

Impact of Faradic Foot Bath Application in Lisfranc Injury: A Case Report

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Abstract: The Lisfranc joint is complex joint consisting of ligaments and connective tissues that serve to give a shape to the transverse arch of the foot. Though injury to the joint is rare, it can occur due to longitudinal axial forces applied to a hyperplantarflexed foot. These forces can result from direct or indirect trauma leading to tearing of weak intermetatarsal ligaments. Lisfranc injuries often result in pain, limitation of motion at ankle joint and reduced proprioception. The present case discusses about the role of faradic foot bath in a 40 year old patient who met with an accident resulting in twisting of foot and severe pain in mid foot. He could not be relieved from conservative orthopaedic management. However, application of faradic foot bath and joint mobilization over a period of two weeks resulted in a significant reduction in pain and an improvement in joint function following Lisfranc injury.

Keywords: Faradic foot bath, Function, Lisfranc injury, Pain.

I. INTRODUCTION

The Lisfranc joint is complex joint structure that includes 5 metatarsals articulating with the medial, middle, and lateral cuneiforms in connection with cuboid by transverse arch that balances tarsometatarsal (TMT) joint. The transverse metatarsal ligaments originate at the bottom of 5th metatarsal anatomically, but its connection to the 1st and 2nd metatarsal is not visible. The complicated connection of ligaments among the medial cuneiform and 2nd metatarsal base consists of 3 separate ligaments that include dorsal ligament, the oblique interosseous ligament or the Lisfranc ligament and plantar ligament [1].

Lisfranc injury is a rare type of injury which can range from comminuted fracture to a sprain in the ligament in the dorsal aspect of the foot. It can lead to sustained chronic pain and functional loss if not diagnosed properly [2]. The most common

mechanism of injury is a longitudinal axial force applied to a hyperplantarflexed foot [3]. There are two types of trauma that can result in these injuries: indirect trauma and direct trauma. Indirect trauma refers to a low energy injury that is typically encountered in sports [4]. Direct trauma may result from direct injuries such as road traffic accident (RTA). The injury results in tearing of the weaker intermetatarsal ligaments due to plantarflexion of foot followed by generation of an axial load across it [5]. High energy direct trauma related Lisfranc injuries can sometimes be more easily detected as they frequently manifest as fracture dislocations affecting the TMT joint. These injuries are typically caused by motor vehicle accidents, falls that are more than three metres high, and crush injuries [6].

Patients with Lisfranc injuries have slow walking pattern and significantly lower flexion/extension in the midfoot [7]. Proprioception for ankle joint is important for postural control, as it is the only joint which gets in contact with the ground. For restoring ankle arthrokinematics, joint mobilization techniques are being used. Movement with mobilization (MWM) helps in increasing the extensibility of the joint and range of motion [8].

The Foot and Ankle Ability Measure (FAAM) and the Foot and Ankle Outcome Score are recommended by the International Ankle Consortium to assess the functional limitations of people with conditions of Ankle and Foot. These tests measure the function of the ankle/foot joint complex (FAOS). Sports (8 items) and activities of daily living (21 items) are the two subscales of the FAAM, which consists of 29 items with scores ranging from 0 to 4 [9, 10]. The present case study discusses about the role of faradic foot bath in the rehabilitation following a Lisfranc injury.

II. CASE PRESENTATION

A 40-year-old patient from Greater Noida reported to the Physiotherapy department with a complaint of pain in the

midfoot while walking. Patient had a history of RTA 3 months back where he fell from the auto and twisted his left foot during the accident. Then he visited the Orthopaedics department, where on examination, a Numeric Pain Rating Scale (NPRS) score of 8 was recorded and X-ray was suggested to him. No fracture was observed on X-ray, though on examination it was found to be a case of Lisfranc injury indicating a sprain in the intermetatarsal ligaments. He had pain, tenderness and swelling in the left midfoot over the dorsal aspect for which he was advised conservative management that included anti-inflammatory drugs and RICE (rest, ice, compression and elevation) protocol. Patient was unable to perform weight bearing activities even after 2 weeks of conservative management and reported no decrease in the pain intensity. Following this, he visited the physiotherapy department, where a detailed examination was done.

On observation, deviation in gait pattern was seen. Patient had slow gait speed and significantly lower flexion/extension in the midfoot during the weight shifting phase of the left foot. On palpation, grade 2 tenderness was found over the 2nd and 3rd transmetatarsal region. NPRS score was 6. Piano test was also performed and it was found to be positive. Thus, physical examination confirmed the diagnosis of Lisfranc injury over the left foot.

III. TREATMENT

Before starting with the physiotherapy sessions, the patient was explained in detail regarding the procedure and a written informed consent was taken from him. The treatment plan was aimed at relieving pain, improving strength, gait correction and to regain functional independence. The following outcome measures were recorded at baseline:

- Numeric Pain Rating Scale (NPRS)
- Foot And Ankle Ability Measure (FAAM)

A total of 15 sessions were scheduled i.e., one session/day for 15 days.

For pain reduction, hot pack was applied over the mid foot for 5 minutes followed by faradic foot bath application. To apply the faradic foot bath, equipments used included a plastic tub containing water, muscle stimulator and electrode pads. The patient was asked to place his left foot under water in the tub. The negative electrode was placed below the metatarsal head and positive below the calcaneum. Surge faradic current (5 sec surge on: 2 sec surge off) at intensity between 18-25 Hz was applied. Total treatment duration for faradic foot bath was 10 min. (Fig. 1). One session/day lasting for 10 minutes was given for 2 weeks.



Fig. 1: Application of Faradic Foot Bath

Following the faradic foot bath, joint mobilization was given at the midfoot. Tarsometatarsal distraction and tarsometatarsal glides were performed first for 5-6 repetitions. After this, intermetatarsal joint mobilizations were performed for 5-6 repetitions. No strengthening exercise was given in initial 2 days. Joint mobilization was also given for 2 weeks.

From session 3 of treatment, strengthening exercises for ankle and foot were done using theraband. These resistance exercises were done for plantar flexion, dorsiflexion, inversion and eversion for 10 repetitions with 10 second hold for each repetition.

From day 5 of the treatment, walking up the stairs for 3 steps and coming down was repeated for 10 times which was progressed to stepping up and down on stairs for 10 steps on day 10 of the treatment.

IV. RESULTS

After completion of the sessions, both NPRS and FAAM score were recorded.

TABLE I: NPRS SCORES AT BASELINE AND AFTER 2 WEEKS

NPRS Score	Day 1	Day 15
	6	1

Table I shows the NPRS scores at baseline and after 2 weeks of intervention. There was a remarkable reduction in the pain level (Table I) and walking pattern.

TABLE II: FAAM PERCENTAGE SCORES AT BASELINE AND AFTER 2 WEEKS

FAAM Sub Scales	Day 1	Day 15
Activities of daily living	42.22%	77.11%
Sports activities	10.71%	75%

Table II shows the pre and post intervention scores for FAAM. There was improvement in activities of daily living and sports activities. Activities of daily living improved from 42.22% on

day 1 to 77.11% on the 10th day. Sports activities improved from 10.71% on day 1 to 75% on day 15.

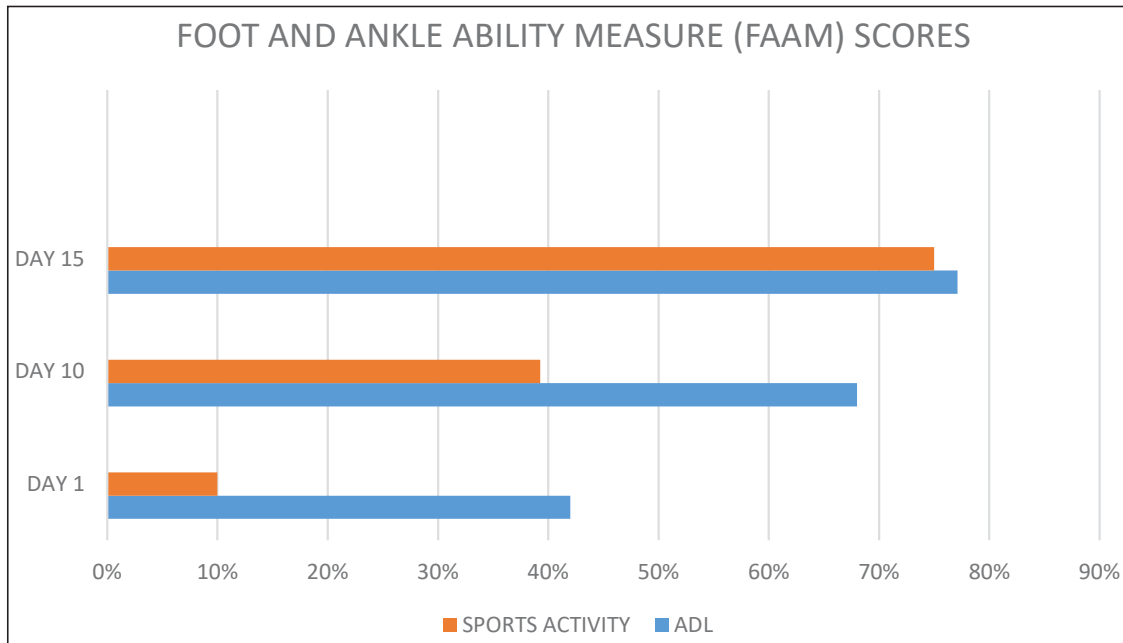


Fig. 2: FAAM Score Improvement Over 2 Weeks

V. DISCUSSION

Lisfranc injury is an injury that occurs at TMT joint ranging from a simple ligamentous sprain to open fracture resulting from either crush injury, overloading of plantarflexed foot or foot being forcefully abducted. It is one of the rare injuries that results from motor vehicle accidents (MVA). The causes can also include direct or indirect forces acting over the TMT joint. The bilateral representation of this injury is rare [11]. Failure to get an accurate diagnosis can lead to chronic pain and instability with some degenerative changes such as post-traumatic arthritis [11].

Common symptoms for this injury include pain, swelling, tenderness and reduced gait speed. Similar changes were also observed in the present case of Lisfranc injury, where patient had slow and deviated gait pattern during loading phase characterised by pain, swelling and tenderness. The range of motion at the left foot was reduced in addition to pain while pronating the foot.

The present case report describes the physiotherapy management for Lisfranc injury. A thorough examination was done including the piano test that resulted in positive outcome [12]. The physiotherapy intervention included strengthening exercises, joint mobilization and faradic foot bath- electrical stimulation with 5 min. of hot pack [13]. After 2 weeks of intervention, there was a reduction in pain and an improved gait speed, range of motion and FAAM score [14].

The results of our study are in line with the findings of Nirav *et al.* who reported a reduction in pain and swelling with the application of faradic current [15].

Improvement in joint range of motion in the present case can be attributed to be due to joint mobilization that helps to break adhesions and prevents contracture formation. John *et al.* have also reported that midfoot joint mobilization is an effective measure to reduce pain and improve mobility in ankle sprains [16]. Activities of daily living also improved more as compared to sports activities after the treatment plan.

VI. CONCLUSION

It can be concluded that conventional physiotherapy treatment in combination with faradic foot bath and strengthening exercises is effective for improving pain, range of motion and function in Lisfranc injury patients.

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