SURGICAL MANAGEMENT OF LISFRANC INJURIES

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SUMMARY

Introduction: Lisfranc injuries were found to be not so uncommon.

Patients and Methods: We have evaluated the results of 11 patients with Lisfranc injuries that had been treated with open reduction and internal fixation between January 1988 and December 1997. There were 3 female and 8 male patients with a mean age of 31.2 years. Injuries resulted from motor vehicular accidents in 8 patients, falls in 2 patients and a direct crushing injury in one. None of the injuries open but one. All were treated with open reduction and internal fixation with screws and/or pins.

Results: Eight of the patients were graded functionally as good while 2 were fair and 1 was poor.

Conclusions: Fracture-dislocations of the tarsometatarsal joint (Lisfranc joint), are rare injuries which can often be missed. Since they are associated with a high functional disability, early diagnosis, anatomical reduction and stable fixation is essential for a good outcome.

Key Words: *Lisfranc Injuries, Tarsometatarsal Fracture Dislocation, Surgical.*

INTRODUCTION

Lisfranc injuries were found to be not so uncommon, as were thought to be in the past[1-3]. Since the long term disability with flattening of both the transverse and longitudinal arches, arthritis, pain, weakness, difficulty in fitting shoes and marked limp; these injuries should be diagnosed and managed accurately[2-5].

ANATOMY:

Lisfranc or tarsometatarsal (TMT) joint is the articulation of the forefoot and the midfoot. Anatomically tarsometatarsal joint is divided into three parts: The medial column includes the first metatarsal and medial cuneiform, the middle column includes the second and third metatarsals and corresponding cuneiforms and the lateral column includes the fourth, fifth metatarsals and the cuboid. These articulations working together allow supination and pronation of the forefoot. These bony structures with ligamentous elements compose the transverse arch of the foot. In this complex, the base of the second metatarsal occupies a special position, as been locked into a mortise formed by cuneiforms. This recessed base locks the entire tarsometatarsal complex. Dorsal stability is supported by the triangular shape of the bases of the metatarsals, which provide an arch effect. The primary ligamentous supports are the Lisfranc's ligament – a strong plantar ligament between the bases of the first and second metatarsals – and the intercuneiform ligaments. The secondary stabilizers include the intermetatarsal ligaments between the lateral four metatarsals, the dorsal capsules and the accessory ligaments. TMT complex is also reinforced by the insertions of peroneal and posterior tibial tendons.

Considering that there is no intermetatarsal ligament between the first and second metatarsals, the maintenance of this anatomic relationship between the medial and middle columns is totally dependent on an intact Lisfranc ligament. Since this ligament's plantar location makes its surgical repair impossible with the routine dorsal incision, this joint can only be stabilized with reduction and screw fixation of the complex.

PATIENTS AND METHODS

We have evaluated the results of 11 patients with Lisfranc injuries that had been treated with open reduction and internal fixation between January 1988 and December 1997. The sex ratio was (+: m) 3: 8. The mean age of the patients was 31.2 years, ranging between 16 and 44. Motor vehicular accidents in 8 patients, falls in 2 and direct crushing injury in 1 patient was responsible in etiology. Affected foot was left in 6 patients and right in 5. None of the injuries were open except one Gustillo

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type II injury with associated medial cuneiform and navicular fracture. In a patient with acetabular fracture, the diagnosis was missed at the beginning. This patient was treated on the second week of his injury.

Associated lesions were fractures of the tibia (1 patient), metatarsal bones (4 patients), tarsal bones (2 patients), phalanx (3 patients) and multiple injuries (3 patients). All patients had pain, edema and haematoma of the forefoot after the trauma. Radiological examination included AP, oblique and lateral X-rays of the foot in all, as well as the contralateral X-rays of the foot in three. More than 2 mm. separation between the bases of the first and the second metatarsals, lateral or dorsal subluxation of the metatarsal bases corresponding to the cuneiforms or cuboid and in subtle injuries, decreased distance between plantar aspect of the fifth metatarsal and medial cuneiform measured on weight-bearing lateral radiograms were helpful in diagnosis[1-3]. We have evaluated our patients with Hardcastle classification[6] on AP radiograms. Two patients had type A injuries that is total incongruity in same direction. Five patients were graded as Type B (Partial incongruity) and four as Type C (Divergent) i.e. medial displacement of the first metatarsal and lateral displacement of any combination of the four metatarsals.

Operative Technique: We have used three longitudinal incisions in 6 patients and extensile dorso-medial aproach described by Trevino[3] in 5 patients. After reachnig the tarsometatarsal area, we tested the "intact-appearing" TMT joints and intercuneiform articulations. After reducing the first metatarsocuneiform and if necessary naviculocuneiform joint, first TMT was fixed temporarily with a pin. After this stage, the most important part of the procedure, reduction of the base of the second metatarsal and stabilization of the Lisfranc ligament was performed. This was done mostly with a reduction clamp between medial cuneiform and the base of second metatarsal. After reduction, a 4.0 mm. cancellous screw with a short thread length was used for fixation. The first three TMT joints and if necessary the intercuneiform or naviculocuneiform joints were fixed with cancellous lag screws. In the fourth and fifth metatarsals, Kirschner wires were preferred. After the operation weight-bearing was not allowed for 6-8 weeks and patients were immobilized in cast. In the sixth week Kirschner wires were removed and partial weight bearing allowed. Screw removal was delayed until 3 to 4 months after surgery to prevent recurrent diastasis.

RESULTS

Our average follow-up was 3.4 years. The patients were asked for control on 1.5, 3, 4.5, 6, 9 and 12 months and then twice a year. Results were classified functionally and anatomically as good, fair and poor[1,2,4,6]. In general, a good anatomical result based on clinical and radiological examination implied a good functional result also. Patients who had no pain or only mild subjective complaints that did not affect their daily activities and who experienced only slight limitation of movement without local tenderness and pain and with the ability tip-toe walking were rated as functionally good. Eight of the patients were graded as good. "Fair" implied moderate pain on activity, difficulty standing tip-toe, a limp, a foot of reasonably good shape and slight to moderate radiographic evidence of degeneration. Two patients were evaluated as fair. "Poor" implied marked pain which affected the ability to walk, inability to stand tip-toe, limp, deformity and radiographic evidence of moderate to severe degeneration. One patient fell into this category. The patient with "Poor" result and one of the patients with "Fair" result had to change their previous work.

In one patient Sudeck's atrophy developed.

We have not experienced screw fracture but in one Kirschner wire fracture and migration.

DISCUSSION

It has become evident that, in the management of Lisfranc injuries, open reduction and internal fixation yields better results than conservative treatment as it achieves and maintains an anatomical reduction which is essential for a good functional outcome[2,3,4,7,8]. Literature data indicates that slight graps between the medial and middle columns may lead to permanent disability in the form of chronic pain, arthritis, deformity and difficulty in wearing shoes.

Our functional results after open reduction and stable fixation were good in 72.7%, fair in 18.2% and poor in 9%. Good results were reported between 63% and 92% by various authors[2,5-8]. The outcome was related to many factors that will be discussed below.

Faciszewski et al[1] reported that, flattening of the longitudinal arch of the foot is much more important in functional results than the diastasis between the medial and middle columns. They also proposed the extent of diastasis did not correlate with the

patients final result and recommended the measurement of distance between the fifth metatarsal and medial cuneiform to evaluate the extent of flattening of the longitudinal arch[1]. In all our patients except one, after reduction, the optimal height of the fifth metatarsal was restored.

To avoid missing subtle injuries, supination-pronation stress roentgenograms was recommended[2,8]. All the patients in our series presented with a noticeable diastasis by routine X-rays.

There has been argument about the way of internal fixation. Some authors report problems with Kirschner wires like migration, pin tract infection breakage and most importantly loss of fixation[3,4,7]. Nowadays, the most accepted method is fixation with 4.0 mm. cancellous screws. We preferred 4.0 mm. screws in medial and middle columns and pins in lateral column.

Arntz et al. recommend 3.5 mm. cortical screws instead of 4.0 mm. cancellous screws to avoid cancellous screw breakage[7].

There is also controversy on the amount of immobilization and screw removal. It is evident that although the fractures can heal successfully in a 6 week period, the disrupted joint capsules and ligamentous supports require more time for a stable full weight-bearing capability. Therefore screw removal is not recommended until 3-4 months postoperatively. Cast immobilization was recommended about 2-6 weeks and full weight bearing after 6 weeks[3,5,8].

We beleive a high index of suspicion and early recognition with an open anatomical reduction and stable fixation is essential, in preventing the long-term disability, that result from inadequate reduction.

Fig. 1a: A 36 years old male patient after a motor vehicular accident sustained Type B (Partial Incongruity) injury of 2, 3, and 4. metatarsals associated with fracture of the medial cuneiform and dislocation of naviculocuneiform joint.

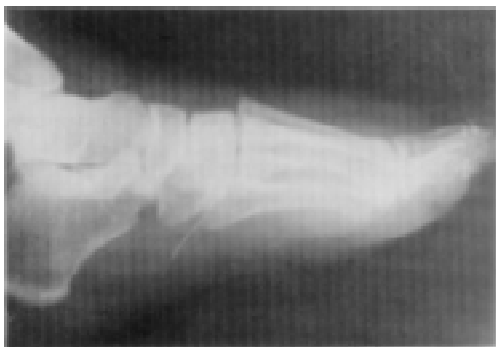
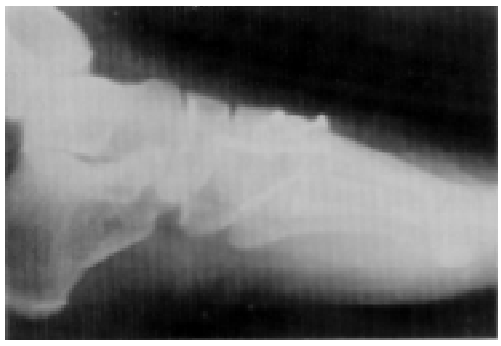


Fig. 1b: Dorsal subluxation is seen.

(c)



(d)

Fig. 1c, d: Postoperative 3. month radiograms reveala good alignment and healing medial cuneiform. Four mm. cancellous screws were used to stabilize naviculocuneiform and intercuneiform joints, Lisfranc's ligament and 2, 3 and 4. tarsometatarsal joints.

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