A Lisfranc's Fracture-Dislocation in a Collegiate Football Player

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ABSTRACT: The Lisfranc's fracture-dislocation is an extremely serious injury that needs immediate recognition and treatment. In displaced fractures, swelling and deformity will be evident. But, often, because of spontaneous reduction, chronic midfoot pain and arthritis may result if the injury goes unrecognized. The tarsometatarsal joint, referred to as Lisfranc's joint, can be fractured and dislocated by direct or indirect forces. In football, one possible injury mechanism occurs when a foot that is planted on the ground receives an axial force applied to the heel as the forefoot is hyperextended. Using a classification system, the dislocation can be identified and treated in reference to the damage done. Treatment should consist of a thorough examination, including evaluation of the vascular supply. The athlete should be immobilized and transported properly, nonweight-bearing, for medical referral. Correct rehabilitation will allow the athlete to return to competition.

The Lisfranc's fracture-dislocation is an injury that occurs when the tarsometatarsal joint is disrupted beyond ligamentous and bony stability (6). This injury rarely occurrs, but it is one that requires immediate recognition by the athletic trainer (2,5,6). In a patient with a fracture-dislocation, deformity of the area helps with diagnosis. In a patient with any foot injury, a physical examination is very important (7).

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This report is provided so that the reader can gain an understanding of the mechanism of injury, treatment, and rehabilitation. Lisfranc's fracture-dislocation injuries are associated with a high potential for chronic disability (1).

A 19-year-old collegiate football fullback injured his left foot during practice. He was unable to walk and was assisted off the field in a nonweight-bearing manner. He was unable to describe how the injury happened, except to note that pain clearly was radiating from his foot.

We removed his shoe and sock, and deformity of the midfoot region was evident. The dorsalis pedis pulse from the artery lying dorsally between the first and second metatarsal was absent. Immediate reduction was performed by the athletic trainer on the field, because disruption of these bones places the artery at risk. Reduction was done by applying steady anterior traction on the forefoot. The pulse returned immediately and the athlete felt relief.

Further examination revealed instability and crepitus, along with swelling and tenderness over the midfoot. An airsplint and ice were applied, and the athlete was transported to the team physician for treatment. Radiological examination revealed a Lisfranc's fracture-dislocation of the foot (Fig 1). The X-rays showed fractures of the second and third metatarsal heads, with an avulsion fracture at the base of the fifth metatarsal. The anteroposterior radiograph showed that the first metatarsal was displaced medially, and that the remaining four metatarsals were displaced laterally (Fig 2). This is known as a divergent

Fig 1.—Lisfranc's fracture-dislocation of the second and third metatarsal heads

Fig 2.—First metatarsal displaced medially; second through the fifth displaced laterally

fracture-dislocation (2).

The athlete was placed in a bi-valve cast and admitted to the hospital where closed reduction was performed by placing traction through the mid- and forefoot using Chinese finger traps, which were applied to the toes of the foot. Pressure was then applied downward via the heel as the fracture fragments were manipulated. Follow-up X-rays showed improved alignment of the second and third metatarsal head fractures, as well as the first through the fifth metatarsal cuneiform joints. Casting was recommended because the reduction was stable. If the reduction had been unstable, pin fixation would have been necessary (7).

Rehabilitation of the foot was initiated after the cast was removed. This included mobilization and exercise, with the emphasis on edema reduction. Gentle mobilization focused on increasing mobility of metatarso-phalangeal (MP) joints and the ankle mortise. Exercises included passive and active assisted range of motion activities such as towel stretching, wall stretching, alphabet formation, and clockwise/counterclockwise activities.

Electrical muscle stimulation was applied during each treatment to help reduce the edema and improve mobility of the foot and ankle. Pads were placed on the dorsum of the foot and around the malleoli to help encourage the pumping motion. Ice was applied and the extremity was elevated after each session. Ultrasound was applied during the first ten treatments to help scar tissue to form correctly.

Manual resistance, surgical tubing exercises, and an ankle strengthening machine were employed to develop muscle strength. The athlete's use of the pool, bicycle, rowing machine, and climber were important for cardiovascular training during the rehabilitative process. Aquatic therapy consisted of walking, running, and resistance work with swim fins and kick boards.

Manual stretching was performed on the gastrocnemius and soleus to improve plantar flexion. Toeing-off exercises and gait training were incorporated into the overall program.

Functional training was initiated using sport-specific drills. Cariocas, running circles, squares, cuts, and figure eights were used to help evaluate the athlete functionally. The athlete was able to play football one year later with the aid of a steel-plated shoe.

Discussion

The tarsometatarsal (Lisfranc's) joint consists of five metatarsal bones, three cuneiforms, and the cuboid. The key to the stability of the tarsometatarsal joint lies in the structure of the second metatarsal base. Fractures to this area contribute to instability. In addition to these bones, ligaments also provide stability (3).

The forces that are responsible for the Lisfranc's fracture-dislocation are either direct or indirect (2,3). A direct force would result from a heavy weight being dropped on the foot. This athlete sustained an indirect force, which occurred when his forefoot was planted on the ground and a tackler from behind landed on his heel, applying an axial force. The forefoot was hyperextended as the force was applied to the tarsometatarsal joint causing disruption (Fig 3).

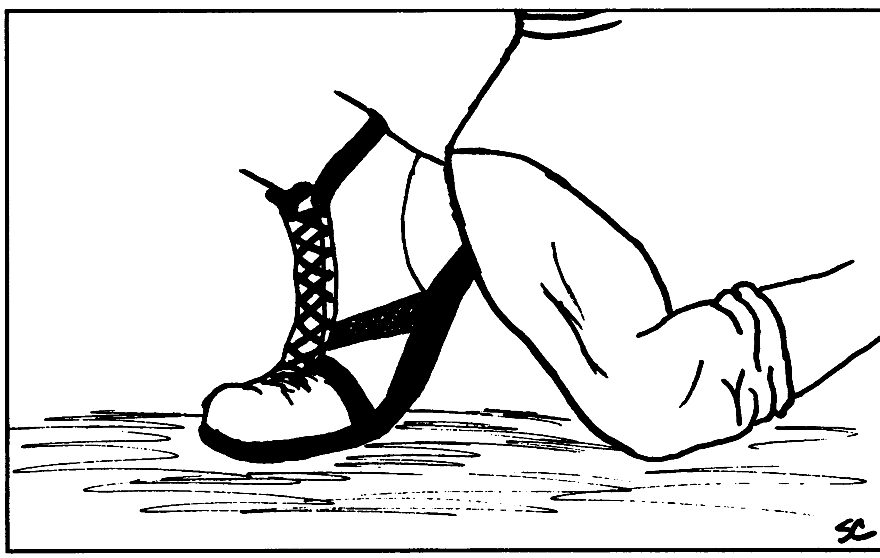

Fig 3. —Axial force applied to the heel with the foot in plantar flexion, causing a Lisfranc's fracture-dislocation

Using a classification system based on displacement, the injury is identified as total, partial, or divergent (2,3). Under Hardcastle's classification (2), this athlete sustained a divergent Lisfranc's dislocation when the first metatarsal displaced medially and the remaining four metatarsals displaced laterally (2,3).

Because the forefoot also was inverted during this injury, the fifth metatarsal sustained an avulsion fracture at the base. The hyperextended position of the toes caused the fractures of the second and third metatarsal heads.

The tarsometatarsal joint, also referred to as Lisfranc's joint, is relatively complex and slightly mobile (4). Injuries to this area may be overlooked if the dislocation spontaneously reduces and is not properly evaluated. In a case of gross deformity, such as this, the diagnosis is evident. It is important to realize that spontaneous reduction may occur causing the diagnosis to be more difficult to make (3).

In addition to recognizing the swelling and deformity, the athletic trainer must check the dorsalis pedis pulse. The artery is at risk of damage in this type of injury, and a loss of blood flow can result in severe complications of the foot. Reported as a rare condition, tarsometatarsal joint injuries are occurring with increasing frequency in athletes. This may be the result of the change in footwear and/or the increase in the forces that athletes are exposed to on the playing field.

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