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Case Report
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Lisfranc injury in a 14-year-old patient. A case report and literature review

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ABSTRACT

We report the case of a 14-year-old girl who experienced a Lisfranc fracture-dislocation while playing sport. The lesion was treated with surgery, consisting of open reduction and internal fixation using cannulated screws and Kirschner wires. After one year of follow-up, the patient has no symptoms and no X-ray evidence of degenerative changes in the midfoot. In our view, the surgical procedure, using rigid fixation for the medial column and the second ray, and a provisional fixation to all other rays, allowed for a satisfactory short-term result in this patient. We have used this case to review the management of this lesion in the pediatric population.

Key words: *Tarsometatarsal joint, Lisfranc Injury, pediatric age*

Introduction

The Lisfranc injury accounts for less than 1% of all fractures and is often missed at the initial assessment [1,2]. In the pediatric population, incidence of this injury is anecdotal [3,4].

The injury mechanism is similar to that in adults, with direct axial load or after an indirect rotational force on a foot in plantar flexion [4–6]. Treatment must aim at anatomical reduction and stabilization. However, there is no agreement on injury management in children, and long-term results are unknown [4,7]. A Lisfranc fracture-dislocation in a 14-year-old girl treated surgically is reported.

Case Report

A 14-year-old female patient attended the emergency room reporting significant pain and she could not bear weight on her left foot. Three days before she had suffered a trauma after a 1-meter jump. Physical examination revealed diffuse pain that increased on palpation over the tarsometatarsal (TMT) joint, significant swelling, and plantar hematoma.

Anteroposterior and oblique foot X-rays showed dislocation of the TMT joint with lateral displacement of all metatarsal bones and increased space between the first and second metatarsals (Figure 1). Based on an emergency CT scan, injury was classified as Myer-

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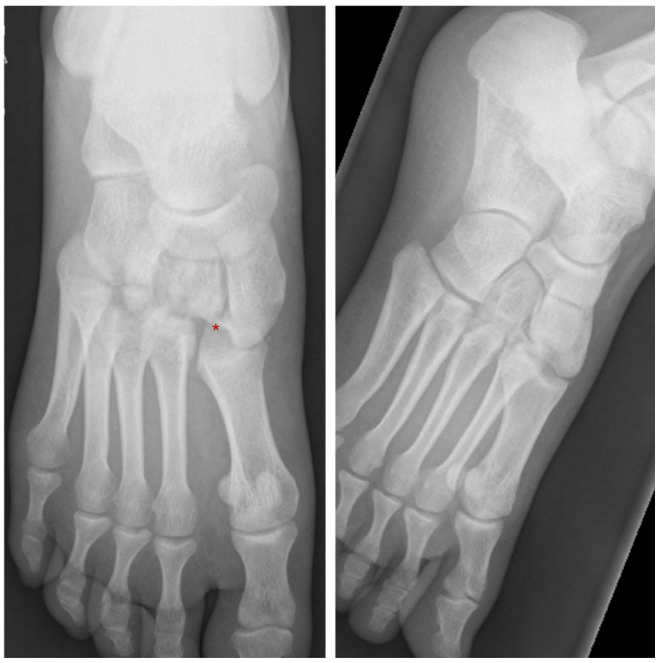

Figure 1. Radiographic AP and Oblique radiographs made in the emergency room. AP projection demonstrates a little osseous fragment (Fleck sign) corresponding to the Lisfranc ligament insertion place marked with a red star in the image.

son type A (Figure 2), with fractures at the base of the second, third, and fourth metatarsal bones. Emergency surgical treatment of the lesion was decided.

Surgical procedure: Under general anesthesia, with tourniquet in the leg and after administering cefazolin 1 g IV as preoperative prophylaxis, a dorsal medial approach was used to widen the interval between the long extensor of the 1st toe and the common extensor, while protecting the neurovascular package. The dislocation was localized between the first and second joints. After washing and removing the interposed soft tissues, dislocation was reduced and fixed using a 1.5-mm Kirschner wire from distal to proximal for stabilization until synthesis with a 3.5-mm anterograde screw. The second metatarsal bone was then reduced and fixed with a 3.5-mm screw to the first cuneiform bone. All other joints were then reduced, fixing the third, fourth and fifth metatarsal bone with 1.2-mm Kirschner wires. Finally, a long leg plaster cast was used for immobilization (Figure 3).

At 12 days, after resolution of edema and suture removal, immobilization was changed to a closed plaster boot. After eight weeks, wires and plaster cast were removed, and mobility and partial weight-bearing exercises were permitted. At three months, full weight-bearing and gentle sports activity were authorized, and the usual sports activity was permitted from the fourth month (Figure 4). Twelve months after injury, the patient is pain-free and leads a normal life, with no functional limitations for sports practice.

Discussion

Diagnosis of Lisfranc injury represents a challenge in cases with minimal displacement. Physical examination is essential for diagnosis in such cases. The lesion mechanism, pain localized in the TMT joint, and occurrence of ecchymosis in the sole, should lead us to suspect this lesion even in the pediatric population, in which Lisfranc injury is exceptional. Although the causes of injury are similar to those in the adult population, in the pediatric population sports accidents are more common than high-energy trauma (traffic accidents or falls) [2–4,6].

The few studies available make it difficult to establish guidelines for dealing with this lesion in this age group.

Conservative treatment with plaster casts will be the treatment of choice for stable injuries with no displacement or amenable to reduction, particularly in patients with open physes. Surgery will be recommended in displaced injuries requiring stabilization using synthesis material or in patients with closed physes [4,7–9]. According to Hill, J.F. et al. [4], the presence of a pure ligament lesion may be determinant for deciding on conservative management, provided anatomical reduction is achieved using closed methods. On the other hand, Veijola et al. [3], support that it is difficult to obtain this objective, and they propose surgical treatment for most of these injuries. We assume that the objective in Lisfranc injuries must be an anatomical reduction and a stable fixation since minimal incongruence can lead to osteoarthritis.

The recommended fixation method would be, as in the adult population [2,10], a combination of cannulated screws in the medial and middle column and Kirschner wires in the mobile foot column. In the presence of open physes, fixation using Kirschner wires is considered, thus minimizing iatrogenic damage to the physis and facilitating extraction in order to preserve joint physiology. However, there are studies reporting that this method is associated with loss of reduction with poor functional outcomes [7,10]. For example,

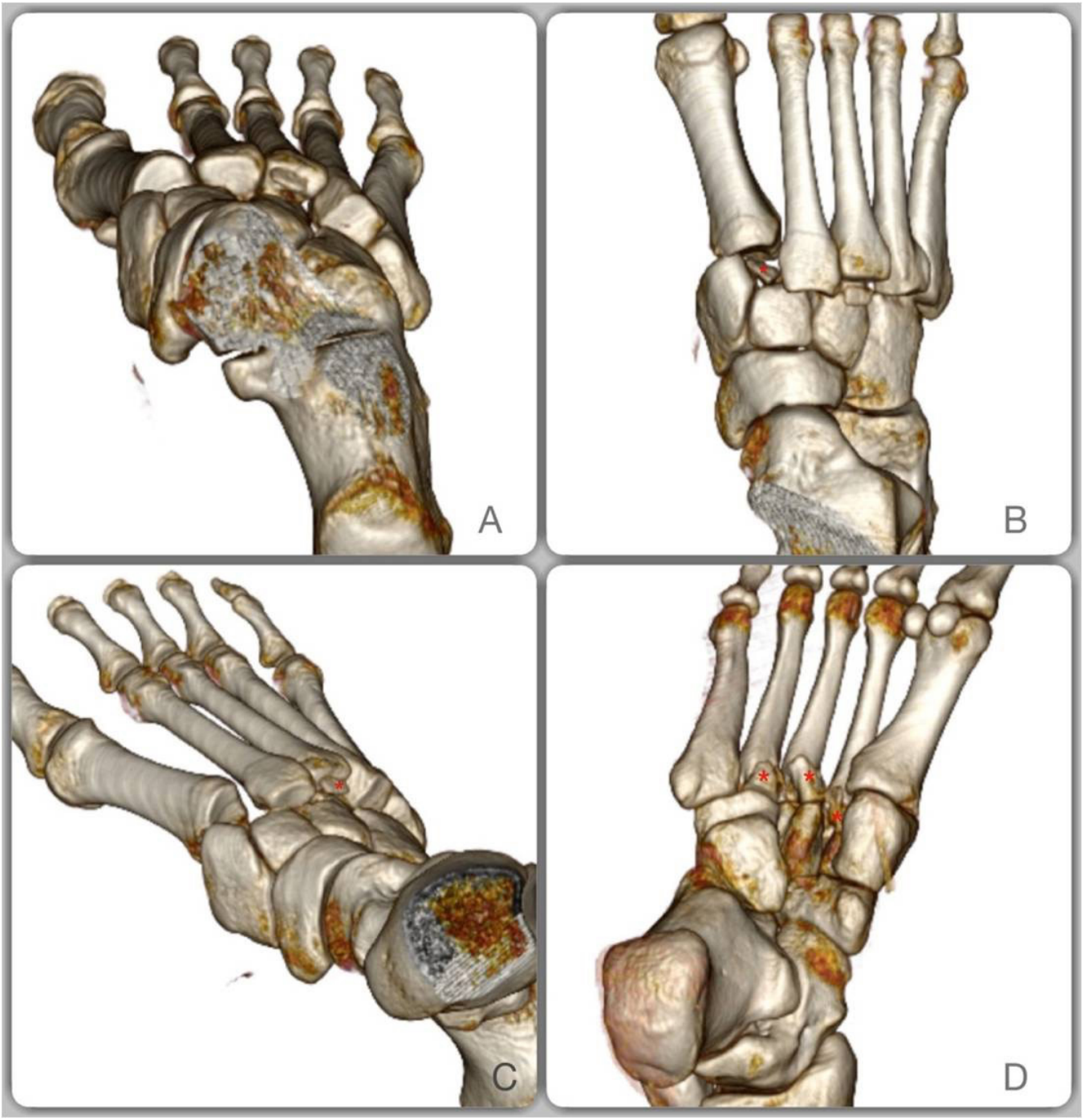

Figure 2. 3D reconstruction of the preoperative TC. It exposes dorsolateral luxation of all the metatarsal bases and comminution of the 2nd, 3rd and 4th bases.

Lesko et al., [7] propose that Kirschner wires used as an isolated mode of fixation may be one possible cause of loss of reduction in this kind of injury. In our case, fixation with screws of the first and second metatarsal bones (more unstable) and with Kirschner wires of all other rays was decided.

In adults, postoperative management consists of 2 weeks of a short leg splint. Then a short leg non-weight bearing cast 4 to 6 more weeks. At 6-8 weeks postoperative, progressive to full weight bearing with a walking boot is allowed [2,10]. In the pediatric population, time to weight bearing after osteosynthesis is up to 11 weeks according to Hill [4], but just seven weeks in non-surgical treatments. Veijola et al. [3], maintained immobilization around four weeks and allowed weight-bearing at 6-8 weeks after surgery. We have found only one study describing an early weight bearing protocol [7]. It was associated with a loss of reduction and own authors mentioned this as a possible cause of this result. In our patient, we considered eight weeks a suf-

Figure 3. Postoperative control. The first cuneiform second metatarsal space was closed by a screw. Another screw fixed the first cuneiform to the first metatarsal. A Kirschner wire was used to support the synthesis. The lateral column was fixed with Kirschner wires to the cuboid.

Figure 4. Last radiographic control. It shows fragment consolidation and good alineation of the Lisfranc Joint. Screws will be left.

ficient time for fracture union and healing of capsular ligament structures. No loss of reduction was seen after the start of weight bearing.

In the short term, several studies have shown no restrictions in daily activities or sports [4,9] in this age group. There are no studies showing the long-term course or functional outcome. The incidence of post-traumatic osteoarthritis, the main complication in adults [2,10], has not been reported either. Nevertheless, some authors report clinical symptomatology and osteoarthritic changes in a few cases [3,8,9]. Buoncristiani et al. [9], in their series of 8 patients, evidence one case of midfoot pain and swelling after 5 minutes of running in a ten-years-old girl 39 months after injury. X-ray examination revealed osteoarthritis changes around first and second TMT joint. Veijola et al. [3] showed two of six patients with a moderate grade of osteoarthritic changes at 16 months follow-up. These findings lead us to think that probably in the medium to long term, the development of osteoarthritis may be increased over time in this age group in a similar way to what occurs in the adult population.

Given the age of our patient, and despite radiographic physeal closure, removal of osteosynthesis material remains controversial. Maintenance of this material may cause osteoarthritis in adjacent joints and their removal damage as the result of repeat bone, ligament, and soft tissue surgery. Long-term studies are required to establish optimum management after osteosynthesis of Lisfranc injuries in children.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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