COMPARISON OF TREATMENT RESULTS OF ACUTE AND LATE INJURIES OF THE LISFRANC JOINT

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ABSTRACT

Objective: A retrospective comparison of treatment difficulties and treatment outcomes in Lisfranc joint injuries with late and early diagnosis. Methods: The study group consisted of 10 patients diagnosed and treated properly within six months to 20 years of the accident causing the injury (mean six years). The control group consisted of the same number of randomly selected patients with a similar type of injury treated immediately after the accident. Mean follow-up was 13 years in the study group and eight years in the control group. The analysis evaluated the causes of the delay and the foot function at the time of follow up, measured using the AOFAS Midfoot Scale and the Lublin Foot Functional Score. The scores of the patients were analyzed using the non-parametric Mann-Whitney U test and the non-parametric Wilcoxon test. Results: The control group had statistically significantly better scores on both scales. Conclusion: The main cause of treatment delay was misdiagnosis by the primary care physician. ***Level of Evidence III, Retrospective Comparative Study.***

Keywords: Dislocations/surgery. Fracture fixation, internal/methods. Fractures, bone/surgery.

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INTRODUCTION

Injuries of tarso-metatarsal joints, commonly referred to as Lisfranc injuries, can be caused by either direct or indirect trauma. The indirect mechanism involves axial loading of a plantarflexed foot and the direct mechanism involves a heavy load crushing the dorsal aspect of the foot.[1]

Lisfranc injuries vary in type and may involve individual rays as well as the whole Lisfranc joint.[1,2] Due to their low incidence and complexity, injuries of tarso-metatarsal joints are often missed on initial evaluation. Treatment delays caused by incorrect diagnosis represent 20% of cases of injuries to this body region.[3,4]

Lisfranc joint injuries are commonly described according to the Quénu and Küss classification, modified by Hardcastle into three types.[1] Type A is characterized by a dislocation of the bases of all metatarsal bones in one plane. Type B resembles type A in that the joints are displaced in the same direction, but it involves from one to four radii, never all of them. In the most severe and least common type C, dislocations within the Lisfranc joint occur in different directions. The incongruity may involve all rays and is then called total. If a divergent displacement involves from one to four metatarsals, then this is a partial type C.[1] The goal of this work was to compare long-term treatment results for delayed tarso-metatarsal joint injuries with treatment outcomes for identical injuries which had been properly diagnosed and treated directly after the accident.

Patients and Methods

The retrospective analysis was based on material consisting of 41 patients treated for Lisfranc joint injuries. The study group included 10 persons (6 men and 4 women), whose injuries had been diagnosed correctly later than 6 months after the trauma. The age of the patients ranged from 18 to 55 (mean 34 years). There were four A type injuries and the remaining 6 were B types. In four patients, the damage extended beyond the tarso-metatarsal joints. Originally, three patients had been diagnosed with a tarsal sprain, three others with contusions, two with small fractures of metatarsal bone bases, and one with a wound of the foot dorsum. In one case, despite correct diagnosis, reduction of the displacement under anaesthesia was unsuccessful as seemingly "minute anatomical imperfections" were left unreduced and immobilized in plaster. Cooling of the injured area was suggested to two patients and 6 others had plaster splints applied.

The time that had passed from the trauma to operative treatment ranged from 6 months to 20 years (mean 6 years). Medical attention was sought due to pain in 6 cases and deformities with pain in the remaining four.

All the authors declare that there is no potential conflict of interest referring to this article.

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A control group included 10 people (8 men and 2 women) who had been properly diagnosed and subjected to adequate operative treatment directly after the trauma. Four persons with A type injuries and 6 with B type damage of an identical pathomorphism as in the study group were chosen for comparative analysis.

All operative interventions in patients from the study group commenced with an attempt at an open reduction of the dislocations. This, however, always ended with the resection of the damaged parts of the Lisfranc joint and its arthrodesis. In two cases, the displacement of the tarso-metatarsal junctions of two rays was accepted and arthrodesis was performed in the fixed subluxation.

The patients of the control group were treated on the day of the trauma or, at most, after a few days' postponement. The procedure began with an attempt at a closed reduction of the luxations or fractures. After putting it in the correct position, the Lisfranc joint was stabilized percutaneously with Kirschner wires. In six cases, the non-operative attempts were not successful, and the dislocations were reduced openly and stabilized with Kirschner wires.

All patients underwent follow-up evaluation with physical examination in the outpatient department. The functional status of the feet was assessed using the AOFAS scale for the midfoot. (Table 1) This scale takes into account the intensity of pain, activity limitations, footwear requirements, walking distance depending on the quality of the walking surface, and the foot axis. The scores on this scale range from 0 to 100 points. A self-designed function evaluation system (called the Lublin Foot Functional Score) was also developed, which included the assessment of tiptoeing, running, climbing up and down the stairs, weight-bearing of the foot in supination, presence of skin changes (e.g. corns), occurrence of swelling, as well as other patient complaints. (Table 2) Control radiographs were performed in standard projections in all of the examined patients from both groups. The mean follow-up was 13 years in the study group and 8 years in the control group.

Table 1. AOFAS Mid-foot Scale.

Pain (40 points)	
None	40
Mild, occasional	30
Moderate, daily	20
Severe, almost always present	0
Function (45 points)	
Activity limitations, support	
No limitations, no support	10
No limitation of daily activities, limitation of recreational activities, no support	7
Limited daily and recreational activities, cane	4
Severe limitation of daily and recreational activities, walker, crutches, wheelchair	0
Footwear requirements	
Fashionable, conventional shoes, no insert required	5
Comfort footwear, shoe insert	3
Modified shoes or brace	0
Maximum walking distance, blocks	
Greater than 6	10
4 – 6	7
1 – 3	4
Less than 1	0
Walking surfaces	
No difficulty on any surface	10
Some difficulty on uneven terrain, stairs, inclines, ladders	5
Severe difficulty on uneven terrain, stairs, inclines, ladders	0
Gait abnormality	
None, slight	10
Obvious	5
Marked	0
Alignment (15 points)	
Good, plantigrade foot, mid-foot well aligned	15
Fair, plantigrade foot, some degree of mid-foot malalignment observed, no symptoms	8
Poor, non plantigrade foot, severe malalignment, symptoms	0
Total (100 points)	

RESULTS

Statistical evaluation using the non-parametric Mann-Whitney U test and the non-parametric Wilcoxon test demonstrated significant statistical differences between the scores of the two groups on the AOFAS scale and the Lublin scale at $p < 0.05$. (Table 3)

In the study group, exertion pain and walking distance limitations were common. None of the patients could effortlessly stand or walk on their toes and outer feet margins. Complaints of swelling of the affected foot and both shins of the injured limb were chronic. X-ray images taken in the examined group showed secondary degenerative changes both in the remaining, non-injured parts of the Lisfranc joint, as well as in tarsal joints in all cases.

In the control group, only one patient reported a slight limitation in gait performance. One patient, with the lowest scores, displayed characteristics of degenerative changes in the Chopart joint in his x-ray image.

DISCUSSION

The comparison of the results of delayed and acute injuries of the Lisfranc joint demonstrates the obvious regularity that early diagnosis and immediate treatment prognosticate a good outcome. Every omission and postponement of proper treatment inevitably leads to future limitations in functional ability. All authors stress the significance of correct diagnosis during a patient's first visit.[3-5] In the discussed material, all delays were, unfortunately, caused by the mistakes of the doctors who examined the injured patients directly after the accidents. Delays due to visit postponements by patients were not observed. The predominance of B type injuries suggests that an in-depth

Table 2. Lublin foot functional score.

Tiptoe walking (10 points)	
Without restrictions	10
Difficult but possible	5
Impossible	0
Jogging (10 pontos)	
Without restrictions	10
Difficult but possible	5
Impossible	0
Stair walking (10 points)	
Without restrictions	10
Difficult but possible	5
Impossible	0
Foot weight-bearing in supination (10 points)	
Without restrictions	10
Difficult but possible	5
Impossible	0
Skin corns (10 points)	
None	10
Present but small	5
Present and diffused	0
Swelling (10 points)	
None	10
Present but small or temporary	5
Present and persistent	0
Other complaints (10 points)	
None	10
Mild or temporary	5
Persistent	0
Superficial sensation abnormalities (10 points)	
None	10
Present, very local	5
Present, diffused	0
Total (80 points)	

Table 3. Scores obtained by patients in the study and control groups on the AOFAS and Lublin scales were statistically significant at $p<0.05$.

	Study group	Control group
AOFAS score (0–100)	34–95 points (mean 60)	68–100 points (mean 91)
Lublin Foot Functional Score (0–80)	15–75 points (mean 31)	50–80 points (mean 73)

analysis of injury mechanisms, a critical evaluation of the clinical symptoms and a meticulous comparative verification of x-ray images should be performed.[6] Underestimation of the patient's seemingly unimportant complaints, the superficiality of medical examination, and the omission of fine anatomical irregularities in roentgen pictures all lead to delays in administering proper treatment.[7] The consequence is always a poor outcome and an irreversible dysfunction of the foot and the whole limb.[8] Treatment in delayed cases is difficult, and the expected outcome is worse than in acute injuries.[9,10] As the analyzed material shows, operative procedures in patients with long-standing injuries are more extensive. Usually, metatarsal arthrodesis is necessary, sometimes with the need leaving the existing dislocations unreduced. The existing dislocations than become the direct cause of progression of arthritis in other, primarily healthy, foot joints.

CONCLUSIONS

Treatment delays in the Lisfranc joint result from diagnostic errors. Treatment of long-standing injuries of the tarso-metatarsal joint, independently of their type, is difficult and prognosticates poorly. Correct and timely treatment of Lisfranc joint injuries creates an opportunity of regaining permanent good function of the injured foot.

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