

Open Tibiotalar Dislocation Without Associated Fracture in a 7-Year-Old Girl

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Complete tibiotalar dislocations without associated fractures are relatively rare injuries. In the literature, the earliest description of such an injury dates back to 1939, when Wilson and colleagues¹ reported on 16 cases (including 2 of their own) of ankle dislocation without associated fracture. Since then, case reports and small case series in adults have appeared sporadically.²⁻¹⁰

Pure dislocations in children are rare. Dislocations are usually accompanied by fracture or deformity. Our literature search found only 1 pediatric case of closed posterior tibiotalar dislocation, described by Nussem and colleagues¹¹ in 1999. Earlier, Lovell¹² reported on a pediatric ankle dislocation, but it was a Bosworth-type injury without fracture of the fibula rather than a true tibiotalar dislocation.

Pure posterior dislocation of the ankle joint has never been described in a pediatric patient. In this article, we report on the case of a 7-year-old girl who sustained an open tibiotalar dislocation, treated with immediate reduction and then formal débridement, lateral collateral ligament and anterior capsular repair, and transcalcaneal Kirschner-wire (K-wire) pinning to maintain reduction. A review of the literature is also presented.

CASE REPORT

A 7-year-old girl was hit by a car. An open wound around the ankle joint was bandaged by paramedics, and the patient was taken to hospital. After ATLS (advanced

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trauma life support) assessment, she was found to have sustained an open tibiotalar dislocation without an associated fracture. On initial clinical examination, a laceration was seen around the anterior aspect of the right upper ankle joint, along with clinical dislocation of the tibiotalar joint. The distal tibia was visible through the wound. The dorsalis pedis pulse was not palpable, and capillary refill time was more than 2 seconds. Neurologic status was difficult to ascertain, as the child was distressed and uncooperative at the time.

After initial x-rays (Figures 1A, 1B), which confirmed a posterior tibiotalar dislocation without any obvious fracture, the dislocation was manually reduced under intravenous (IV) morphine sedation. After reduction, peripheral pulses were well felt, and capillary refill time returned to normal. Sterile dressing and posterior splint were applied. IV antibiotics were promptly started. No other significant injuries were detected.

The patient was taken to the operating room within 2 hours of injury. Exploration showed an intact anterior neurovascular bundle and intact extensor tendons (tibialis anterior, extensor hallucis longus, extensor digitorum longus). The medial collateral ligament was intact, whereas the lateral collateral ligament complex was avulsed from

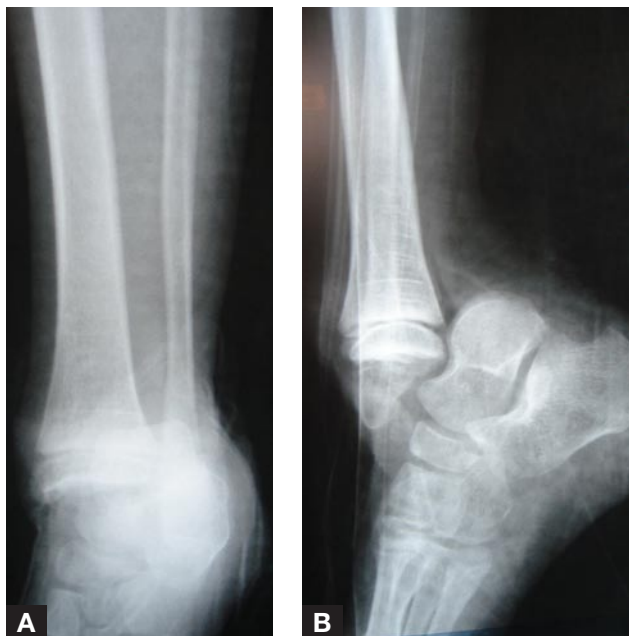


Figure 1. Preoperative anteroposterior (A) and lateral (B) x-rays of tibiotalar dislocation in a 7-year-old girl.

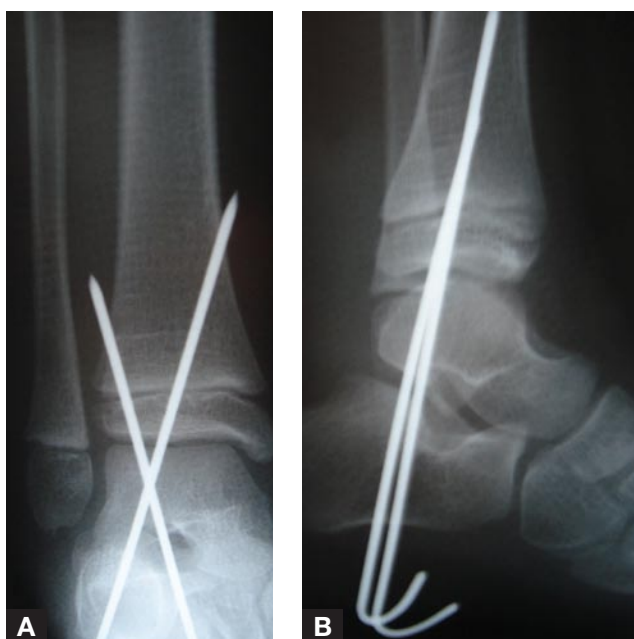


Figure 2. Immediate postoperative anteroposterior (A) and lateral (B) x-rays show ankle-joint reduction and Kirschner-wire stabilization.

the lateral malleolus with varus instability. The wound was lavaged with thorough débridement of the soft tissue. The lateral collateral ligament was reattached to the distal fibula with strong, nonabsorbable suture (2/0 nylon), and the capsular tear was repaired. Two 2.0-mm K-wires were passed from the os calcis through the ankle joint to maintain the joint in neutral position and to allow repair of the soft-tissue injury (Figures 2A, 2B). The wound was primarily closed, and a backslab was applied. A course of 3 days of IV antibiotics was completed. A full cast was applied after wound inspection, and the patient was discharged from the hospital non-weight-bearing with crutches 4 days after injury.

Four weeks later, at an outpatient clinic appointment, the patient's wound was healed, and the K-wires were removed under general anesthesia. The patient was then allowed gradual weight-bearing in a full cast for another 4 weeks. She was capable of full weight-bearing 10 weeks after injury.

At final follow-up, 1 year after injury, the patient was mobilizing well and without any pain. Her parents told us that she was able to walk and run without any problem. Neurovascular examination was normal, and radiographic examination did not reveal any physis abnormality (Figures 3A, 3B). She had full range of motion, the wound was well healed, and the ankle joint was stable.

DISCUSSION

Tibiotalar dislocations without associated fractures are very uncommon in adults. More than 50% of these dislocations are posteromedial, with a high incidence of open injuries, and 25% are pure posterior dislocations.^{2,4,5,10,13} On rare occasions, anterior/anterolateral, medial, and lateral ankle



Figure 3. Anteroposterior (A) and lateral (B) x-rays 1 year after injury show no evidence of physeal damage.

dislocations have been described.^{9,13,14}

The usual mechanism of injury is a fall on the foot, with the foot in an equinus position, which forces the talus into a position posterior to the tibia.^{1,3} These clinical observations can be confirmed with the cadaver studies undertaken by Fernandes,¹⁵ who found that dislocation of the upper ankle joint without fracture occurred with maximal plantar flexion followed by inversion. Reported mechanisms of this injury pattern include motor vehicle accidents (as in our patient's case) and engaging in sports, such as softball, volleyball, parachuting, and skiing.^{2,3,16}

Almost all published case reports and case series have involved adults.¹⁻¹⁰ As already mentioned, only 2 pediatric ankle dislocations have been reported in the literature.^{11,12} Nussem and colleagues¹¹ reported the case of a 12-year-old girl who, falling off the stairs, sustained a closed posterior tibiotalar dislocation without fracture. The patient, treated with closed reduction and a below-knee cast for 5 weeks, recovered fully and had no long-term sequelae 4 years after injury. Lovell¹² described the case of a 13-year-old boy with a rotational injury of the ankle joint plus dislocation of the distal tibiofibular joint and an intact fibula. This injury is a posterior entrapment of the fibula behind the tibia rather than a tibiotalar dislocation and therefore represents a different entity.¹⁷

In an 1898 monograph, Poland¹⁸ described the ligaments in children as being stronger than the physis and indicated that forces that usually cause ligamentous damage in adults instead cause physeal cartilage injury in children. Pure traumatic dislocations of other joints without fractures or deformities in children of this age are very rare. In children, such an injury usually causes a physeal injury or fracture, as the growth plate is the weakest structure in the ankle

complex.^{11,18,19} In fact, in young or older children, physeal ankle fractures, typically caused by an adduction force, are very common.²⁰ In our patient's case, however, no physeal injury occurred, but the dislocation was associated with ligamentous injury secondary to the hyperextension forces applied (sparing the physis).

Most cases of closed tibiotalar dislocations can be treated with early reduction and in-line traction under morphine sedation. Subsequent cast immobilization is necessary. Most authors recommend immobilization with a weight-bearing full cast as tolerated by the patient for 6 to 9 weeks.^{1,2,10} In open injuries, thorough débridement and washout are required. In our patient's case, meticulous débridement and copious lavage helped prevent any pathologic septic events.

Colville and colleagues² suggested that initial anatomical repair of disrupted lateral ligaments contributes to a good long-term outcome. We combined that technique with capsule repair in our patient's case. As the patient's upper ankle joint still seemed unstable after ligamentous and capsule repair, transarticular K-wires were inserted from the heel to provide supplementary stabilization of the ankle joint and allow satisfactory healing of all soft-tissue structures. This technique has been described being used (a) to temporarily stabilize ankle fractures in order to release soft-tissue swelling or (b) to permanently stabilize ankle fractures in patients with osteoporotic bone or soft tissue in poor condition.^{13,21-23} Insertion of transarticular K-wires raises concern about potential physis damage. In our patient's case, however, radiography showed no physeal damage related to K-wire insertion, and clinical and radiographic outcomes 1 year after injury were excellent in terms of pain, stability, and range of motion.

CONCLUSIONS

Open tibiotalar dislocation without fracture is rare in children. Long-term follow-up and outcomes have been reported in adults but not children. In the case of our 7-year-old patient, prompt reduction, adequate débridement, and ligamentous and capsule repair with supplementary transarticular K-wire insertion produced an excellent outcome with no lasting functional limitation.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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