

STUDY OF OCCURRENCE, DEMOGRAPHY AND PATHOMORPHOLOGY OF ANKLE AND FOOT FRACTURES AND EVALUATION OF THE TREATMENT OUTCOME OF CALCANEAL FRACTURES

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ABSTRACT:

BACKGROUND:

This study highlights which injury has greatest burden, how frequent are the injuries of foot and ankle areas, which is an extremely neglected specialty in orthopedics and also the importance of proper diagnosis, classification of fractures, appropriate pre-operative planning and timely conservative as well as surgical intervention of ankle and foot fractures that resulted in a satisfactory outcome. Despite the fact, foot and ankle is the most important locomotor unit of our lower limb, there have been few studies addressing the problem and treatment outcome of such fractures.

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OBJECTIVE:

To determine the occurrence, demography and pathomorphology of ankle and foot fractures, also evaluation of treatment outcome of calcaneal fractures.

METHODOLOGY:

This was a longitudinal interventional study which dealt with acute traumatic ankle and foot fracture patients coming to Accident and Emergency Department of MHL, DOST unit 1, with inclusion and exclusion criteria clearly defined.

RESULTS:

Total 100 patients were included in the study. Mean age of patients was 35.71±13.60 years. Minimum age of patients was 14 and maximum age of patients was 70 years respectively. Gender distribution of patients shows that 15 patients were female and the remaining 85 patients were male. Male patients were greater in number as compared to female patients ie. M: F, 6:1. Mechanism of the injury showed that there were 48 patients who suffered from RTA, 37 patients had trauma due to fall from height, 6 patients had industrial injuries, 5 patients had Fire Arm Injury, and 2 patients had injuries due to domestic activity, 1 had trauma due to sports activity and 1 had injury due to agricultural work. There were 41 patients with fractures of calcaneum and out of which 5 had bilateral

fracture calcaneum. They were classified according to CT based Sanders classification. Out of these 22 patients were of Sanders type III, 12 patients were of Sander type II, 5 patients were of Sander type IV, 2 patients were of Sander type I. Sander type I were treated conservatively with Boot cast, Sanders type II and III were treated with boot cast and Percutaneous Stiemann pin, K-wire and malleolar screws, while Sander type IV treated conservatively due to severe communication with subsequent Tripple Arthrodesis if required.

CONCLUSION:

This study highlights the burden of foot and ankle injuries as well as the importance of proper diagnosis, classification of fractures, appropriate pre-operative planning and timely intervention of Ankle and foot fractures. Foot and ankle is the most important locomotor unit of our lower limb and this is a neglected specialty in our society which needs special attention and care for the welfare of patients by expertise. Outcome assessment of ankle and foot patients was done by Olerud-Molander scoring system. Patients with follow up of at least 8 months were called by phone to complete the functional scoring system (Olerud-Molander). According to this criteria 5 patients had excellent outcome, 42 had good outcome, 43 had fair and 10 patients had poor outcome.

KEY WORDS:

Ankle and Foot Fractures, Calcaneal Fractures, HSS

INTRODUCTION:

Ankle and foot fractures are very frequent of lower limb fractures, more commonly in men, but after menopause there is female predominance. The main objective in the management of the ankle & foot fractures is to obtain absolute reduction and stable fixation to facilitate early mobilization and good functional recovery. The incidence of ankle

fractures is approximately 187 fractures per 100,000 people each year. The vast majority of ankle fractures are malleolar fractures: 60-70% occurs as unimalleolar fractures, 15 to 20% as bimalleolar fractures and 7 to 12 % as trimalleolar fractures. The prevalence of these fractures have a similar trend among men and women, but in men these are more common in younger group while in women the incidence is higher in 50 to 70 years age. The fracture of foot is the most common sites with incidence rate reported to be 3.6/1000 women in women aged 65 and older in United States ^[1-3].

Among bones of the foot, the calcaneus is the most commonly injured bone. Calcaneal fractures are divided into intra-articular and extra-articular types. For orthopedic surgeon, calcaneum fractures are the most challenging problem. Among all fractures, the incidence of Calcaneum fractures is 2%, with displaced intra-articular fractures account for 60% to 75% of these injuries. In patients with calcaneal fractures, 10% have associated spine fractures and 26% have associated with other extremity injuries. In age group of 21 and 45 years ^[4,5]. 90 % of calcaneal fractures occur in males, with the majority occurs in industrial workers, the economic implications of this injury are substantial ^[4, 6-10].

The incidence of Talus fractures is only 3-6% of all foot fractures. Fractures of body of Talus account for 13-23% of all Talar fractures and less than 1% of all fractures. There is increased risk of avascular necrosis in Talar body fractures which ultimately ends up in secondary degenerative changes and long term ankle disability ^[11].

Modern surgical techniques have improved the outcome in many patients, but there is controversy regarding classification, treatment, operative technique, and postoperative management ^[4-10].

This study has reviewed the treatment outcome of ankle and foot fractures with special reference to occurrence, demography, pathomorphology and also evaluates the treatment outcome of calcaneal fractures. This study will guide about the gender affected, age group of the patient, mechanism of the injury, occupational work and the risk factors involved in ankle and foot fractures & different outcomes regarding these fractures. This study highlights the importance of proper diagnosis, classification of fractures, appropriate pre-operative planning and timely conservative as well as surgical intervention of ankle and foot fractures that resulted in a satisfactory outcome.

MATERIALS & METHODS:

This is a longitudinal interventional study with total 100 cases of ankle and foot fractures presenting to A & E department Mayo Hospital Lahore Ortho I during two years time period.

Inclusion Criteria

Acute ankle & foot fractures within 1 week of occurrence

Exclusion Criteria

- Fracture more than 1 week
- Pediatric patients
- Poly trauma patients with associated ankle & foot injuries
- Diabetic foot

Outcome Criteria

The effect of incidence, mechanism of injury, occupational work and risk factors regarding ankle and foot fractures are also under consideration. Olerud-Molander ankle and foot scoring system for the management of ankle and foot fractures was used^[11].

Ankle and foot scoring system^[11]:

Olerud-Molander designed the following clinical ankle scores (total score=100, excellent: 91-100, good: 61-90, fair 31-60, poor :< 30)

TABLE 1: OLERUD-MOLANDER ANKLE AND FOOT SCORING SYSTEM

Symptoms	Severity	Points
Pain	None	25
	While working on uneven surface	20
	While working on even surface	10
	While working indoors	5
	Constant and severe	0
Stiffness	None	10
	Present	0
Swelling	None	10
	Evenings only	0
Stair Climbing	No problems	10

	Impaired	5
	Unable	0
Running	Possible	5
	Impossible	0
Jumping	Possible	5
	Impossible	0
Squatting	No Problems	5
	Unable	0
Support	No Support	10
	Taping, wrapping	5
	Stick, crutches	0
Works, acts of daily living	Same as before injury	20
	Loss of tempo	15
	Changed to a simpler job/part-time	10
	Disabled, strongly impaired work capacity	0

RESULTS:

This study was conducted in A& E Dept. of DOST unit 1, MHL. Total number of patients were 100, out of that 85 were males and only 15 were females. The minimum age of the patient was 14 and maximum age of patient was 70 years respectively. Mean age of patient was 35.71 ± 13.60 years. According to educational status of patients, there were 20 patients who were uneducated, 27 were primary class, 21 patients were middle class, 21 having education upto matric, 9 patients were graduates and 4 patients were post graduate. Psychological status of 97 patients was normal, 2 patients were addict and only 1 patient had psychiatric problem. According to mechanism of injury, 48 patients had RTA, 37 patients had trauma due to fall from height, 6 patients had industrial injuries, 5 patients had FAI, 2 patients had injuries due

to domestic work, 1 patient had injury due to agricultural work and 1 patient had trauma due to sports activity. Mean duration of injury was 8.84 ± 12.67 hrs. Minimum and maximum injury duration was 2 hours and 96 hours. Diagnosis and classification of fractures showed that out of 100 patients 41 were calcaneum: 22 Sanders type III, 12 Sanders type II, 5 Sanders type IV, 2 Sanders I. Table 2 shows types of different foot and ankle fractures in our study. There were 92 patients who had received first aid, whereas 8 patients did not receive any kind of first aid. Complications observed in patients were 35 patients who had swelling and 4 patients had infection. Outcome assessment of patients shows that 5 patients had excellent outcome, 42 had good outcome, 43 had fair, and 10 patients had poor outcome.

Table 2: DIAGNOSIS AND CLASSIFICATION OF FRACTURES

	Frequency	Percent
# Calcaneum Sander's-I	2	2%
# Calcaneum Sander's-II	12	12%
# Calcaneum Sander's-III	22	22%
# Calcaneum Sander's-IV	5	5%
# Bimalleolar DW-A	2	2%
# Bimalleolar DW-B	8	8%
# Bimalleolar DW-C	27	27%
Jones # Delee-I	2	2%
Jones # Delee-II	1	1%
# Proximal Phalanx 2 nd Toe	1	1%
# Distal Phalanx Big Toe	1	1%
# Proximal Phalanx Big Toe	3	3%
# 2 nd ,3 rd Metatarsals	6	6%
# Middle Phalanx Little Toe	2	2%
# 1 st Metatarsals	2	2%
# Talus (Hawkins-II)	2	2%
# Talus (Hawkins-IV)	1	1%
# Middle phalanx 4 th Toe	1	1%
Total=	100	100.0%

Different treatment methods for different types of the calcaneum fractures were used, according to CT-based Sander's classification. Sander's type I were treated conservatively while Sander's type II and III were treated conservatively with Boot cast and sometimes percutaneous K-wire and Stiemann Pin. The larger fragments were fixed by manipulation and Stiemann Pin while the smaller fragments were fixed with K-Wire and Sander's type IV treated with boot cast. Patients with follow up of at least 8 months were called by phone to complete

the functional scoring system (Olerud-Molander).

DISCUSSION:

This study was conducted to analyze the occurrence, patient's demography, mechanism of injury, assessment of morphology of injury (classification), of ankle and foot fractures, initial management of injuries in A & E Dept, DOST Unit 1, MHL and definitive management in orthopaedics operation theatre and evaluation of treatment outcome of calcaneal fractures.

Fractures of the calcaneum present a challenging problem for the orthopedic surgeons because of the prolonged treatment and slow progression of the recovery and disability, this situation enforces the patient to know about the process of recovery. In this study, we selected 100 patients, out of which 41(41%) were calcaneal fracture patients and 59(59%) were ankle and foot fractures patients. The incidence of calcaneum fracture is 60 % by Tim S et al. This is due to different mode of trauma ^[12].

Mean age of patients in this group was 14-70 years while in the study of T.Schepers et al the range is 16-65 years. The 100 patients found in this survey represented 85 % male patients, comparable to study of T.Schepers that included 72 % male patients. In calcaneal fractures, 15 % were female patients as compared to 14 % of female patients in the study of Tim S et al ^[12].

In patients with calcaneal fractures, 10% have associated spine injuries and 26% have associated with other extremity injuries. In age group of 21 and 45 years, 90 % of calcaneal fractures occur in males, with the majority occurs in industrial workers, the economic implications of this injury are substantial. Patients in this study showed the incidence of 41% for the calcaneal fractures, in the age group of 14-70 years, which were more common in the males. The incidence of displaced intra-articular fractures was 60-75%. In our study, the incidence of calcaneal fractures with spine injuries was 3% and the association with other extremity injuries was 16% ^[4-8].

The mode of trauma in this study was road traffic accident as compared to Tim S study, in which industrial is the main cause. Majority of the patients had the

history of fall, firearm injury and industrial injuries in our study. The incidence of RTA was maximum (48 %). Other modes of trauma included fall from height (37 %), industrial (6 %), FAI (5 %), domestic (2 %), agricultural (1%) and sports (1 %) ^[12].

In Canada, only patients with proper insurance receive worker compensation. Multiple studies explained that such patients receiving this worker's compensation have poorer outcome. In Netherlands, every patient is compensated for sickness leave for full one year before procedures started for the disability allowance. These return to work rate of 76 % is in accordance with literature. In our study, the calcaneum fractures occur more in the poor and middle class and there is no compensation for them while in Canada, they were paid compensation ^[12, 21, 22-30].

The infection and wound complication rate in T. Schepers study was 30 to 40 % . Reports from the last 5 - 10 years showed superficial wound infection 10 % . Moreover the deep infections osteomyelitis occurred at lower rates. The largest prospective and multi-centric study of Buckley et al in 2002 showed a superficial infection and wound complication rate of 17 % and deep infection rate of 5 % for ORIF. In our study, the post-operative complications were superficial infection that was 3% and swelling was only 5%, comparable to the superficial infection of 16% in the study of T.Schepers ^[12, 35-38].

In this study of 100 patients different treatment methods for different types of the calcaneum fractures were used, according to CT-based Sander's classification. Sander's type I were treated conservatively while Sander's type II and III were treated

conservatively with Boot cast and sometimes percutaneous K-wire and Stiemann Pin. The larger fragments was fixed by manipulation and Stiemann Pin while the smaller fragments were fixed with K-Wire. While in the Canadian study, they only use surgical option for the treatment of calcaneal fracture. In the T. Schepers study, 46 % were treated with ORIF, conservative (39%), and Percutaneous (10 %). In our survey, the fracture of the Calcaneum was 97% in normal people while 2% were the addicts and 1% had some psychiatric problem.

The functional results presented in this study appeared to be better than those for conservatively treated patients [39-41].

So outcome assessment of the patient showed that 5% had the excellent outcome, 42% had good outcome, 43% had fair and 10% had poor outcome.

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