

# A Study on Etiology, Clinical Features and Management of Fracture Calcaneum in a Teaching Hospital

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## ABSTRACT

**Background:** The calcaneum is the largest of the tarsal bones, it projects backwards beyond the bones of the legs so as to provide a short lever for the muscles of calf. It is irregularly cuboid in shape. The average weight is about 36.64 gms in Males and 24.75 gms in Females. Calcaneum is the most frequently fractured bone among all tarsal bones. It accounts for 2.3% of all fractures and 62% of tarsal bone injuries. Most common mode of injury is axial loading and frequently occurs due to fall from height.

**Aim of the study:** We have conducted this study to know the etiology, clinical features and management of fracture calcaneum in a Rural Medical College.

**Materials and Methods:** We have conducted the study in peoples Medical College, Bhopal (MP) in the department of Orthopaedics for 1 year. We have included 28 patients in this study. Out of these 28; 18 were Males and 10 were Female patients.

**Results:** We have included 28 patients in this study out of these 28, 18 were Males 10 were Female patients. Right sided fractures are most common, few patients are having bilateral fracture calcaneum.

**Conclusion:** Fracture calcaneum is commonest among all the tarsal bones injuries. Mostly due to fall from height. Males are more commonly affected, other fractures associated with fall from height must be excluded like vertebral.

**Key words:** Calcaneum, Internal Fixation, Complications, Trauma, Sander's Classifications.

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## INTRODUCTION

The calcaneus is the largest of the tarsal bones, it projects backwards beyond the bones of the legs so as to provide a short lever for the muscles of the calf, which are inserted into its posterior surface.<sup>1</sup> It is irregularly cuboid in shape and weights around ranges from 23.3 to 56.8 gms in Males and 13.5 to 33.2 gms in Females. The dorsal surface bears a large articular facet about its middle which distinguishes it from the rough planter surface. Calcaneus bone has 6 surfaces (1) dorsal or superior surface (2) Anterior surface (3) Posterior surface (4) Planter surface (5) Lateral surface and (6) Medial surface.<sup>2</sup> It was concluded that the concordance between upper limb dominance and increased density of ipsilateral os calcis had been determined during fetal life.

Calcaneum fractures are most common fractures in tarsal bones accounting for 62% and 2.3% of all adults fractures. Approximately 78% of these injuries are intra articular and most of them are occur due to axial load such as a fall from height or motor vehicle accident. Most calcaneal fractures occur in Male

industrial workers. Making the economic importance of this injury substantial. Historically most fractures are treated conservatively due to high complications rates associated with open reduction and internal fixation.<sup>3</sup> However since past two decades, the techniques in surgical management are improved due to better understanding of fracture pattern. Axial loading is most common mode of injury, fall from height causing bilateral calcaneal fractures. Other fractures associated with fall from height have to be excluded such as pelvic and spinal fractures. And open fractures are caused by brake pedal injuries and high velocity trauma. Essex Lopresli described, secondary, fracture lines, which can produce tongue type and joint depression type calcaneal fractures. Secondary fracture line extending through tuberosity of calcaneum produces tongue type fracture and if it extends through dorsal aspect of calcaneum joint depression type fractures will occur. Open method might be applied by various approaches for these fracture according to degree of injury and position of the fragments.<sup>4</sup> If operative procedure is choice different methods like

external fixation, internal fixation with pins or screws, lateral plating from extended lateral L shaped method, percutaneous reduction.<sup>5</sup> The clinical features include, pain, edema, Ecchymosis, deformity of the heel or planter arch, inability to bear weight on the injured foot. The most common types of fractures are intra articular and extra articular.<sup>6</sup>

**MATERIALS & METHODS**

We have conducted this study in Peoples Medical College, Bhopal (MP) in the department of Orthopedics for 1 year. We have included 28 patients, 18 are Males and 8 are Female patients. The common age group is between 20 and 40 years. We have obtained consent from all the patients' attendants by giving the information in their local language. After obtaining the detailed history, we have examined the patients in detail and advised investigations, the investigations advised are complete blood picture, RBS, Blood urea, serum creatine serum electrolytes, blood group and Rh typing, x-ray foot. Ap and lateral views, and CT Scan Foot. We have collected the total data systemically and computerized by using MS Office.



Fig 4: Fracture Calcaneum on CT scan



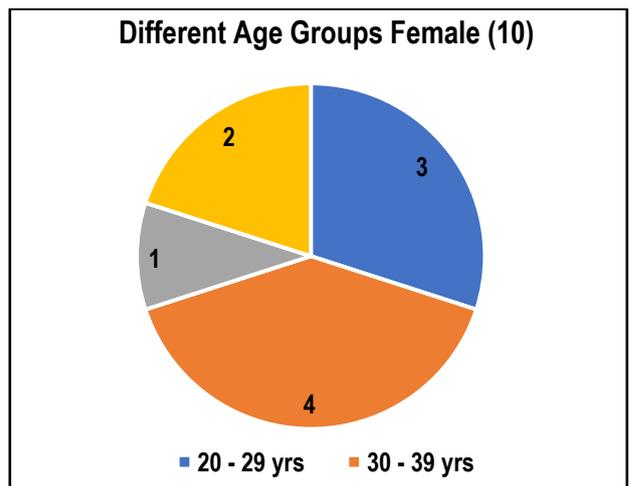
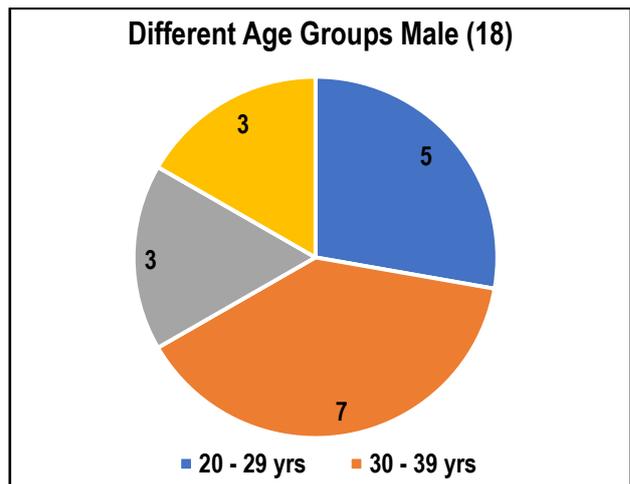
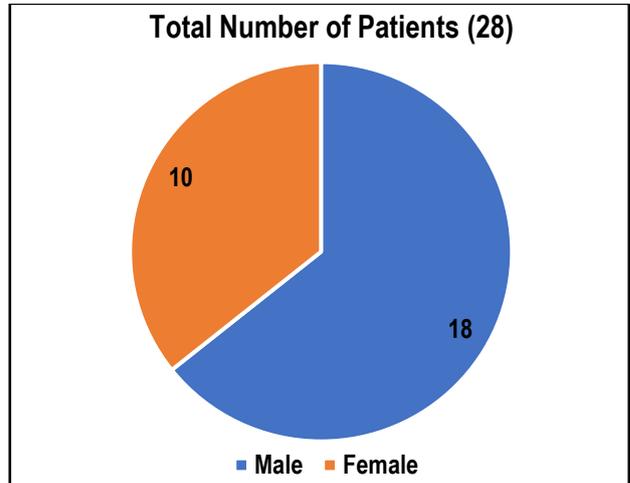
Fig 1: Calcaneum Fracture on Xray



Fig 2: Toungue type Calcaneum Fracture



Fig 3: Extreme toungue type fracture calcaneus body



**Table 1: Different age groups**

Age groups in Yrs	Males Total (18) (%)	Females (10) (%)
20-29 Yrs.	5 (27.75%)	3 (30.0%)
30-39 Yrs.	7 (38.6%)	4 (40.0%)
40-49 Yrs.	3 (16.5%)	1 (10.0%)
50-59 Yrs.	3 (16.5%)	2 (20.0%)

**Table 2: Types of Calcaneum Fractures**

Types of Fracture	Males (18)	Females (10)
Intra articular	14 (77.9%)	3 (30.0%)
Extra articular	4 (22.1%)	4 (40.0%)

**Table 3: Different clinical features**

Clinical features	Males (18)	Females (10)
Pain	18 (100%)	3 (30.0%)
Swelling	15 (83.4%)	4 (40.0%)
Ecchymosis	13(72.8%)	1 (10.0%)
Others	10 (55.6%)	2 (20.0%)

**Table 4: Management**

Results	Males (18)	Females (10)
Excellent	10 (55.6%)	6 (60.0%)
Good	3 (16.5%)	2 (20.0%)
Poor	5 (27.75%)	2 (20.0%)

## RESULTS AND DISCUSSION

We have included 28 patients in this study, out of these 28 patients Males were 18 and females 10 patients, the age group involved is between 20 years and 60 years. The common age group is around 3<sup>rd</sup> decade. The study conducted by Veaghan Tk et al. shows that the active age group is between 30 and 40 years, because they are active in construction work (high rise buildings) and vehicle accidents are also more common in young people.<sup>7</sup> The most common type fractures are intra articular. In our study we observed 77.9% in Males and 60% in Female patients whereas extra articular fractures are 22.1% in Male's patients and 25% in Female patients. The observations made by Benircle et al shows that intra articular fractures in Males were 83.2% and in Females 69.7%.<sup>8</sup> The common clinical features in our study are pain in 100% patients, edema in 83.4% in Males and 70% in Females; ecchymosis 72.8% in Males and 60% in Female patients and other features are 55.6% in Males and 50% in Female patients. Regarding Management, the outcome was excellent in 55.6% in Male patients; 60% in Female patients; good in 16.5% in Males and 20% in Female patients and poor in 27.5% in Male patients and 20% in Female patients.

The study conducted by Zwipp et al shows the outcome is 62.5% excellent in Males and 68.2% in Females and good in 19.8% in Males and 68.2% in Females and good in 19.8% in Males and 22.5% in Females and poor in 18% in Males and 16.9% in Female patients.<sup>9</sup>

Calcaneum fracture is common among all tarsal bone fractures. It accounts for 2.3% of all fractures, 2 major types of fractures are seen. Most commonly occurred fractures are intra articular which accounts for nearly 80% and 20% are extra articular fractures. The major clinical features are pain, Edema, Ecchymosis,

deformity of heel or plantar arch and inability to bear weight on the injured foot. A history of fall from height or motor vehicle accident or similar mechanism should suggest a possible injury to the hind foot. Patients are more likely to young, the discomfort associated with a fracture of the calcaneus may be so distracting to the patient that other significant injuries are ignored. Thorough neurovascular examination should be done, for which pulse rate of ipsilateral dorsalis pedis or posterior tibial artery can be compared to the contralateral limb. The diagnosis was made in our study was by history, clinical examination and x-ray (AP, lateral and oblique plain films of foot) were taken Axial determines the primary fracture line and displays the body, tuberosity, Middle and posterior facets the lateral view determines the Bohler's angle and finally CT scan is the gold standard for traumatic calcaneal injuries. In some cases, Mondor's sign (A haematoma identified on CT scan that extends along the sole and is considered pathognomic for calcaneal fractures) is noted.<sup>10</sup> The management of calcaneal fractures includes open reduction and internal fixation of displaced intra articular calcaneal fractures by locking calcaneal plate maintains the joint congruity and decrease the incidence of subtalar arthritis. Fractures were classified as per Sanders classification based on coronal images of posterior facet. Patients with type I Sanders fractures were subjected to conservative line of management. In our study Sanders type II – IV fractures were managed by surgical procedure. Surgical approach used was lateral plating via the L approach. The patient is placed in the lateral position with tourniquet. The study conducted by Stephenson SR et al shows excellent results with this approach.<sup>11</sup> The fracture usually concludes with three major fragments the tuberosity fragment (lateral portion of the posterior facet); the Superio-medical fragment (the sustentacular portion) ; the distal or anterolateral fragments. During the surgical procedure these major fragments should be the targets for insertion of the absorbable screws. Based on the understanding of the mechanism and anatomy of calcaneal fractures, the bioabsorbable screws were used to fix the major fragments including the calcaneal tuberosity, subtalar joint, sustentacular Fragment and calcaneal body. Two k-wires (2.5mm) were used temporarily to strengthen the reconstruction by longitudinally passing through the subtalar joint and calcaneo-cuboid joint. The complications in our study are 12.5% which includes skin infections, wound dehiscence, and osteomyelitis. The study conducted by Chan et al shows that the complications are less than 10% (9.92%).<sup>12</sup> Historically most calcaneal fractures have been treated closed because open reduction and internal fixation (ORIF) did not result in improved outcomes and had high complications rate, open techniques may be performed by using medial lateral or combined approaches depending on the extent of injury and the location of fracture fragments. The study conducted by Weber M. et al shows that 48% patients had excellent results; 38% patients had good results and 4% patients had poor results.<sup>13</sup>

## CONCLUSION

Calcaneal fractures are commonly occurs due to fall from height or motor vehicle accidents, intra articular fractures are more common. While managing the fracture, open reduction and internal fixation with locking calcaneal plate is excellent treatment option with good post operative outcome for displaced fracture of calcaneum, as serious complications are not significant.

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