



## EVALUATION OF FUNCTIONAL AND RADIOLOGICAL OUTCOME OF PATIENTS WITH MEDIAL MALLEOLAR FRACTURES TREATED BY OPEN REDUCTION AND INTERNAL FIXATION AT GOVT.MEDICAL COLLEGE, THRISSUR – A PROSPECTIVE STUDY DURING OCTOBER 2019 TO OCTOBER 2020

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### ABSTRACT

**INTRODUCTION:** Medial malleolar fractures (isolated or as part of bimalleolar fractures) are one of the common injuries that orthopaedic surgeons will face during their trauma practice. Management of this fracture remains a subject of debate to this day which includes whether to treat it conservatively or percutaneously or proceed with open reduction.

**OBJECTIVES:** To evaluate the functional and radiological outcome of medial malleolar fractures treated with open reduction and internal fixation.

**MATERIALS AND METHODS:** A prospective study of cases of medial malleolar fractures meeting the inclusion criteria who were admitted in Government Medical College, Thrissur between 1-10-2019 to 1-10-2020 was carried out. Fractures were classified according to Lauge Hansen system and anatomical reduction of fragments was attempted through open reduction and internal fixation. After a minimum follow up period of 6 months, the functional and radiological outcomes were standardised using Baird and Jackson scoring system.

**RESULTS:** A series of 21 patients with medial malleolar fractures were studied comprising of 13 males and 8 females. The largest contribution came from age group of 25-35 years (48%). Road Traffic Accidents was the commonest mode of injury (62%). Pronation injuries made the largest contribution to displaced medial malleolar injuries. 2 cases were found to develop post-operative infection and 1 among those cases also developed stiffness. Postoperatively excellent scores was achieved in 14 cases (66.6%) and good results in 5 cases (24%).

**CONCLUSION:** Good to excellent results was attained in majority of patients after open reduction and internal fixation of medial malleoli, with outcomes and complications comparable to other studies in literature. This study supports the finding that open reduction and internal fixation of displaced medial malleolar fractures results in improved functional and radiological outcome.

**KEYWORDS :** medial malleolar fractures; open reduction and internal fixation; Lauge Hansen classification; Baird and Jackson scoring system.

### INTRODUCTION:

The word "ankle" is derived from the root "ank" to bend. Sir Robert Jones said "Ankle is the most injured joint of the body but the least well treated".<sup>[1]</sup> Ankle joint is the articulation of the ankle mortise proximally with the dome end sides of talus distally. Movements of the ankle joint is very important for squatting and sitting cross legged. It is a hinge type of synovial joint, but its movements are not those of a single hinge, as its axis of rotation is not fixed and changes in extremes of plantarflexion and dorsiflexion. Thereby, the movements are not only pure plantar and dorsiflexion, rather in the extreme end of each, there is variable amount of varus and valgus respectively.

The medial malleolus articulates with the medial facet of talus and divides into the anterior and posterior colliculus. Deltoid ligament provides stability on the medial side of the ankle. It originates in the medial malleolus and inserts on the navicular bone, talus and calcaneus.

### It has two layers:

- 1) Superficial layer consisting of a. Tibionavicular ligament b. Tibiocalcaneal ligament c. Talo-tibial ligament 2) Deep layer consisting of a. Anterior tibiotalar ligament b. Posterior tibiotalar ligament.

Fractures involving the ankle joint are common and often occur with little apparent force. There is fracture of one or more of the malleoli associated with varying subluxation or dislocation of the ankle joint. Percival Pott described this injury (ankle fractures) in 1768.

Twisting strain or a direct injury to the ankle can cause malleolar fracture.<sup>[2]</sup> Anyhow most common cause nowadays is road traffic accidents.

According to Schatzker, mechanism of injury is mainly due to 2 distinct

### types of disrupting force:<sup>[3,4]</sup>

- (i) those due to an adduction-inversion force causing a lateral injury below the syndesmosis, and
- (ii) those caused by an external rotation-abduction force, producing an injury to the lateral complex at or above the syndesmosis.

When the foot is held on ground, the disrupting forces singly or in combinations, produce much strain on ligaments and undue loading on the bones. With continuance, a chain reaction of component failures occurs leading to different patterns of injury.

### Classification of ankle fractures:

1. POTT'S - isolated / bi / trimalleolar fracture
2. AO / OTA AND DANIS –WEBER –<sup>[5,6]</sup> based on level of fibular injury

44 - malleolar segment fractures  
 TYPES A – infrasyndesmotomic  
 B – transsyndesmotomic  
 C – suprasyndesmotomic

### GROUPS (for type A, B)

- 1 – isolated fibular injury
- 2 - with a medial injury
- 3 - with a posteromedial /lateral injury

### 3. LAUGE –HAUSEN –takes into account 2 factors<sup>[7,8,9,10,11,12]</sup>

Position of foot at the time of injury  
 Direction of the deforming force

Four patterns are recognized, based on injury sequence, each further divided into Stages of increasing severity. It gives good information about the extent of skeletal

and ligamentous involvement.  
 Supination – adduction (SA) – 10-20%  
 Supination – external rotation (SER) – 40-75%  
 Pronation – abduction (PA) – 5-20%  
 Pronation – external rotation (PER) – 5-20%

Patients present with variable presentations from swelling, significant pain to variable Deformity. For radiographic evaluation x rays in ANTEROPOSTERIOR, LATERAL and MORTISE views should be obtained.

Goal of treatment is restoration of anatomy and contact loading characteristic of the joint, restoration of fibular length and rotation, easier rehabilitation, early mobilization, and earlier weight bearing. Closed reduction should be tried.

But chance of loss of reduction is as high as 25% in unstable ankle injuries treated conservatively. Also non-union affecting medial malleoli is not uncommon when treated with conservative management or percutaneous fixation mainly due to interposed soft tissue. When malleolar fractures are not reduced accurately, it may lead to post traumatic painful restriction of motion or osteoarthritis or both.<sup>[13]</sup>

The superiority of Open Reduction and Internal Fixation over closed treatment have been thoroughly demonstrated in literature. <sup>[14]</sup> However all studies have not obtained good results.

**CASE STUDY**

**Study population:** All the patients attending Orthopaedics department of MCH

Thrissur who sustain medial malleolar fracture treated with open reduction and internal fixation fulfilling inclusion criteria during the study period.

**INCLUSION CRITERIA:**

- Isolated displaced medial malleolar fracture
- With lateral malleolar fracture
- Above 18 years

**EXCLUSION CRITERIA:**

- Patient unfit for surgery
- Open fractures with soft tissue injuries

**Procedure:**

All procedures were performed under either general or regional anaesthesia.

Preoperative prophylactic intravenous cefuroxime was given. Intraoperative use of tourniquet and diathermy was done to achieve haemostasis.

The standard medial approach was undertaken to fix the fragments. Incision was deepened to the bone protecting long saphenous vein in anterior part of incision. Fracture site was exposed and cleared of blood clots and intervening periosteum with a curette exposing small serrations of the fragment. Reduction was performed with the help of a towel clip. Provisional fixation was done with the help of temporary Kirschner wires if needed, followed by definitive fixation using Modified tension band wiring technique or 4mm cannulated cancellous screws.

Intraoperative evaluation of fracture reduction and fixation was done with the help of an image intensifier. All surgeries were done by experienced surgeons in Govt. Medical College, Thrissur.

**Follow Up and Evaluation:**

Postoperatively radiographs were taken to confirm the implant placement and fracture reduction. The limb was kept elevated in below knee plaster slab. Active finger and knee exercises were started at the earliest possible. Parenteral antibiotics and analgesics were given during the first 3 postoperative days, which were later converted to oral medication. After suture removal on the 10<sup>th</sup> day the plaster slab was converted into a below knee cast.

The cases were reviewed after 3 weeks when the plaster cast was removed and crepe bandage applied. Active exercises of hip, knee and ankle were started. The patients were followed up for a minimum period of 6 months. The subjective, objective and radiographic findings were quantified according to Baird and Jackson scoring system



**Figure 1: Skin Incision**



**Figure 2: Fracture Site Exposed**



**Figure 4: Immediate post operative x ray**



**Figure 5: Follow up x ray at 3 months post Op**

**RESULTS**

In our present study of 21 patients, the age distribution of the patients ranged from 20 to 61 years in our study and the mean age was 39.5 years with a standard deviation of 12.82. Most of the cases are in between 20 to 35 years of age, i.e. 48%. Least number of cases were seen in the range of 36 to 50 years, i.e.

**Table 1: Age Distribution**

Age (years)	Frequency	Percentage
20-35	10	48
36-50	5	24
51-65	6	28
<b>TOTAL</b>	<b>21</b>	<b>100</b>

Among these 13 males and 8 females sustained medial malleolar fractures requiring open reduction and internal fixation. In this study, maximum number of cases happened to be males, i.e. 62%. The sex ratio is nearly 2:1.

**Table 2: Gender Distribution**

Gender	Frequency	Percentage
Male	13	62
Female	8	38
<b>TOTAL</b>	<b>21</b>	<b>100</b>

The most common mode of injury is found to be Road Traffic Accidents (RTA), 13 out of 21 cases i.e. 62%. Rest of the cases were due to slip and fall, 6 cases i.e. 28% and sports injury, 2 cases i.e. 10%.

**Table 3: Mode Of Injury**

Mode of Injury	Frequency	Percentage
RTA	13	62
Slip and fall	6	28
Sports Injury	2	10
<b>Total</b>	<b>21</b>	<b>100</b>

In our study, functional and radiological grading was done by Baird and Jackson scoring system. It is based on Pain, Stability, Walking, Running, Work, Motion and Radiographic result. There are four grades namely Excellent, Good, Fair, Poor.

Although the Baird and Jackson scoring system has proven to be strict, allowing only a very small fluctuation from normal, about 66.6% patients in this series achieved excellent results by that scoring system and 24% patients achieved good results and also had anatomical reduction of the medial malleoli radiologically.

**Table 4: Functional and Radiological result**

Result	Frequency	Percentage
Excellent	14	66
Good	5	24
Fair	1	5
Poor	1	5
<b>Total</b>	<b>21</b>	<b>100</b>

In our study, 2 (10%) cases developed infection, treated by debridement and parenteral antibiotics, among which 1 case later developed stiffness as well.

### CONCLUSION

This single centre series demonstrated good to excellent results in the majority (90%) of patients after open reduction and internal fixation of the medial malleoli, with outcomes comparable to other studies in literature.

This study corroborates the finding of other well-designed studies showing association between radiographic and functional outcomes in patient population with medial malleolar fractures as an improved outcome noted in those cases where good anatomical reduction could be achieved.

This study also led to the conclusion that open reduction and internal fixation guarantee high standard of reduction besides eliminating the chance of loss of reduction. Chance of nonunion of medial malleolus due to soft tissue and periosteal interposition is avoided. Plaster cast for a period of 6 weeks does not reduce the final outcome. Rehabilitation is quick because immobilization of the joint is for relatively short period.

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