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A Cross Sectional Study On Functional And Radiological Outcome Of Internal Fixation In Mid Foot Injuries.

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ABSTRACT

Lisfranc injuries are uncommon and can be challenging to manage. There is considerable variation in opinion regarding the mode of operative treatment of these injuries, with some studies preferring primary arthrodesis over traditional open reduction and internal fixation (ORIF).The aim of this study is to analyze prospectively the functional and radiological outcome of internal fixation in midfoot injuries using plates and screws in cases admitted and followed up in the department of Orthopaedics, Tirunelveli Government Medical College Hospital over a period of 24 months from October 2021 to September 2022. The major current controversies in literature concern the management and treatment. In stable lesions and in those without dislocation, conservative treatment with immobilization and no weight-bearing is indicated for a period of 6 weeks. Displaced injuries have worse outcomes and require surgical treatment with the two main objectives of anatomical reduction and stability of the first three cuneiform-metatarsal joints. Different surgical procedures have been proposed from closed reduction and percutaneous surgery with K-wire or external fixation (EF), to open reduction and internal fixation (ORIF) with trans articular screw (TAS), to primary arthrodesis (PA) with dorsal plate (DP), up to a combination of these last 2 techniques. There is no superiority of one technique over the other, but what determines the post-operative outcomes is rather the anatomical reduction. However, the severity of the injury and a quick diagnosis are the main determinant of the biomechanical and functional long-term outcomes

Keywords: Clinical outcomes, dorsal bridging plate, joint preserving surgery, Lisfranc injury, open reduction and internal fixation,

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INTRODUCTION

The midfoot is anatomically defined as the section between theChopart joint line and the Lisfranc joint line. The two French surgeons Jacques Lisfranc de saint Martin and Francois chopart defined these joint lines originally not for traumatic foot reconstruction but as amputation lines. The spectrum of these injuries varies from low-energy sports injuries to high-energy crush injuries [1]. There is a wide variation in these injuries with pure ligamentous injuries to comminuted forefoot and midfoot fracture dislocations [2]. These injuries are caused by axial loading of hyperplantar flexed foot. These can also be caused by high-velocity trauma. These are increasingly reported as being caused by twisting injuries or minor trips and falls [3]. Up to 24% of these injuries are missed or frequently diagnosed late. Untreated, delayed treatment, or inadequately treated injuries result in poor functional outcome for the patient in proportion to the severity of the initial injury [4]. This results in substantial pain, midfoot arthritis, pes planus deformity, decreased function, and loss of quality of life [5]. Secondary arthrodesis may be used to treat these injuries, but the outcome is poorer, the longer the treatment is delayed [6]. Prompt diagnosis and early treatment is, therefore, essential in ensuring good outcome in these injuries [7]. Early diagnosis with proper clinical examination and weight-bearing radiographs is important. The key to good functional outcome is anatomical reduction and stable internal fixation. There is good evidence to suggest that quality anatomical reduction of <2 mm is associated with a significant improvement in both radiological and functional outcomes [8]. There is a wide range of opinions regarding the treatment of these injuries. The treatment varies from closed reduction and immobilization, closed reduction and percutaneous K wire fixation, open reduction and internal fixation (ORIF)with trans articular screw (TAS) or extraarticular fixation with joint-sparing surgery by dorsal bridging plate (DBP). A number of studies have also shown good clinical outcomes with primary arthrodesis (PA) in these injuries. Injuries that involve the midfoot are rare and comprise only about 5% of allfoot injuries [9]. Overall, an incidence of 0.45% has been reported with 5.0 injuries per100,000 population and unimodal distribution affecting younger men and women [10]. This is due to a strong ligamentous connection between the five bones forming the midtarsal complex (the navicular, the cuboid and the medial, middle and lateral cuneiforms).Acute injuries to the TMT or Lisfranc joints are rare accounting for 0.1% to 0.4% of all fractures and dislocations. Despite improvements in diagnosis, missed or overlooked injuries are common [11,12].

METHODS

It is a prospective study was conducted in the department of Orthopaedics, Tirunelveli Government Medical College Hospital over a period of 24 months from October 2021 to September 2022.patients with midfoot injuries. Informed consent was taken from all patients. Surgery was done electively after anesthesia assessment. All cases were operated under regional anesthesia.

Inclusion Criteria

- Age <15 years and >60 years
- Tarsometatarsal joint fractures and dislocations
- Navicular fractures
- Cuboid fractures
- Cuneiform fractures and inter cuneiform dislocations

Exclusion Criteria

- Preexisting foot deformities
- Congenital foot deformities
- Fractures with segmental bone loss
- Severe osteoporosis and pathological fractures
- Compound fractures more than gustilo Anderson grade 2

All cases were taken up for surgery immediately following admission. Follow up of patients was done till good clinical outcome is achieved clinically as well as radiologically.20 cases were studied. Pre operative preparation: patients underwent preoperative evaluation including blood Investigations, electrocardiography, X ray chest for anaesthesia assessment, foot X rays , CT foot in selected cases. Data entry was done using Microsoft excel. Data was analysed with SPSS version 23. Frequencies and proportions were calculated as appropriate.

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RESULTS

In this study, 20 patients were studied. All of them undergone ORIF. The age range was from 19 to 57 with the mean age of 36.4 with majority between the age group of 41 to 50. All the 20 patients were male. The left foot was involved in 8 patients and the right foot, in 12 patients (60%). Out of 20 patients ,19 patients (95%) had history of road traffic accident. Eight patients (40%) had associated fractures other than foot injury . Most common injury associated was fibula fracture (20%). All the 20 patients were closed injuries. Of the 20 patients, 17 were Lisfranc injuries(85%). Among those 17, myerson type B2 was the commonest type which was 35%. Postoperatively 3 patients (15%) had complications. The mean AOFAS Score at final follow-up was 90 with minimum of 77 and maximum of 100. In our study 35% had excellent outcome, 45% had good outcome and 20 % had fair outcome as per AOFAS MIDFOOT SCORE. As per wilppula classification 80% patients had good outcome. All the patients who scored excellent in AOFAS score were found to have scored good in wilppula classification.

Table 1: Age wise distribution

Age group	Frequency	Percent(n=20)
Less than 20 years	3	15.00%
21 to 30 years	4	20.00%
31 to 40 years	4	20.00%
41 to 50 years	5	25.00%
51 to 60 years	4	20.00%

Majority of the participants were in the 41 to 50 years age group (25%).

Table 2: Mode of injury

Mode of injury	Frequency	Percent
Fall from height	1	5.00%
RTA	19	95.00%

95 % of the participants were victims of Road traffic injuries.

Table 3: Distribution by type of associated injuries

Associated injury	Frequency(n=20)	Percent
2nd MTP joint dislocation	1	5.00%
Fracture femur shaft & patella	1	5.00%
Fracture Fibula distal 3rd	**4**	**20.00%**
Fracture Fibula distal 3rd& metatarsal fracture (2nd & 3rd)	1	5.00%
Fracture medial malleolus	1	5.00%
No	12	60.00%

40 % of the participants had associated injury. Fracture Fibula (distal 3rd)was the commonest associated injury (20%).

Table 4: Diagnostic classification of mid foot injury

Diagnosis	Frequency(n=20)	Percent
Lisfranc -17(85%)		
Subtle lisfranc	2	10.00%
Myerson C2 lisfranc	2	10.00%
Myerson B1 lisfranc	3	15.00%
Myerson B2 lisfranc	7	35.00%
Myerson C1 lisfranc	3	15.00%
Other types -3 (15%)		
Middle intercuneiform dislocation	1	5.00%
Sengeorzan type 2 navicular	1	5.00%
Sengeorzan type 3 navicular	1	5.00%

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Lisfranc type of injuries were the commonest (85%) and among themMyerson B2 Lisfranc type was the commonest injury reported (35%).

Table 5: Distribution by procedure done

Procedure done	Frequency(n=20)	Percent
ORIF with plating	17	85.00%
ORIF with bscrew	3	15.00%

ORIF with plating was the commonest procedure done (85%).

Table 6: Distribution by complications after the surgery

Complications following surgery	Frequency	Percent
Implant complication	2	10.00%
Midfoot deformity, superficial infection	1	5.00%
No	17	85.00%

Table 7: AOFAS functional score after surgery

AOFAS functional score after surgery	Frequency(n=20)	Percent
Excellent	7	35%
Fair	4	20%
Good	9	45%

35 % of the patients were in excellent category of AOFAS functional score(after surgery).

Table 8: Outcome- Wilppula classification

Wilppula classification Outcome	Frequency(n=20)	Percent
Fair	4	20.00%
Good	16	80.00%

80% of the participants had good radiological(anatomical) reduction by **-Wilppula classification.**

Table 9: Comparison of AOFAS functional score after surgeryCategory Vs Wilppula classification

AOFAS functional score aftersurgery Category	Wilppula classification		Odds ratio (95% CI)	P value
	Good	Fair		
Excellent	7(100%)	0		
Good	7(77.8%)	2(22.2%)	3.5	0.33
Fair	2(50%)	2(50%)		

100% patients who scored excellent in AOFAS functional scoring had good anatomical reduction and 77.8% for those scored good in AOFAS functional scoring had good anatomical reduction and 50% among who had scored fair in AOFAS functional scoring had good anatomical reduction . However, it was not significant(p>0.05)

DISCUSSION

This study conducted to establish the functional outcome of internal fixation in midfoot injuries. Schildhauer et al first reported bridge plating infoot surgery in 1984 as an alternative for external fixation. In our study we used plates and screws or screws only according to the fracture pattern. This study was done after getting approval from the ethical committee [13]. Among the 20 patients, 35% had excellent outcome, 45% had good outcome and 20 % had fair outcome as per AOFAS MIDFOOT SCORE . After the minimal 1 year follow-up The AOFAS midfoot score has ranged from 77 to 100 for both plate fixation and

screw fixation [14]. In 2014, Hu et al described a prospective study of 60 patients which compared the functional outcome in patients with a Lisfranc injury treated by dorsal plating or trans articular screws. [15]. In addition, no analysis of anatomical reduction was undertaken. In our study, it was noted that plate fixation is associated with improved anatomical reduction. This was probably due to the small sample size. This may be related to the improved maintenance of anatomical reduction. Another potential consideration is that by avoiding further damage to the articular surface, bridge plating results in less arthrosis thereby improving the functional outcome [16]. In our study dorsal plating for Bridging fixation of comminuted Fractures with bony fragments in the TMT joints is used. Open reduction in midfoot injuries is found to be superior, because it provides the possibility of removing intra articular debris or an interposed capsule, allowing for improved reduction by direct inspection and fixation by plate provides maintenance of reduction and maintenance of alignment of normal foot arches. Theoretically the avoidance of penetration of articular cartilage by transarticular screws avoids the late development of posttraumatic arthritis at the TMT joints [17]. Although K-wire fixation minimizes the articular damage, redisplacement rates are unacceptably high. Moreover, given the potentiallyslow healing rate of pure ligamentous injuries, plating provides prolonged Fixation. Wound problems are not more common with plating. Painful hardware has not been a concern in our study except in two cases and removal is not common with properly placed Low-profile plating systems [18]. Open reduction and internal fixation using plating is associated with increased dissection using 2 incisions is needed to place the plate [19,20]

CONCLUSION

AOFAS score was used to assess the functional outcome in our study, and wilppula classification used to assess the radiological/anatomical outcome. Internal fixation with plates and/or screws resulted in good fracture union, return to preinjury level functional status, normal stable foot with its alignment and arches without much complications. So this technique can be done for all closed midfoot injuries. This study is limited by the small sample size and short follow-up period. Longer follow-up is needed to determine whether the prevention of secondary damage to articular surface leads to less posttraumatic arthritis.

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