surgery was performed 12 hours after injury (the patient was brought to our hospital only 4 hours after injury). The hip was approached using Ganz’s surgical dislocation of the hip.\(^8\) The displaced femoral head fragment was reduced and fixed with a lag screw. The acetabular fragments were small and not amenable to plate fixation and were stabilized using lag screws. Hip joint was subsequently reduced and checked for stability and congruency. The knee joint was reduced closely by forward traction of the tibia over femur. The tibial plateau fracture was opened through the anterolateral approach. The depressed articular surface was raised and supported using raft screws and the stabilization was further supplemented using a laterally placed buttress plate (MRI compatible titanium implants, Figure 4). This was followed by an intraoperative examination of the joint to rule out any residual instability. The knee joint was supported with a spanning external fixator (Figure 5). The open fracture of the contralateral leg was also thoroughly debrided and fixed using an external fixator.

Postoperative period was uneventful. Bedside mobilization, ankle pumps and isometric quadriceps exercises were initiated on the second postoperative day. Three weeks after operation, external fixators were removed from both limbs and patellar tendon bearing cast was applied on the right leg. Knee flexion and extension exercises were started on both the limbs. The patient was followed up at 6, 12, 24 and 48 weeks after operation. Gradual hip abductor strengthening, hamstring and quadriceps strengthening exercises were initiated. Weight bearing was delayed for 6 weeks as both the limbs were injured. Subsequently, the patient was allowed to ambulate with partial weight bearing using axillary crutches. Unrestricted weight bearing was allowed 3 months after operation when radiological signs of union were present. Complete clinical and radiological examinations were performed at each postoperative visit. The MRI scan was also carried out at 3 and 6 months after operation to look for any evidence of avascular necrosis. The clinical assessments of the hip and knee joints were carried out using the Harris hip scale (HHS) and International Knee Documentation Committee (IKDC) scores, while the hip joint was radiologically assessed using Matta scores at the last follow-up. There was no demonstrable knee laxity in either plane in the postoperative period or at follow-up, ruling out any associated ligamentous injury.

At the last follow-up, the patient had no clinical or radiological features suggestive of avascular necrosis of the hip joint (Figure 6). The patient was broadly symptom-free. The range of motion achieved by the hip joint at one year follow-up was almost full except for a 15 degrees restriction of abduction and 10 degrees restriction of flexion and extension. The knee joint fell short of complete flexion by 10 degrees (Figure 7). Clinical evaluation of the hip joint by HHS (HHS = 90) revealed excellent outcome and radiological grading (Matta score) was good. Subjective evaluation of the knee by IKDC score was also good at the last follow-up.
DISCUSSION

In the literature, 8 case reports on concomitant dislocations\textsuperscript{8-16}, 4 reports on fracture-dislocations\textsuperscript{3-6} and 4 case series on concomitant knee injuries\textsuperscript{2,17-19} in cases of hip dislocations were identified. The combination of simultaneous hip and knee dislocations is one of the most challenging conditions encountered by the ortho-
pedic surgeons, with higher instances of early mortality and an increase of early, intermediate and late complications. Many authors have reported arthrofibrosis of knee joint, popliteal artery injury leading to limb amputation and osteonecrosis of the hip despite an aggressive management of such injury.4,10,12

Considering the high velocity of the trauma and severity of the impact involved, it is not surprising to note the high risk of hemodynamic instability and other serious and life-threatening injuries associated with these fracture-dislocations. The significance of timely intervention (early and adequate resuscitation to stabilize the general condition of the patient, complete primary survey to look for other life-threatening conditions and a secondary survey to rule out other associated injuries and complications) in managing these situations cannot be understated. A high degree of clinical suspicion is essential so that one injury is not overlooked in the shadow of graveness of the other injury.

The typical mechanism for posterior hip dislocations involves a deceleration accident that follows an axial impact on the knee, usually against the dashboard (following road traffic accident) or fall from height with the hip and knee joints in flexed position. Position of the hip, direction of the force vector and the anatomy of the proximal femur determine whether the patient suffers from isolated dislocation or fracture-dislocation. A longitudinally-directed, severe, axial impact on a more anteverted hip, applied across the thigh through the knee, with the limb in a relatively less adducted and internal rotated position, forces the joint to undergo fracture-dislocation rather than isolated dislocation.1 Such posteriorly directed impact along with associated varus/valgus or rotational forces displace the knee joint with/without associated tibial or femoral fractures.7 Our patient had a similar mode of injury with the resultant type IV Pipkin’s fracture and Hohl and Moore type II knee fracture-dislocation. The type II fracture-dislocation of the knee joint involves the medial or lateral plateau and the fracture line extends into the opposite compartment beneath the intercondylar eminence. It results in an instability equivalent to the loss of the cruciates and corresponding collateral ligament.

As discussed earlier, a high association of these injuries with diverse complications, such as neurovascular injuries, avascular necrosis of femoral head, coxarthritis, stiffness, heterotopic ossification, recurrent instability, chronic pain and degenerative arthritis in the knee is well-known. Clinical examinations to rule out associated vascular or neurological injuries or compartment syndrome and other investigations including CT scans of the hip and knee joints (in addition to X-rays) to assess the joint and fracture morphologies and CT-angiography of the limb before and after the reduction are necessary in these situations. MRI scan may also be necessary at follow up to diagnose avascular necrosis of the hip joint or associated meniscal or cruciate injuries in the knee joint.

The urgency, that the treating surgeon shows in managing these injuries, significantly affects the prognosis and outcome finally achieved by these patients (golden period in reducing the hip joint has been described to be 6 hours)12. The usual management protocol includes an immediate attempt at closed reduction of the joints (knee followed by hip joint). However, factors like soft tissue impingement, capsular button-holing, or associated fractures may preclude any possibility of closed reduction, if so, an emergent open reduction should be appropriately planned.

We had planned a single staged surgery (as both the injuries were orthopedic emergencies) with a decision to operate upon the hip joint first. In a dislocated knee joint, especially associated with neurovascular or other complications, the knee injury deserves emergent care. In our case, an uncomplicated, knee dislocation was reducible with proper splintage and the apprehension of greater insult to the vascularity of femoral head with delay in hip reduction prompted us to consider managing this injury foremost. The surgical approach to the hip in these injuries for arthrotomy has been controversial until recent studies have confirmed the advantages of Smith Peterson approach or posterior approach with trochanteric flip osteotomy (surgical dislocation of hip described by Ganz et al8) in preserving the major blood supply to femoral head via medial circumflex femoral artery (over the traditional Kocher langenbach approach). In a posteriorly dislocated hip joint along with an associated posterior wall acetabular fracture (as in our case), the posterior approach along with flip trochanteric osteotomy provides the more convenient exposure. We, however, ensured a judicious handling of the knee joint during the hip procedure so as to avoid inflicting any further soft tissue disruption.
The tibial fixation was then performed, as described, using a laterally placed buttress plate (in the locking mode). The joint stability was then re-assessed under anesthesia and ascertained. As discussed in the literature, any further instability needs to be addressed with appropriate management although, the time and type of repair or reconstruction performed in different soft tissue injuries are still controversial and the issue needs to be individualized based on the surgeon’s knowledge of the concepts and understanding of the patient’s need. The index case had no signs of knee instability at the latest follow-up. The fractures of lateral tibial plateau, fibular head and inter-condylar eminence had actually resulted in avulsion of the collateral and cruciate ligaments and they got united after the fixation. Had there been any intrasubstance tear of these ligaments, the patient might have manifested at a later stage and a ligament reconstruction procedure had to be performed. Again the knee support with spanning fixator for 3 weeks provided adequate time for periarticular soft tissue healing and avoided the possibility of instability.

The rarity of these injuries and the complications associated has been elaborately described. A high degree of suspicion is needed to ensure an early diagnosis of this uncommon combination of injuries. This paper, thus, aimed to stress upon the importance of timely, appropriate interventions by technically experienced surgeons in such complicated situations in order to provide a good, final, functional outcome.

REFERENCES


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