

Complex Lisfranc Injury in a Professional Bull Rider

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ABSTRACT

American bull riding is one of the most dangerous sports in the world, with a high prevalence of injury. Due to the high-velocity trauma that is common in this sport, injuries occur frequently and are often classified as severe despite the use of protective equipment. While Lisfranc fracture-dislocations are somewhat common in elite athletes, open Lisfranc fractures are much less common. Consequently, there are little data concerning recovery and return to sport. This case demonstrates an uncommon presentation of open Lisfranc fracture dislocation and first metatarsophalangeal dislocation in a professional bull rider who was able to return to sport at 18 months postoperatively.

Keywords: Foot Injuries; Joint Dislocations; Metatarsophalangeal Joint

INTRODUCTION

The tarsometatarsal joint is known as the Lisfranc complex and consists of the articulation between the midfoot and the forefoot, and a Lisfranc injury is a disruption of this joint complex.^{1,2} The Lisfranc joint represents the transition from midfoot to forefoot and therefore is crucial for a normal gait pattern.³⁻⁵ Injury may occur directly or indirectly. Direct injury is caused by high-velocity blunt trauma, such as falling from a height or a motor-vehicle accident and is often associated with significant soft-tissue trauma.⁴ Indirect injury is more common in athletes and may occur when an undue force is imposed on a hyper plantar-flexed foot.⁵ Due to the high-energy trauma, direct injuries often have associated complications, and outcomes in these patients are generally worse.^{4,5} The specific mechanisms resulting in open Lisfranc fracture are not well reported in the literature. Multiple K-wire fixation is the recommended treatment for most open Lisfranc fractures.⁶

Prior studies reviewing Lisfranc injuries and the effect on return to sport in elite athletes have consisted of closed Lisfranc injuries resulting from an indirect method of injury. The athletes that were studied included soccer, rugby, and American football players. Injuries in these athletes have had little to no effect on career length or productivity. Outcomes of open Lisfranc injuries have been reviewed, although the study size was small, and the authors could find no documentation of this injury in high-performance athletes.^{7,8} Given that recovery from open Lisfranc injury is generally less optimal than recovery from general Lisfranc injury and open Lisfranc injury is rare in elite athletes, this study is important to adding to the medical knowledge regarding return to high-level performance following this severe injury.

CASE REPORT

A 30-year-old male professional bull rider presented to the hospital as a transfer for an open left foot fracture. During a professional competitive rodeo event, a bull stepped on his left foot, after which he felt immediate pain in his foot. Although he had multiple orthopaedic injuries in the past, he denied any previous foot injuries.

The patient was found to have an open left foot first metatarsophalangeal dislocation and Lisfranc fracture/dislocation. The open laceration site was 9 cm x 4 cm (Figure 1). He also had neck and base fractures of the second, third, and fourth metatarsals, the base of the fifth metatarsal, and a fracture of the cuboid (Figure 2).

Intraoperatively, the wound was extended proximally and irrigated and debrided down to the bone. Open reduction and internal fixation of the Lisfranc joint and second and third metatarsaltarsal joints was performed using 3.5 mm cortical screws. Open reduction and percutaneous pinning of the first metatarsophalangeal joint and second and third metatarsal neck fractures were also performed. Additionally, closed reduction and percutaneous pinning of the fourth metatarsal base



Figure 1. Image of the left foot injury revealing an open first metatarsal dislocation and wound measuring 9 x 4 cm.

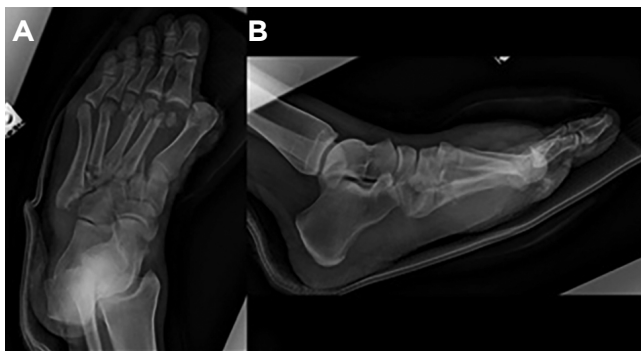


Figure 2. Oblique A) and lateral B) X-ray images of the left foot showing complete dislocation of the first metatarsophalangeal joint, with neck and base fractures of the second, third, fourth metatarsals, and base of the fifth metatarsal. A cuboid fracture is present.

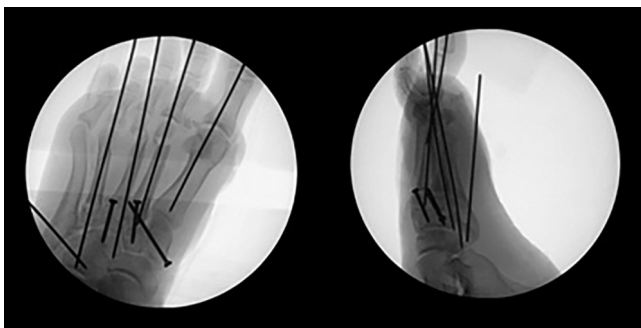


Figure 3. Intraoperative fluoroscopic imaging after screws were placed at the second and third metatarsals as well as percutaneous pinning of the first, second, third, fourth and fifth metatarsals.



Figure 4. Primary closure of the medial wound with vessel loops in a criss-cross fashion.

fracture were performed. Next, a pin was placed from the base of the fifth metatarsal to the cuboid to stabilize the fifth ray (Figure 3).

The medial wound was unable to be primarily closed without excessive tension due to swelling. Therefore, the authors used staples and a vessel loop in a criss-cross fashion for a provisional closure (Figure 4). The patient returned to the operating room five days later for primary closure and placement of negative pressure wound therapy.

Postoperatively, the patient's pins were removed at six weeks. The patient lived remotely and thus followed up with a local orthopedist near his home. Subsequently, the authors were unable to obtain postoperative imaging; however, they continued to follow up with the patient via phone calls. Negative pressure wound therapy was in place for nine months due to delayed wound healing. The patient slowly returned to weight bearing as tolerated the following months. It took almost nine months for the patient's pain and swelling to start improving to the point where he could wear cowboy boots again. Thirteen months after injury, the patient started riding again, but it was 18 months before he was able to ride professionally. Three and a half years after injury, he continued to have mild residual pain and swelling located around his first metatarsal and metatarsophalangeal joints. He has developed hallux valgus, which bothers him while riding. His gait is mildly altered, but overall, he states that he is doing well and has learned how to adapt. The patient is back to professional bull riding and has won multiple competitions post-injury.

DISCUSSION

During training or competition, elite athletes are always at risk of suffering injury. Some injuries provide minor setbacks and have no long-term effect on the athlete's career or earning potential. But other injuries may result in an inability to perform at high levels over a long period of time and negatively affect the athlete's continued participation in their sport. Rodeo is a dangerous sport, with one study finding that an athlete has an 89.0% chance of becoming injured during the rodeo season.⁹ Among rodeo events, bull riding is the most dangerous and is in fact the most dangerous organized sport in the world. Head, knee, and shoulder injuries are the most common, and 36.0% of injuries are considered severe.¹⁰ Most injuries result from high-energy contact with the animal or with the ground after falling from the animal.

While some rodeo athletes may profit from endorsements, compared to other major American sports, compensation from competition is largely performance-based on an event-to-event basis. There is no profit guaranteed for participation, meaning that if the athlete is not a top finisher in an event, there is no monetary compensation and the athlete is responsible for covering all traveling costs and entrance fees. This

compensation strategy is similar to that of golf, except in rodeo, the prize money is generally awarded to a smaller percentage of participants, and the purse is much smaller. Time lost to injury is much more detrimental to an athlete reliant on this type of income rather than an athlete under contract with a guaranteed salary.

Lisfranc fracture-dislocations are not uncommon in athletes such as soccer, rugby, and American football players, and there is generally no long-term effect on career production. These athletes returned to training at four months on average, and return to competition ranged from an average of six to 11 months.^{7,8} In this case, the injury suffered by the athlete was much more severe and caused by a different mechanism than injuries reported in other sports. This athlete did not return to sport until 13 months and did not return to professional competition for 18 months after the original injury. This is double the time it took for patients with lower-energy injuries to return.

While the data on recovery from surgery to repair open Lisfranc fractures as opposed to a general Lisfranc fracture is small, open Lisfranc fractures have a worse outcome.^{8,11,12} These outcomes were reported for the general population returning to daily activities, not elite athletes returning to high-level competition. It stands to reason and is of value to note the difference in the recovery of an elite athlete from this more serious form of Lisfranc fracture.

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