

Original research article**Clinical profile of patients with compound fractures of distal third tibial meta-diaphyseal fractures****¹Dr. Likith Kumar D, ²Dr. Shreesha T, ³Dr. Mahidhara S.N, ⁴Dr. Vineeth Varma**¹Senior Resident, Department of Orthopaedics, Karwar Institute of Medical Sciences, Karwar, Karnataka, India^{2,4}Assistant Professor, Department of Orthopaedics, Karwar Institute of Medical Sciences, Karwar, Karnataka, India³Associate Professor, Department of Orthopaedics, Karwar Institute of Medical Sciences, Karwar, Karnataka, India**Corresponding Author:**

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Abstract

Distal meta-diaphyseal compound fractures of the tibia have been challenging situation mostly treated with joint spanning external fixation, resulting in residual ankle stiffness and prolonged immobilization. Internal fixation failed due to infection, inadequate skin coverage and avascular necrosis of the skin leading to sloughing. Patients on admission, a careful history was elicited and/or attenders to reveal the mechanism of injury and severity of the trauma. The patterns were then assessed clinically to evaluate their general condition and local injury and radiologically confirmed distal third tibial meta-diaphyseal compound fractures, and were eligible for the study according to the above-mentioned eligibility criteria were included in the study after informed consent from the patient. In the study, AO/OTA classification was also used to categorize the fracture based on the severity. Accordingly, majority belonged to A2 (35.0%). The next common groups were in A1 (30.0%), followed by A3 (25.0%). Only 1 individual each were belonging to C1 and C2 respectively. In the study, Gustilo Anderson classification was used to categorize the fracture based on the severity. Accordingly, majority belonged to Grade II (55.0%), and the remaining were in Grade I (45.0%). None of the subjects with severity of Grade III or more were included in the study.

Keywords: Compound fractures, distal third tibial meta-diaphyseal fractures, gustilo Anderson classification

Introduction

Tibia acts as the major weight bearing bone of the leg through which the neurovascular bundle traverses to the foot. Subcutaneous location of tibia in the anterior and medial aspect makes it more susceptible to injury and especially vulnerable to open fractures ^[1].

Distal meta-diaphyseal compound fractures of the tibia have been challenging situation mostly treated with joint spanning external fixation, resulting in residual ankle stiffness and prolonged immobilization. Internal fixation failed due to infection, inadequate skin coverage and avascular necrosis of the skin leading to sloughing ^[2].

These include five principal causes-falls, sports injuries, direct blows or assaults, motor vehicle accidents and gun-shot injuries.

Fall may be simple falls on his or her height, fall down stairs or slopes and fall from height. The highest incidence is seen in motor vehicle accidents usually affecting the motor cyclists, pedestrians and automobile occupants ^[3].

Bone is visco-elastic, the rate of loading shifts the stress strain curve. Rapid axial loading absorbs and then at failure releases more energy. The released energy is imparted to the soft tissue. Part or the entire articular surface may be involved. The injury may be confined to an epiphyseal area just above the joint, it may involve the epiphysis and metaphysis or it may have extension to diaphysis. The precise direction of force and the position of foot when it is applied lead to wide variation in fracture patterns ^[4].

Rotational forces (torsion) usually lead to a spiral fracture which may be intra or extra-articular. These are usually closed, resulting from low energy and the associated soft-tissue injuries are not usually severe.

Methodology
Study Design

Prospective Clinical Study.

Sample Size Calculation

The total sample size was 20.

Sampling Method

Convenience Sampling.

Inclusion Criteria

- Patient aged above 18 years, both male and female.
- Distal third tibial compound meta-diaphyseal fractures.
- Grade 1 and 2 Gustilo and Anderson classification of open fractures.
- Grade 1, 2 and 3 of Tscherne classification of soft tissue injury.
- Written consent from patient for treatment.

Exclusion Criteria

- Patient age less than 18 years.
- Compound fractures without adequate soft tissue coverage.
- Grade 3 of Gustilo and Anderson classification of open fractures.
- Grade 4 of Tscherne classification of soft tissue injury.
- Fractures with severe periosteal stripping.
- Pathological fractures.
- Patient unfit for surgery.
- Patient not willing for surgery.

Patients on admission, a careful history was elicited and/or attenders to reveal the mechanism of injury and severity of the trauma. The patterns were then assessed clinically to evaluate their general condition and local injury and radiologically confirmed distal third tibial meta-diaphyseal compound fractures, and were eligible for the study according to the above-mentioned eligibility criteria were included in the study after informed consent from the patient.

Results

In the study, majority of the subjects belonged to the age group of 31 to 40 years (35.0%). The next common age group was 51 to 60 years (30.0%). The mean age of the subjects was 47.65 ± 11.43 years.

Table 1: Age distribution of the study subjects

		Frequency (N)	Percentage (%)
Age group	31 to 40 years	7	35.0%
	41 to 50 years	5	25.0%
	51 to 60 years	6	30.0%
	>60 years	2	10.0%

	Mean	SD	Median	Minimum	Maximum
Age (in years)	47.65	11.43	48.00	32.00	70.00

In the study, majority of the subjects were males (70.0%), and the remaining were females (30.0%) showing male preponderance because of travelling and working in fields and factories.

Table 1: Distribution of the study subjects based on gender

		Frequency (N)	Percentage (%)
Gender	Male	14	70.0%
	Female	6	30.0%

In the study, the most common mode of injury was road traffic accidents (65.0%), followed by self-fall or fall from height (25.0%). Remaining 2 individual’s sustained fracture due to either sharps or heavy objects.

Table 3: Distribution of the study subjects based on the mode of injury

		Frequency (N)	Percentage (%)
Mode of Injury	RTA	13	65.0%
	Fall	5	25.0%
	Others	2	10.0%

In the study, fracture was evident over right lower limb in majority of the subjects (60.0%), and left side in the remaining cases (40.0%).

Table 4: Distribution of the study subjects based on the laterality of injury

		Frequency (N)	Percentage (%)
Laterality	Right	12	60.0%
	Left	8	40.0%

In the study, AO/OTA classification was also used to categorize the fracture based on the severity. Accordingly, majority belonged to A2 (35.0%). The next common groups were in A1 (30.0%), followed by A3 (25.0%). Only 1 individual each were belonging to C1 and C2 respectively.

Table 5: Distribution of the study subjects based on Orthopaedic Trauma Association classification

		Frequency (N)	Percentage (%)
AO/OTA Classification	A1	6	30.0%
	A2	7	35.0%
	A3	5	25.0%
	C1	1	5.0%
	C2	1	5.0%

In the study, Gustilo Anderson classification was used to categorize the fracture based on the severity. Accordingly, majority belonged to Grade II (55.0%), and the remaining were in Grade I (45.0%). None of the subjects with severity of Grade III or more were included in the study.

Table 6: Distribution of the study subjects based on Gustilo Anderson classification

		Frequency (N)	Percentage (%)
Gustilo Anderson Classification	Grade I	9	45.0%
	Grade II	11	55.0%

12 cases had an associated fracture of fibula.

Statistics of Surgery

All 20 cases were operated under Lumbar Sub Arachnoid block (spinal anesthesia). All the cases studied under went closed reduction under fluroscopic control. All cases were regularly followed upto 1 year.

Duration of Surgery

The duration of surgery ranged between 40 minutes to 70 minutes and averaging of 55 minutes. The operating time reduced with increasing experience of the operating surgeon.

Discussion

In the present study, majority of the subjects belonged to the age group of 31 to 40 years (35.0%). The next common age group was 51 to 60 years (30.0%). This sort of presentation is due to the fact that working adults are more prone for such kind of fractures, who are more exposed to the external environment.

Majority of the subjects in the present study were males (70.0%), and the remaining were females (30.0%). This sort of male predominance was observed in most of the previous studies such as, Luo P. *et al.* [5] (65.7%), Gupta SKV *et al.* [7] and also among external fixators by hybrid exfix studies such as Anglen *et al.* [8], Barbieri *et al.* [9] had male predominance. This is mainly because of the reason that males are often involved in exertions, travelling, occupational injuries which could get harmful sometimes.

In the present study, the most common mode of injury was road traffic accidents (65.0%), followed by self-fall or fall from height (25.0%) and remaining 2 individuals sustained fracture due to either sharps or heavy objects. This mimics the findings from the study by Gupta SK *et al.* [7], C Zhang *et al.* [10], where too majority of the subjects had sustained distal third tibial metaphyseal fractures due to road traffic accidents. Thus, road traffic accidents are most common mode, as this fracture being a high energy trauma.

In the present study, Gustilo Anderson classification was used to categorize the fracture based on the

severity. Accordingly, majority belonged to Grade II (55.0%), and the remaining were in Grade I (45.0%). The subjects with severity of Grade III or more were excluded in the study. This was similar to the findings from few of the previous studies such as Gupta SK *et al.*^[7] (60%), C Zhang *et al.*^[10] (48%). The present study could not be compared with other studies because our primary aim was to study the meta-diaphyseal fractures. AO/OTA classification was also used in the present study to categorize the fracture based on the severity. Accordingly, majority belonged to A2 (35.0%). The next common groups were in A1 (30.0%), followed by A3 (25.0%). Only 1 individual each were belonging to C1 and C2 respectively.

Conclusion

AO/OTA classification was also used in the present study to categorize the fracture based on the severity. Accordingly, majority belonged to A2 (35.0%). The next common groups were in A1 (30.0%), followed by A3 (25.0%). Only 1 individual each were belonging to C1 and C2 respectively.

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