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Surgical management of malleolus fracture of ankle, a prospective observational study

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Abstract
Background: Ankle joint also called talocrural joint is a hinge joint which is uniaxial approximately. Fracture of ankle is common and important because failure to achieve accurate anatomical alignment may lead to significant long term morbidity Fracture of malleolus is common can be unimalleolar, bimalleolar and trimalleolar and proper reduction of joint is essential to prevent complication.
Material and Method: This study has been conducted in the department of orthopaedics, Konaseema institute of medical sciences, Amalapuram, Andhra Pradesh from February 2017 to December 2020. Standard surgical protocol was followed for fixation of lateral, medial and posterior malleolus. Syndemosis was reduced anatomically with K wire and syndesmotic screw was inserted.
Result: Regarding outcome of surgical management based on Biard and Jackson ankle scoring system excellent outcome was there in 50% patients, good outcome was there in 32.5% patients, fair outcome was there in 15% patients and poor outcome was there in 2.5% patients.
Discussion and Conclusion: We have observed that type C fracture is more common as per Danis-Weber classification system and Supination External rotation is most common as per Lauge-Hansen classification system. As per Biard and Jackson ankle scoring system excellent outcome was there in 50% patients, good outcome was there in 32.5% patients, fair outcome was there in 15% patients and poor outcome was there in 2.5% patients.

Keywords: Malleolus fracture, surgical management, outcome

Introduction
Ankle joint also called talocrural joint is a hinge joint which is uniaxial approximately. The lower of the tibia and its medial malleolus, together with the lateral malleolus of the fibula and inferior transverse tibiofibular ligament form a mortise for talus. The axis of rotation is dynamic and shifting during dorsi and planter flexion. Fracture of ankle is common and important because failure to achieve accurate anatomical alignment may lead to significant long term morbidity [1]. Fracture is one of the most common fractures of lower limb and occurs in 174 per 100000 adults per year, there is a bimodal distribution of ankle fractures having two peaks on in young and another in older people due to degeneration of bone [2, 3]. Fracture which is stable and closed with proper alignment of joint or displacement less than 2 mms are treated conservatively. But for open displaced fracture open reduction and internal fixation required [4, 5]. There are various methods to classify ankle fractures out of them Danis-Weber classification system and Lauge-Hansen classification system are important which is based on level and mechanism of fracture [6, 7]. Fracture of malleolus is common can be unimalleolar, bimalleolar and trimalleolar and proper reduction of joint is essential to prevent complication.
Various literatures are available about outcome of open reduction and internal fixation of malleolus fracture. Dr. M Palani Kumar and Dr. Babu Aloy has concluded that Anatomical reduction, restoration of fibular length and stable fixation were found to be essential for achieving good return of joint function [8]. Porter DA, May BD, Berney T *et al.* has reported that Athletes who undergo ORIF followed by early motion and early weight bearing are able to return to their pre-injury level of competition within 2 to 4 months with minimal functional morbidity or pain [9]. Verhage, S.M., Schipper, I.B. & Hoogendoorn, J.M *et al.* has reported that long-term functional outcome is strongly associated to medial malleolar fractures, isolated

Or as part of bi- or trimalleolar fractures. More cases of osteoarthritis are found in trimalleolar fractures [10].
The purpose of present study is to determine the functional outcome and result of surgical treatment of malleolus fracture and complication associated with open reduction and internal fixation.

Material and Method

Place and time of study

This study has been conducted in the department of orthopaedics, Konaseema institute of medical sciences, Amalapuram, Andhrapradesh from February 2017 to December 2020.

Type of study

This is a prospective observational study.

Ethics

Approval from institutional ethics committee was taken before start of study. A written informed consent was obtained from all patients before enrolling them for study.

Selection of patients

The patients admitted in the department of orthopaedics with unimalleolar, bimalleolar and trimalleolar fracture were enrolled for this study as per following exclusion and inclusion criteria.

Inclusion criteria

- Age more than 18 years
- Both sex
- Unimalleolar, bimalleolar and trimalleolar fractures of ankle

Exclusion criteria

- Pathological fracture
- Neurovascular compromise
- Active infection or inflammation
- Compound fracture

Method

After receiving the patients with ankle fracture in emergency and trauma department, assessed thoroughly to rule out significant injury and sent for radiological evaluation in AP, lateral and motorise view to know the nature of fracture and classify it. Complete history of patient about mechanism and demography of fracture was taken and examined properly. Routine preoperative investigation was done and patients were operated as early as possible after stabilisation of patients. In the operation theatre patients were shifted to table and positioned as per protocol and open reduction and internal fixation was performed K wire fixation, tension bend wiring, malleolar screw or semitubular platting with screw. Standard surgical protocol was followed for fixation of lateral, medial and posterior malleolus. Syndemosis was reduced anatomically with K wire and syndesmotic screw was inserted. All patients received similar antibiotic, analgesic and anti-inflammatory drugs. Stitch was removed in 12th postoperative day. Weight bearing was restricted up to 6 weeks; x ray was done to know the status of healing. After that patient was allowed full weight bearing and syndesmotic screw was removed. Regular follow up was done at 1, 2, and 6 month after surgery till fracture gets united. Biard and Jackson ankle scoring system was used to analyse functional outcome. Maximum possible score was 100, excellent was 96 to 100 score, good was 91 to 95, fair was 81 to 90 and below 80 was poor.

Fig 1: Fracture of malleolus of ankle joint and open reduction and internal fixation

Result

As per selection criteria during our study period forty patients with unimalleolar, bimalleolar and trimalleolar fracture were enrolled for this study.

Table 1: Demographic and clinical profile of fracture of ankle

Variable		Number	Percentage
Age (Mean= 48.24±7.21 years)	18 to 30	14	35
	31 to 50	8	20
	More than 50	18	45
Sex	male	28	70
	female	12	30
Side of fracture	Right	24	60
	Left	16	40
Mode of injury	RTA	32	80
	Fall from height	6	15
	Trivial fall	2	5
Malleolus involved	Unimalleolar,	16	40
	bimalleolar	18	45
	trimalleolar	6	15
Danis-Weber classification system	A	12	30
	B	12	30
	C	16	40
Lauge-Hansen classification system	Supination adduction	12	30
	Supination External rotation	18	45
	Pronation adduction	1	2.5
	Pronation External rotation	8	20
	Pronation dorxiflexon	1	2.5

As per table 1 mean age of patients was 48.24±7.21 years, number of patients from 18 to 30 years were 14(35%), from 31 to 50 years were 8(20%) and rest 45% were above 50 years of age. There was male predominance and ratio of male to female was 2.34/1. Right side fracture was more common then left (60% vs 40%). Road traffic accident was most common mode of injury (80%) followed by fall from height (15%) and trivial fall (5%). Unimalleolar fracture was present in 40% patients, bimalleolar fracture present in 45% patients and trimalleolar fracture present in 15% patients. As per Danis-Weber classification system type. A fracture was present in 30% patients, type B fracture was present in 30% patients and type C fracture was present in 40% patients. As per Lauge-Hansen classification system Supination adduction type of fracture was present in 30% patients, Supination External rotation type of fracture was present in 45% patients, Pronation adduction type of fracture was present in 2.5% patients, Pronation External rotation adduction type of fracture was present in 20% patients and Pronation dorxiflexon type of fracture was present in 2.5% patients.

Table 2: Outcome of surgical management based on Biard and Jackson ankle scoring system

Score	Number	Percentage
Excellent (96 to 100)	20	50
Good (91 to 95)	13	32.5
Fair (80 to 91)	6	15
Poor (below 80)	1	2.5

Regarding outcome of surgical management based on Biard and Jackson ankle scoring system excellent outcome was there in 50% patients, good outcome was there in 32.5% patients, fair outcome was there in 15% patients and poor outcome was there in 2.5% patients.

Table 3: Complication after surgical management

Complication	Number	Percentage
Infection	2	5
Non union	0	0
Malunion	1	2.5
Pain	1	2.5

Complications were not common in our study, 5% patients have developed infection, malunion was present in one patient and one patient has pain.

Discussion

During our study period we have enrolled 40 patients with fracture of ankle. The mean age of patients were 48.24±7.21 years with bimodal distribution and there was male predominance. Juto H, Nilsson H, Morberg P *et al.* has reported that 34.6% were 65 years or older, 58.4% were women which partially support our study [11]. Steen L Jensen, Bjarke K Andresen, Steen Mencke & Poul T Nielsen *et al.* has reported that; the incidence in young men was double that of young women and there was bimodal distribution regarding age which support our study [12]. In our study right side is more commonly involved and RTA is common mode of injury which is supported by the work of Baptista MV, Costa AR, Jimenes N, Júnior, Pegoraro M, Santos RD, Pimenta LS *et al.* But in his study left side is more commonly involved which does not support our study. But our finding is supported by the study of Sakaki MH, Matsumura BA, *et al.* and Salai, M., Dudkiewicz, I., Novikov, I. *et al.* [13, 14, 15]. In present study bimalleolar fracture is commonest and trimalleolar fracture is least common wich is supported by the study of Koujan K, Saber AY *et al.* and Segal G, Elbaz A, Parsi A, *et al.* [16, 17].

We have observed that type C fracture is more common as per Danis-Weber classification system and Supination External rotation is most common as per Lauge-Hansen classification system. Which is not suppoted by the study of Han, SM., Wu, TH., Wen, JX *et al.* and Fonseca, L. L. D. *et al.* [18, 19]. As per Biard and Jackson ankle scoring system excellent outcome was there in 50% patients, good outcome was there in 32.5% patients, fair outcome was there in 15% patients and poor outcome was there in 2.5% patients. Mohapatra A, Raj K *et al.* has reported that according to the Baird and Jackson score, clinical functional outcome was excellent in 17 cases, good in 47, fair in 15 and poor in 5 patients which support our study [20]. Complications were not common in our study, 5% patients have developed infection, malunion was present in one patient and one patient has pain. Which is supported by the study of Manuel Leyes, Rau´l Torres, Pedro Guille´n, *et al* [20].

Conclusion

From our study we can concluded that fracture of malleolus has bimodal age distribution, with male predominance. Right side is affected more commonly then left, road traffic accident is common cause of fracture and bimalleolar fracture is most common type. We have observed that type C fracture is more common as per Danis-Weber classification system and Supination External rotation is most common as per Lauge-Hansen classification system. As per Biard and Jackson ankle scoring system excellent outcome was there in 50% patients, good outcome was there in 32.5% patients, fair outcome was there in 15% patients and poor outcome was there in 2.5% patients. Complications were less common in our study.

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