

Management of Simultaneous Ipsilateral Dislocation of Hip, Knee, and Ankle

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Posterior hip dislocations frequently result from forces applied at the knee joint and are associated with high rates of concomitant intra-articular knee injury.^{1,2} Simultaneous ipsilateral hip and knee dislocations present a challenging problem because of the need for urgent reduction, which is balanced by the need to avoid iatrogenic injury that may be caused by reduction attempts.²⁻⁷ Additional ipsilateral injuries to the extremity increase the complexity of the early management of these dislocation injuries.

We present the case of a 25-year-old man who sustained simultaneous ipsilateral dislocations of the hip, knee, and ankle after being struck by a car. The patient underwent successful closed reduction of the hip through use of a novel reduction technique. Additional injury to the ipsilateral knee and the ankle was prevented. The patient provided written informed consent for print and electronic publication of this case report.

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CASE REPORT

A 25-year-old man was struck by a car while he was changing a tire on the side of a highway. The patient was brought emergently to a level I trauma facility. On arrival, pulse was 140 beats per minute, respirations were 30 breaths per minute, systolic blood pressure was 120 mm Hg, and Glasgow Coma Scale score was 14. On secondary survey, the right hip was flexed, adducted, and internally rotated. In addition, there were gross

anterior dislocation of the tibiotalar joint. The ankle was also immediately treated with closed reduction.

Because of the multiple ipsilateral injuries, closed reduction of the hip was performed with a modification of the techniques described by Allis⁸ and Marya and Samuel.⁹ With 2 assistants stabilizing the patient's pelvis, the surgeon flexed the right hip past 90° and gently stabilized the ipsilateral knee and ankle by flexing it over his

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valgus deformity and swelling of the right knee. The right ankle demonstrated gross swelling and valgus deformity with anterior tenting of the skin and a plantarflexed foot position. The patient also had an open left tibia fracture. Results of neurologic examination of the lower extremities were normal. Vascular examination revealed weakly audible Doppler signals at dorsalis pedis and posterior tibial arteries. Initial trauma radiographs showed a right posterior hip dislocation (Figure 1) and multiple rib fractures.

The patient underwent rapid-sequence intubation in the trauma bay. Examination of the right knee confirmed the presence of a knee dislocation with gross anteroposterior and valgus instability of the knee. The knee was immediately reduced after identification of the dislocation on examination. Examination of the right ankle revealed a pos-

terior dislocation of the tibiotalar joint. With assistants in position, manual axial traction was applied to the distal femur with gentle, alternating internal and external rotation at the hip. Unlike the technique described by Marya and Samuel,⁹ the tibia was not used as a fulcrum because of the ipsilateral knee and ankle dislocations.



Figure 1. Anteroposterior radiograph of pelvis shows right posterior hip dislocation.



Figure 2. Postreduction radiograph of right hip without evident fracture.

The closed reduction was successfully performed with use of this method and postreduction radiographs (Figure 2). Computed tomography confirmed concentric hip reduction without associated acetabular fracture. Postreduction radiographs of the knee (Figure 3) showed no fractures. Postreduction radiographs of the ipsilateral leg and ankle showed tibia-fibular diastasis and a fracture of the proximal fibula (Figure 4).

Repeat vascular examination after closed reduction of the hip, knee, and ankle revealed weakly audible Doppler signals at the posterior tibial and dorsalis pedis arteries. Femoral angiography demonstrated common femoral and popliteal artery injury. The patient was taken urgently to the operating room and underwent arterial repair with interpositional grafting. The right lower extremity was immobilized in a plaster splint, and the left open tibia fracture was debrided and treated with an intramedullary nail. At the end of the procedure, the left lower extremity had palpable pulses in the dorsalis pedis and posterior tibial arteries.

The patient was extubated on postoperative day 1. On postoperative day 7, the right ankle was stabilized with syndesmotic screw fixation. Examination of the ankle after syndesmotic fixation demonstrated



Figure 3. Postreduction radiographs of right knee.

stability. Subsequent MRI of the right knee showed medial cruciate ligament, anterior cruciate ligament, and posterior cruciate ligament injuries with an associated medial meniscal tear (Figure 5). The right knee was maintained in a knee immobilizer. The patient was able to ambulate with full weight on the left leg, and he remained non-weight-bearing on the right leg. The patient was discharged on postoperative day 10.

The patient remained in a knee immobilizer for 3 weeks. Knee ligament reconstruction was discussed with the patient, and recommended, but he refused further surgery. The patient was placed into a physical therapy program consisting of hip and knee range of motion and gradual strengthening starting 6 weeks after injury.

At 8-month follow-up, the patient was ambulating with full weight-bearing on both lower extremities without assistive devices. Right knee range of motion was 0° to 105°, and there were no symptoms of instability. Radiographs of the hip, knee, and ankle showed maintenance of joint reduction, no evidence of avascular necrosis of the hip, and no evidence of arthrosis in any joint. At 6 months, the patient's Short Musculoskeletal Function Assessment scores were 42 (Dysfunction) and 12 (Both).

The patient noted mild difficulties in climbing stairs, bending or kneeling, pivoting, and participating in recreational activities.

DISCUSSION

To our knowledge, this is the only report of a patient with closed simultaneous ipsilateral dislocations of the hip, knee, and ankle without associated fractures. Besides dislocating the ankle, the patient sustained a Maisonneuve-type ankle injury, which also had not been reported in conjunction

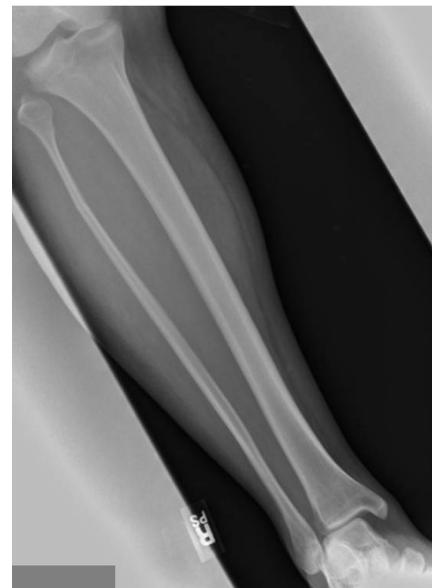


Figure 4. Anteroposterior radiograph of right leg shows tibiofibular diastasis and fracture of proximal fibula.



Figure 5. Sagittal (A) and coronal (B) magnetic resonance imaging shows a medial meniscal tear and medial cruciate ligament, anterior cruciate ligament, and posterior cruciate ligament injuries.

with an ankle dislocation. In 1984, Malimson¹⁰ reported a case of ipsilateral fracture-dislocations of the hip and knee and a fracture-dislocation of the tarsometatarsal joints. In 1991, Millea and colleagues¹¹ described a case of ipsilateral fracture-dislocations of the hip and knee and an open fracture-dislocation of the ankle. The 3 dislocations described in these 2

of hip dislocations, Gillespie¹⁵ found that 11% of associated knee injuries were missed on initial evaluation. Associated knee dislocations in particular must be promptly recognized and reduced, as up to 45% of posterior knee dislocations may have associated vascular injuries.^{17,18} Similarly, ankle dislocations may compromise the surrounding skin or neurovascular structures until reduction is

posterior hip and knee dislocations, Freedman and colleagues⁶ reduced the hip with manual traction on the thigh. Schierz and colleagues⁵ obtained closed reduction of an ipsilateral hip (with a posterior wall acetabular fracture) and knee dislocation by maintaining the hip and knee in a 90°/90° flexed position. DuBois and colleagues⁴ used Schanz pins to maneuver the closed

“In a series of hip dislocations, Gillespie¹⁵ found that 11% of associated knee injuries were missed on initial evaluation.”

reports had associated fractures. Pure tibiotalar dislocations, without associated malleolar fractures, are rare,¹²⁻¹⁴ and this combination of dislocations without fractures was not previously reported.

Hip, knee, and ankle dislocations all require urgent reduction. Ninety percent of hip dislocations are posterior, and they often result from an axial force transmitted through the flexed knee.¹⁵ Longer duration of hip dislocation has been associated with development of avascular necrosis of the femoral head, and therefore, early reduction is warranted.¹⁶ The incidence of ipsilateral bony and soft-tissue extremity injuries with hip dislocation can be as high as 33% and 93%, respectively.¹ In a series

obtained. Simultaneous ipsilateral dislocations of the hip, knee, and ankle therefore present a challenging problem. The potential for development of avascular necrosis of the femoral head warrants urgent reduction, but the potential for neurovascular injury exists with the instability of the knee and the ankle.

Previous reports of simultaneous ipsilateral hip and knee dislocations have described different methods of reducing the hip while maintaining knee reduction. Kreibich and colleagues⁷ reported a case of ipsilateral posterior hip and knee fracture-dislocations in which the hip dislocation was reduced through an open posterior approach. In a case of simultaneous ipsilateral

reduction in a hip dislocation with an ipsilateral knee dislocation. The Schanz pins were inserted in the femoral condyles and in the lateral aspect of the femur at the level of the femoral neck. Most recently, Motsis and colleagues³ reported on a patient with a concomitant ipsilateral hip dislocation and open knee dislocation in which the hip was successfully treated with closed reduction, but they did not describe their reduction technique.

In the case of concomitant ipsilateral dislocations of the hip, knee, and ankle, additional consideration must be given to stabilization of the ankle while the more proximal reductions are obtained. Malimson¹⁰ obtained closed reduc-

tion of the hip, knee, and tarsometatarsal joint fracture-dislocations, but they did not describe their reduction techniques or the method for stabilizing the other joints. Millea and colleagues¹¹ reported using open reduction for all ipsilateral hip, knee, and ankle fracture-dislocations.

With our patient, we used a novel modification of the hip reduction techniques of Allis⁸ and Marya and Samuel.⁹ Allis described a technique in which longitudinal traction is applied to the leg with gentle internal and external rotation and gradual flexion of the hip. In the “piggy-back” reduction technique described by Marya and Samuel, the surgeon places his or her back to the patient, and the patient’s knee is placed over the surgeon’s shoulder, which is used as a fulcrum. The patient’s tibia is levered against the fulcrum to facilitate reduction.

In our patient’s case, the treating surgeon faced the patient, and the patient’s knee was flexed over the surgeon’s shoulder (as described by Marya and Samuel⁹), but the shoulder was not used as a fulcrum. Instead, gently placing the knee in this position allowed the knee dislocation to be stabilized while the hip was reduced. Furthermore, the reduced posterior ankle dislocation was stabilized by allowing the ankle to rest against the surgeon’s back. Traction was applied through the distal femur to prevent further injury to the knee dislocation. The tibia was not used as a fulcrum because of the knee injury and the associated tibiotalar dislocation. Flexion of the hip and gentle internal and external rotation, as described by Allis,⁸ completed the maneuver and facilitated reduction.

Many of the previously reported reduction techniques require transporting the patient to the operating room for open procedures^{7,11} or, in the case of DuBois and colleagues,⁴ for placement of Schanz

pins. Although these techniques are efficacious, the additional time required to transport the patient to the operating room and prepare for a surgical case prolongs the duration of the hip dislocation. DuBois and colleagues noted that their patient arrived in the operating room 3 hours after injury. Although this time frame is ideal, our level I trauma center is in a remote location, and often patients with hip dislocations are transported to us over great distances and long time frames. Therefore, techniques such as ours, which allowed for immediate closed reduction of all 3 dislocations in the trauma bay, are advantageous.

Our patient’s case also illustrates the practice and the importance of reducing dislocations immediately, as soon as they are recognized during secondary survey. We recommend that knee and ankle dislocations be reduced promptly, before radiographs are obtained, to restore vascular flow and prevent neurovascular compromise.

CONCLUSION

Simultaneous ipsilateral hip, knee, and ankle dislocations without associated fracture are a rare injury pattern that was not described until now. The combination of these injuries illustrates the importance of careful secondary survey in patients with hip dislocations. Prompt reduction of all 3 joints is mandatory. The technique of hip reduction, such as the one we used, must maintain knee and ankle reduction to prevent further injury.

AUTHORS’ DISCLOSURE STATEMENT AND ACKNOWLEDGMENTS

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The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or reflecting the views of the US Department of Defense or the US Government. The authors are employees of the US Government.

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