

Original research article

A Study on the Functional Outcome of Surgical Treatment of Malleolar Fractures.

Dr. P. Jagadesh¹, Dr. Rama Manohar U², Dr. Shankar Reddy Dudala³

¹Assistant Professor, Dept of Orthopaedics, Government Medical College, Kadapa, AP.

²Associate Professor, Dept of Orthopaedics, Government Medical College, Kadapa, AP.

³Associate Professor, Dept of Community Medicine, Government Medical College, Kadapa, AP.

Corresponding Author: Dr. Shankar Reddy Dudala

Abstract

Ankle fractures represent 10% of all fractures making it a second most common fracture of the lower limb after the hip. Typically, low energy injuries with the majority occurring due to simple falls or Sports. Accurate reduction of fractures around ankle joint is important for a painless ankle joint. The aim of this study is to evaluate the functional outcome of surgically managed closed malleolar fractures of ankle in adults and to evaluate restoration of the anatomy of malleoli and ankle perfectly by operative treatment with internal fixation. Determining ankle stability for planning fracture management is very critical. Stable fractures can be managed conservatively but outcomes of unstable fractures are always better with surgical management.

Keywords: Malleolar fracture, Unimalleolar, Bimalleolar, Trimalleolar, Lauge Hansen classification, TBW, CC Screws, K- wires, Semitubular plates, Baird and Jackson Criteria.

Introduction

Ankle is the most commonly injured joint of the lower limb but least well treated. Ankle injuries gain importance because body weight is transmitted through it and locomotion depends upon the stability of this joint. Malleolar fractures are one of the most common fractures in orthopedic traumatology. As with all intra articular fractures, malleolar fractures necessitate accurate reduction and stable internal fixation. When malleolar fractures are not reduced accurately, they may lead to post traumatic painful restriction of motion or osteoarthritis or both². The superiority of ORIF over closed treatment have been thoroughly demonstrated in literature³. However, all studies have not obtained good results in cases of malleolar fractures.

OBJECTIVES

- To study the functional outcome and results of surgical treatment of malleolar fractures.
- To know the complications of Open reduction and internal fixation in malleolar fractures

MATERIALS & METHODS

Twenty patients with fresh Unimalleolar, Bimalleolar and Trimalleolar fractures who attended Government Medical College, Kadapa between September 2021 and November 2022 were taken for this study.

Inclusion criteria:

- i. All Closed Malleolar fractures.
- ii. Age >20 years and < 60 years.

iii. All patients who were fit for surgery.

Exclusion criteria:

- i. Compound fractures.
- ii. Fracture extension into distal tibia.
- iii. Patients with severe medical comorbidities.

The fractures were classified based on Lauge-Hansen's and Denis Weber classification in adults. Routine investigations were done for all patients. Patients were operated as early as possible once the general condition stable and was fit for surgery.

OPERATIVE TECHNIQUE:

Under spinal Anaesthesia the patient was put in supine position on table with sand bag underneath the affected side buttock. Pneumatic tourniquet was applied to the proximal thigh after noting the time. Open reduction and internal fixation of the malleolar fractures were performed by tension band wiring, malleolar screw, K-wire fixation or semi tubular plating with screws.

EXPOSURE AND FIXATION OF LATERAL MALLEOLUS:

The lateral malleolus was approached through a postero lateral incision. The incision was put about 12 cm proximal to the tip of lateral malleolus and extended distally along the posterior margin of the fibula to the tip of malleolus and curved it anteriorly for 2.5cm in line of peroneal tendons. The fibula was exposed sub periosteal by deepening the incision through subcutaneous tissue and deep fascia. Full thickness skin flaps were retracted anteriorly and posteriorly. One third tubular plate was contoured to accommodate the lateral bow of the fibula and held in reduction over the lateral side of fibula. Drill holes are made with 2.5mm drill bit. The length of the screw was measured with a screw gauge and tapped with 3.5mm tap. The plate was then fixed with the measured length of cortical screws. The distal two holes were fixed with cancellous screw of length 2mm less than the measured to prevent entry of the tip of screw into the ankle joint. The reduction clamp was then removed and the stability was confirmed.

The wound was washed with isotonic saline and covered with a fresh mop. The limb was extended and the medial side exposed.

EXPOSURE AND FIXATION OF MEDIAL MALLEOLUS:

A medial longitudinal incision of 8cm was put over the medial malleolus between its anterior and posterior borders with the lower end curving anteriorly at the tip of medial malleolus. The incision was deepened to the bone protecting the long saphenous vein over the anterior part of the incision. The skin and subcutaneous tissue was retracted anteriorly and posteriorly without undue pressure over the skin. Reduction of fracture achieved with towel clip then two k wires of 2mm in diameter passed and the reduction secured and the wires were bent and cut and in other cases tension band wiring was done for medial malleolus.

In 11 cases similarly reduction of fracture was done with a towel clip and a drill hole was made perpendicular to the fracture line with 3.2mm drill bit and then with 4.5mm malleolar screws used for securing the reduction. The screws were tightened to provide compression at the fracture site.

FIXATION OF THE POSTERIOR MALLEOLUS:

Fracture of the posterior malleolus occurs rarely but when it does. It is fixed by using one or two 4mm AO cancellous screws.

The wound was washed with Betadine and sutured in layers. Sterile dressings were applied and compression bandage given. Below knee posterior pop slab was given.

FOLLOW UP:

Weight bearing is restricted for 6 weeks. At 3 weeks the POP was removed. Clinical examination was done regarding tenderness and movement of ankle. At 6 weeks x-ray of the ankle was taken both AP and lateral views and looked for signs of fracture union and then advised partial weight bearing for further period of 6 weeks with elastocrepe bandage and elevation of the limb at night times and active movements of ankle joints. Regular follow up was done at 1, 2 and 6 months after discharge till the fracture united.

FUNCTIONAL AND RADIOLOGICAL EVALUATION:

Functional and radiological results were analyzed using the ankle scoring system of Biard and Jackson⁴. The evaluation was based on a questionnaire and physical and radiological examination. Physical examination included the measurement of active dorsiflexion and plantar flexion of injured ankle compared with the uninjured ankle, with forepart of foot in neutral position. Radiologically the medial clear space superior joint space and talar tilt was measured.

The seven categories in the scoring system were given alphabetical grades each being assigned a point score.

Table 1: Baird and Jackson Scoring system⁴ :

Pain	Points
A. No pain	15
B. Mild pain with strenuous activity	12
C. Mild pain with activities of daily living	8
D. Pain with weight-bearing	4
E. Pain at rest	0
Stability of ankle	
A. No clinical instability	15
B. Instability with sports activities	5
C. Instability with activities of daily living	0
Ability to walk	
A. Able to walk desired distances without limp or pain	15
B. Able to walk desired distances with mild limp or pain	12
C. Moderately restricted in ability to walk	8
D. Able to walk short distances only	4
E. Unable to walk	0
Ability to work	
A. Able to perform usual occupation without restrictions	10
B. Able to perform usual occupation with restrictions in some strenuous activities	8
C. Able to perform usual occupation with substantial restriction	6
D. Partially disabled; selected jobs only	3

E. Unable to work	0
Motion of the ankle	
A. Within 10° of uninjured ankle	10
B. Within 15° of uninjured ankle	7
C. Within 20° of uninjured ankle	4
D. <50% of uninjured ankle, or dorsiflexion <5°	0
Radiographic result	
A. Anatomical with intact mortise (normal medial clear space, normal superior joint space, no talar tilt)	25
B. Same as A with mild reactive changes at the joint margins	15
C. Measurable narrowing of the superior joint space, with superior joint space >2 mm, or talar tilt >2 mm	10
D. Moderate narrowing of the superior joint space, with superior joint space between 2 and 1mm	5
E. Severe narrowing of the superior joint space, with superior joint space <1mm, widening of the medial clear space, severe reactive changes (Sclerotic subchondral bone and osteophyte formation)	0
Maximum possible score	100

Excellent = 96 to 100 points, Good = 91 to 95 points, Fair =81 to 90 points, and Poor = zero to 80 points.

Grade A was considered to the normal pre injury condition. The alphabetical grades were assigned to point score that was weighted to emphasize pain, walking stability motion and radiographic findings.

Final scores were based on the combined point scores from seven categories of subjective objective and radiographic evaluation. Results were designated as excellent good fair and poor. A score of 96-100 points was considered excellent; 91 to 95 good; 81-90 points fair and zero to 80 points poor.

RESULTS

All the fractures were followed until fracture union occurred. Results were analyzed both clinically and radio graphically. All most all fractures united at the end of 12 weeks. Majority of patients i.e. 9 (45%) were from 31-40 years age group, followed by 7 (35%) patients in 21-30 age group. The youngest patient was 21 years old and oldest was 57 years of age. The mean age in our study was 34.8 years.

TABLE 2: AGE INCIDENCE

Age in years	No. of patients	Percentage
21-30	7	35
31-40	9	45

41-50	2	10
51-60	2	10

Incidence was more among 31-40 years age group, followed by 21-30 years age group.

TABLE 3 : SEX DISTRIBUTION

Sex	No. of patients	Percentage
Male	18	90
Female	2	10

Incidence was more among male when compared to female.

TABLE 4: MODE OF INJURY

Mode of injury	No. of patients	Percentage
Road Road traffic accident	10	50
Slip	8	40
Fall from height	1	5
Industrial	1	5

Incidence was more among road traffic accidents, followed by slip.

TABLE 5: SIDE OF FRACTURE

Side	No. of patients	Percentage
Right	14	70
Left	6	30

TABLE 6 : TYPE OF INJURY AS DETERMINED BY

A) LAUGE HANSEN CLASSIFICATION

Type	No. of patients	Percentage
Supination adduction	5	25
Supination external rotation	5	25
Pronation abduction	8	40
Pronation external rotation	2	10

A) DENIS WEBER CLASSIFICATION

Type of fracture	No. of patients	Percentage
A	4	20
B	13	65
C	3	15

TABLE 7: MALLEOLUS INVOLVED

	No. of patients	Percentage
Unimalleolar	3	15
Bimalleolar	10	50
Trimalleolar	7	35

TABLE 8: FINAL SCORE ACCORDING TO SUBJECTIVE OBJECTIVE AND RADIOLOGICAL CRITERIA

Category	Grade (No. of patients)					
	A	B	C	D	E	Total
Pain	12	7	1	-	-	20
Stability	20	-	-	-	-	20
Walking	19	1	-	-	-	20
Running	15	4	1	-	-	20
Work	18	2	-	-	-	20
Motion	11	7	2	-	-	20
Radiographs	19	-	1	-	-	20

TABLE 9: COMPOSITE SCORE

Composite score	patients	Percentage
Excellent (96-100 points)	13	65
Good (91-95 points)	5	25
Fair (81-90 points)	1	5
Poor (0-80 points)	1	5

In the present study of 20 patients with ankle fractures treated by open reduction and internal fixation. Excellent results were achieved in 13 (65%) patients, good in 5 (25%), Fair in 1 (5%) and Poor in 1 (5%) patient. Excellent results were observed in all isolated lateral malleolar and bimalleolar fractures. Two (14%) patients of with Trimalleolar fracture had poor to fair results. The patient with poor result had mild pain with activities of daily living, diminution in the abilities to run and to do work.

Complications:

3 patients had superficial skin infection which got healed by 2 weeks. There were no other complications.

DISCUSSION

The treatment of malleolar fractures with accurate open reduction and stable internal fixation using AO method and principles was found to give a high percentage of excellent and good results.² This study supports these conclusions.

Although the scoring of Baird and Jackson has proven to be strict allowing only very small fluctuation from normal about 65% patients in this series achieved excellent results by that scoring system and 25% patients achieved good results and had anatomical reduction of the lateral malleolus as well as anatomical reduction of talus radiologically.

AGE DISTRIBUTION:

The mean age of this study was 34.8 years. This finding was similar to observation of Baird and Jackson⁴, Roberts RS⁵, Beris et al and Lee et al⁹.

Table 10: AGE DISTRIBUTION IN VARIOUS STUDIES

Study	No. of patients	Mean age in years
Roberts SR. ⁵	25	40
Baird and Jackson ⁴	24	30
Beris, et al. ²	144	43.8
Lee et al ⁹	168	44
Present study	20	34.8

SEX DISTRIBUTION:

There was male predominance in this series which is also observed in some other studies.

Table 11: SEX DISTRIBUTION IN VARIOUS STUDIES

Study	No. of patients	Male: Female	Percentage of males
Roberts SR. ⁵	25	11:14	44
Baird and Jackson ⁴	24	17:7	70
Beris, et al. ²	144	56:88	38.88
Lee et al ⁹	168	89:79	42.9
Present study	20	18:2	90

MODE OF INJURY:

The commonest mode of injury was road traffic accident in the present study.

Table 12: MODE OF INJURY SEEN IN VARIOUS STUDIES

Study	No. of patients	Commonest mode
Baird and Jackson ⁴	24	Fall from height
Lee et al ⁹	168	Motor cycle accident
Present study	20	Road traffic accident

SIDE AFFECTED: In this study, right ankle was more affected i.e., 14 patients (76%)

Table 13: SIDE AFFECTED IN VARIOUS STUDIES

Study	No. of patients	Right	Left
Roberts SR. ⁵	25	14 (56%)	11(44%)
Baird and Jackson ⁴	24	11(45.8%)	13 (54.2%)
Beris, et al. ²	144	73 (50.69%)	71 (49.30%)
Present study	20	14 (70%)	6 (30%)

TYPE OF INJURY:

In the present study Lauge Hansens classification system was used for operative evaluation. The most common type of injury was pronation abduction (45%). This finding was in contrast to observation of Roberts RS⁵, Baird and Jackson⁴, Beris et al².

Table 14: TYPE OF INJURY IN VARIOUS STUDIES AS DETERMINED BY LAUGE HANSENS CLASSIFICATION

Study	No. of patients	Most common type	Percentage
Roberts SR. ⁵	25	Supination external rotation	34
Baird and Jackson ⁴	24	Supination external rotation	44
Present study	14	Pronation abduction injury	45

The results in this study were compared with that of Burnwell and Charnley⁶, Colton⁷, DeSouza et al⁸, Beris et al².

In Colton⁷ series he found that eighteen (70%) of patients had good to excellent results. Burnwell and Charnley in their series of 132 patients, 102 (77.3%) had good results, 16% had fair results and 6% patients were found to have a poor score.

In a study conducted by Beris et al² of 144 patients with ankle fracture there were good to excellent results in 74.3% patients, fair results in 14.6% and poor result in 11.1%.

All these were comparable to this study where 65% patients with ankle fractures had excellent results, 25% good, 5% fair and poor results in 5% patients.

Table 15: Final results of this study compared with other studies

Authors & years	Good to excellent	Fair	Poor
Burnwell & Charnley ⁶	102 (77.3%)	22 (16.7%)	8 (6%)
Colton ⁷	18 (70%)	4 (15%)	4 (15%)
Beris et al ²	105 (74.3%)	21 (14.6%)	16 (11.1%)
Desouza ⁸	135 (90%)	9 (6%)	6 (4%)
Present study	18(90%)	1(5%)	1(5%)

CONCLUSION

In this review of 20 patients with ankle fractures that were treated surgically by Open reduction and internal fixation in accordance with AO principles. Majority of them were caused by pronation abduction injuries. The most common etiology being Road traffic accident. Males are more prone with age incidence of 31-40years. Understanding the mechanism of injury is essential for good reduction and internal fixation. The fibular length has to be maintained for lateral stability of the ankle. The operative results were eminently satisfactory in 90% of patients More severe injuries were followed by least satisfactory results. Most of the complications faced were minor which resolved by 2 weeks.

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Conflict of Interest: Nil

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