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Case Report

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# PURE POST-TRAUMATIC LISFRANC DISLOCATION (CASE REPORT)

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## INTRODUCTION

Tarsometatarsal dislocations (LISFRANC dislocations) are defined as a permanent displacement of the metatarsals in relation to the tarsus.

LISFRANC dislocations were first described by MONTEGIO and DUPUYTEN in two cases, followed by a more detailed description by MALGAINE in 1885.

Lisfranc dislocations occur most often in young patients, with a male predominance. This type of injury is often seen in violent accidents and causes severe joint damage that evolves into disabling foot sequelae. These sequelae are presented in the form of foot pain, joint stiffness, trophic disorders and defective walking. These injuries are rare, with an estimated frequency of 0.2% of all foot injuries. However, this figure is underestimated because of their frequent misdiagnosis, estimated at 20% by most authors, particularly when the injuries are purely ligamentary or when they are part of a polytraumatic context.

## OBJECTIVES

- Describe the causes of Lisfranc dislocations.
- Describe the presentation of a patient with a Lisfranc dislocation
- Describe the therapeutic possibilities of a Lisfranc dislocation

## MATERIALS AND METHODS

This is a retrospective study of a series of 2 cases of LISFRANC dislocations over a period of 20 months from February 2020 to November 2021, collected at the Traumatology Orthopedics Department of the Ibn Sina University Hospital in Rabat.

The aim of our study is to compare the management of LISFRANC dislocations at the Avicenne orthopedic trauma department in Rabat with the data in the literature and to assess the appropriate diagnostic and therapeutic means.

**The information collected**

- Demographic data: age and sex
- Circumstances of the trauma and its mechanism: road accident, work accident, domestic accident, sports accident.
- The side affected: right foot or left foot.
- Clinical data: functional signs, physical signs
- Imaging data: imaging means, incidences and results.
- Anatomopathological classification

## 1- CLINICAL CASE N°1

This is a 34 years old patient, history: 0, victim on the day of his admission of a traffic accident, collision between two motorcycles causing a closed trauma of the left ankle, on admission conscious patient, stable on all levels,

The locomotor examination found a swollen, deformed left midfoot, painful to palpation and mobilization, without skin opening,

The examination of the overlying and underlying joints was unremarkable,

The rest of the examination was unremarkable.

The patient was urgently referred to radiology where X-rays of the foot, front and 3/4, were requested:

**Figure 1: Face + ¾ views of the foot showing a homolateral columno-spatellar tarsometatarsal dislocation.**

Standard radiography showed a homolateral columno-spatular dislocation.

The patient was taken directly to the operating room where he underwent reduction under RA, followed by fixation by percutaneous pinning.

**Figure 2.a: Percutaneous pinning of a Lisfranc dislocation seen in profile.**

**Figure 2 b: Percutaneous pinning of a Lisfranc dislocation, front view.**

Post-operatively, a posterior splint was placed and weight-bearing was prohibited for six weeks.

At the six-week check-up: a walking boot was prescribed for an additional six weeks with the start of functional rehabilitation.

After 12 weeks the functional result was satisfactory. With resumption of activities of daily living

## 2- CLINICAL CASE N°2

This is a 30 years old female patient, without any previous history, victim of an MVA: motorcycle fall, causing a closed trauma of the right ankle. No other points of impact.

The clinical examination found a conscious patient, stable in all three planes.

Locomotor examination revealed a swollen, deformed midfoot, painful to palpation and mobilization, with no skin opening.

The examination of the rest of the limb and the contralateral limb was unremarkable.

The rest of the clinical examination was unremarkable.

Standard X-rays of the foot, front and ¾, were taken, showing
- A divergent columno-spatular dislocation
- Absence of fracture line
- Absence of other osteoarticular lesions.

**Figure 3.a: X-ray of the front foot showing a divergent columno-spatular dislocation.**

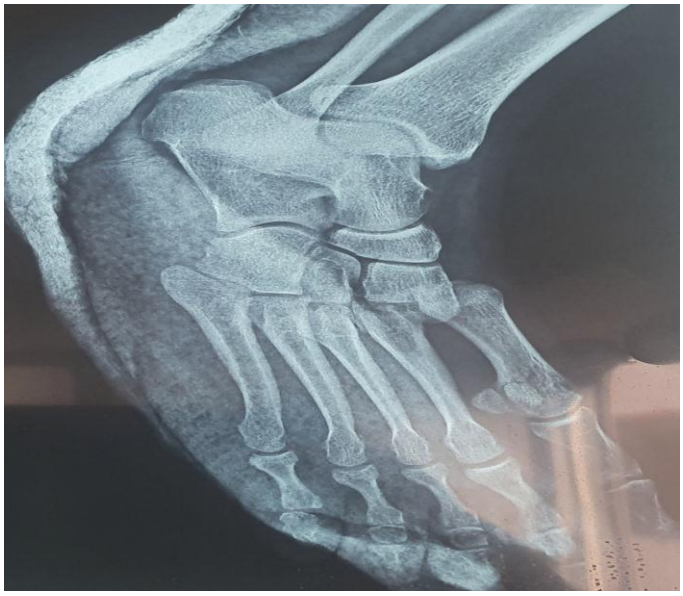

**Figure 3.b: X-ray of the foot ¾ confirming the injury and the absence of other associated injuries.**

The patient was admitted to the operating room on an emergency basis, where she underwent reduction under spinal anaesthesia and percutaneous pinning.

**Figure 4.a: Reduction of dislocation with percutaneous pinning.**

**Figure 4.b: Profile view of reduction and pinning.**

Post-operatively: strict prohibition of walking on the injured limb for six weeks, with a posterior splint.

At the sixth week check-up, a walking boot was put in place, and functional rehabilitation began.
The functional result was excellent.

## RESULTS

The functional signs in patients with Lisfranc dislocation are represented by pain and functional impotence, both signs were present in all our patients.

The clinical examination in our patients found a deformity of the midfoot, localized edema, pain on palpation and localized ecchymosis in only one case.

Other clinical signs have been reported in the literature such as acute ischemia.

Standard radiography was requested in all our patients, a CT scan of the foot was requested in only one patient, following a doubt about a fracture of the medial cuneiform.

The classification used in our series is the classification of LERAT and TRILLAT: in one case it was a homolateral columno-spatular dislocation (50%), in the other case it was a divergent columno-spatular dislocation (50%).

In our series, none of the patients had received orthopedic treatment. The two patients in our series received percutaneous pinning, followed by a cast or a posterior splint, followed by functional rehabilitation, which was systematic.

The evolution was good in all our patients.

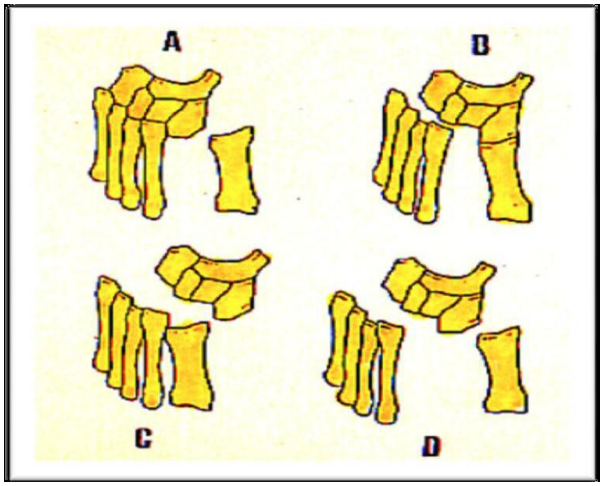


**Figure 5: Classification of Lisfranc dislocations according to LERRAT and TRILLAT.**

LERAT and TRILLAT (in 1976) summarized this analysis anatomically as:

- Divergent columellar dislocation (A)
- Homolateral spatular dislocation (B)
- Homolateral columno-spatular dislocation (C)
- Divergent columno-spatular dislocation (D)

| | **Case n°1** | **Case n°2** |
|---|---|---|
| Gender | male | female |
| Age | 34 | 40 |
| Mechanism | MVA | MVA |
| Other points of impact | 0 | 0 |
| Functional signs | Pain + functional impotence | Pain + functional impotence |
| LERAT and TRILLAT | C | D |
| Fracture + skin opening | 0 | 0 |
| Treatment | Percutaneous pinning | Percutaneous pinning |
| Functional results | excellent | excellent |
| Complications | nothing | nothing |

Summary table of the results obtained in our study

## DISCUSSION

### 1- Etiologies

There are generally two main mechanisms that cause this type of injury: direct and indirect. A direct mechanism of injury presents as a crush injury to the joint area due to an event such as a motor vehicle collision or work accident. Due to the high force levels of these mechanisms, there is usually no classic pattern or appearance. An indirect injury is more common than a direct injury and is often associated with playing sports. This mechanism of injury usually involves a longitudinal force while the foot is in plantar flexion with a medial or lateral rotational force. Another common presentation is clumsily stepping off a curb with the foot in forced plantar flexion.

### 2- Epidemiology

Lisfranc lesions are relatively uncommon. They account for 0.2% of all foot lesions, but the prevalence is probably higher because they often go undiagnosed. The reported incidence of this injury is approximately 1 per 55,000 people per year. This injury can occur at any age, but is most common in the third decade of life and most common in men. Lisfranc injuries are more common in athletes and are increasingly diagnosed in this group.

### 3- Pathophysiology

A Lisfranc injury is a traumatic injury without underlying pathophysiology. There is a small subset of patients who are more susceptible to this injury. This subset includes those with diabetes or nerve damage that results in decreased sensation in the feet. Decreased pain sensation can lead to repetitive injury or wear and tear, making the patient more susceptible to a Lisfranc injury due to a minor mechanism.

### 4- Clinical study

In general, the patient complains of midfoot pain, with variable pain on loading, following an acute injury. The injury is often due to one of the mechanisms described above. The pain is classically aggravated by forefoot weight-bearing, and the patient may describe pain or difficulty during the pushing phases of walking and/or running. It is important to note that the severity of the injury is often underestimated at the time of initial injury and presentation may be delayed. If there is pain in the midfoot for more than five days, swelling, and/or difficulty with pushing activities, a Lisfranc injury should be strongly suspected. Physical examination can be very helpful and suggestive of these injuries. Inspection of the affected foot may reveal significant swelling, bruising, and, although less common, obvious anatomical deformity. Palpation of the dorsal midfoot, specifically the tarsometatarsal joints, is usually painful. Pain often occurs with combined abduction and eversion of the forefoot. Pain can also be commonly reproduced with passive pronation or supination of the tarsometatarsal joint. Care should also be taken to ensure that the lesion is closed, as open lesions are a surgical emergency.

### 5- Evaluation

When a Lisfranc lesion is suspected, anteroposterior, 30-degree oblique, and lateral weight-bearing radiographs should be obtained first. Compliance with loading films is as difficult as it is essential. The patient and the radiographic technician must be made aware of its importance. Although it is most obvious in bony injuries, in purely ligamentous injuries, axial force during radiography is necessary to better illustrate the injury. Radiographic findings of a Lisfranc dislocation usually show misalignment of the lateral border of the base of the first metatarsal with the lateral border of the medial cuneiform, misalignment of the medial aspect of the base of the second metatarsal with the medial border of the median cuneiform, and/or small avulsion fragments of one of the metatarsal or cuneiform bones. In these cases, the finding of avulsion fractures is commonly referred to as a "speckle sign" and suggests a Lisfranc lesion. A displacement of more than 2 mm between the first and second metatarsal bases is considered a positive radiographic finding and strongly suggests a Lisfranc lesion. On oblique view radiographs, the medial aspect of the cuboid should be aligned with the medial aspect of the fourth metatarsal base. The dorsal cortex of the first metatarsal and the medial cuneus should be aligned on lateral weight-bearing radiographs.

When in doubt, a CT scan is more useful for diagnosis, as it can reveal small avulsion fractures that might go unnoticed. CT can also be helpful for surgical planning. MRI can be helpful in assessing the extent of the ligament injury.

### 6- Classification

First of all, it is necessary to recall the main points of the classifications usually used. The medial ray is referred to as the "column", and the four lateral rays constitute the "spatula". Thus, columellar lesions that are displaced medially and spatulate lesions that are displaced laterally are defined. Lesions affecting both structures are called columno-spatular. These are the most frequent. When the displacement is in the same direction, the columno-spatular lesion is said to be homolateral; it is said to be divergent when the displacements are in opposite directions (Figure 5).

### 7- Treatment

Rigorous analysis of the lesions and their local and architectural consequences makes it possible to determine the surgical tactics.

#### a- Severe sprains

As we have seen, the problems are essentially diagnostic, the risks being focused on the lack of recognition. Once recognized, and given the risk of residual pain instability, this injury warrants once recognized, and given the risk of residual painful instability, this injury warrants immobilization with a molded resin boot for a period of at least 6 weeks (including 4 weeks off-load). The presence of significant laxity (confirmed on dynamic images) or of potential instability elements likely to cause low-level joint incongruence (small bone tears or localized osteochondral depressions) should lead to a discussion of the benefit/risk of percutaneous joint pinning.

The advantage of increased stability must be weighed against the iatrogenic risk of joint transfixion.

Pinning should be considered especially in the presence of an apparently isolated medial intercuneo-metatarsal diastasis. It should be remembered that this lesion of the Lisfranc ligament strongly suggests looking for associated spatular lesions, which are not very apparent. It is in this situation that the value of the three-quarter incidence becomes apparent, as it clearly shows the incongruence of the cuboido-metatarsal joints and the abnormal projection of the styloid of the 5th metatarsal. These abnormalities do not show up on the standard dorsoplantar view.

#### b- Proven dislocations

They require urgent reduction. Several issues need to be discussed.

Is closed reduction possible? The series in the literature conclude that it is possible if it is performed as a matter of extreme urgency and if the restoration of joint congruence is perfect. Stabilization by percutaneous pinning is possible. In the majority of cases, open reduction and stabilization are recommended.

The approach for a typical columno-spatular lesion is vertical in line with the 1st and 4th spaces. Longitudinal venous return routes should be kept to a minimum, and care should be taken with the termination of the dorsal artery of the foot in the 1st space. The entire width of the joint space is exposed after subperiosteal detachment of the two incisions, the extensor apparatus being protected by a malleable blade.

After exposure and inventory of the lesions, reduction is performed from proximal to proximal by reference to the joint reduction criteria (restoration of congruence in front and in profile):
- First on the medial sector, giving all its importance to the perfect restoration of congruence between the 1st cuneiform and the base of the 2nd metatarsal; the use of a forceps with a compression tip, resting on the medial edge of the 1st metatarsal and the 3rd cuneiform is often of useful help:
- Then on the spatula by exerting a push from outside to inside:
- The reduction is temporarily stabilized by pins.

If the correction is perfect, final fixation is performed. All authors agree that in an emergency, there is no need to dress the articular surfaces. The wires (average diameter 18/10°) are buried; their direction must be perpendicular to the displacement. It is usual to place two wires crosswise on the medial column (one from medial to lateral trans-MI-C1, the other from lateral to medial trans-M2-C1). On the spatula, two wires can be placed obliquely from lateral to medial and from anterior to posterior, one trans-M5-cuboid and the other trans-M5-M4-M3-C3. In this way, all segments are fixed

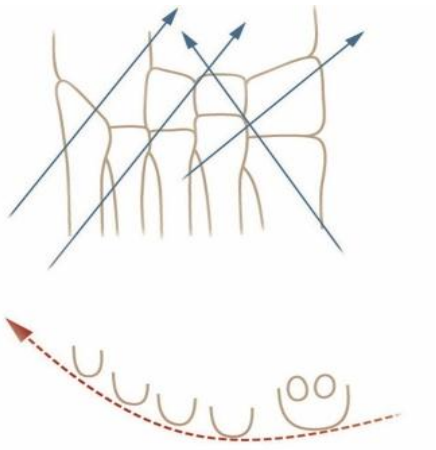

**Figure 5: Schematic representation of a pinned osteosynthesis.**

In the case of an intra-spatular dislocation, the osteosynthesis must be performed individually (by transarticular oblique pinning) each dislocated ray from its neighbors.

In case of propagation of the lines on the skeleton of the anterior tarsus, an intra-articular reduction must be performed before time:
- Fixation of the intercuneal (and possibly navicular) lesions by one or two horizontal screws in compression;
- Reduction and osteosynthesis of the cuboid lesions in the same way by screwing in compression.

Careful closure is required. The subcutaneous plane must be watertight and closed with reverse stitches with dermal support, but the skin must be closed loosely. The use of a drainage system is discussed according to local conditions.

It is essential to make a posterior splint under anesthesia, in a functional position, which moulds the plantar region. This splint will be kept until deflation and replaced by a circular boot.

The decision must be made according to the local conditions and the radiographic evolution. It should be noted that the risk of secondary displacement, loss of correction, and residual instability is higher for pure dislocations than for dislocation-fractures, which consolidate more rapidly. The removal of the pins must be performed under operating room conditions with systematic radiographic control after their removal. This is followed by the immediate fitting of a boot, the duration of which and the attitude to reweighting are discussed. Generally speaking, and taking into account the local biomechanical and trophic conditions, total immobilization for 10 to 12 weeks may be recommended. Removal of the pins should not be discussed before 6 weeks in the case of dislocation-fracture, and 8 weeks in the case of pure dislocation, and support on the boot may be discussed 15 days later, progressively by body weight fractions.

Despite the risk of loss of correction on removal of the pins, the majority of authors do not recommend immediate arthrodesis because of the significant risk of non-fusion and, in this case, the increased risk of residual painful instability, which is usually poorly tolerated.

**c- Functional rehabilitation**

In case of orthopedic treatment, a new evaluation and radiographs should be performed after two weeks to exclude any diastasis that could convert the patient to surgical management. After at least six weeks, if there is no tenderness at all and x-rays are again negative, weight bearing and a rehabilitation program can be considered. If there is tenderness but still no displacement, the patient should again wear a boot or cast for at least four weeks before beginning rehabilitation. Any diastasis or displacement requires surgical fixation.

If surgical treatment is performed, the patient should not bear weight for six to eight weeks. At that time, a re-evaluation is performed and a walking boot or cast may be considered depending on the clinical presentation. This cast or boot is then usually worn for an additional six weeks. At this point, again depending on the clinical presentation, a progressive functional rehabilitation program can be initiated.

## CONCLUSION

Lisfranc dislocations can be devastating. If undetected, they can lead to considerable long-term morbidity and adverse outcomes. If diagnosed and properly treated in a timely manner, acceptable outcomes can usually be expected, hence the need for prompt and effective diagnosis in the emergency department.

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