

A Study of Surgical Management of Bi-Malleolar Ankle Fractures In Adults

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I. INTRODUCTION

According to Sir Robert Jones "Ankle is the most injured joint of the body (1). These injuries gain importance, because the whole body weight is transmitted through the ankle, and locomotion depends on the stability of the ankle. They are usually mixed injuries, ligamentous and bony; and each injury is an end result of the sequence of ligamentous and bony failure due to deforming forces. Open reduction and internal fixation have become the mainstay of treatment for most of the unstable bimalleolar fractures, as these operative methods restore the anatomy, biomechanics and contact loading characteristics of the ankle. When malleolar fractures are not reduced accurately they may lead to post-traumatic painful restriction of motion or osteoarthritis or both (2). The superiority of ORIF over closed treatment has been thoroughly demonstrated in literature (3). The operative method restores the anatomy and contact-loading characteristic of the ankle. Additional advantages include easier rehabilitation without a cast, early mobilisation and earlier weight bearing (4). However, all studies have not obtained good results in cases of bimalleolar fractures. The purpose of this study is to assess the functional outcome and results of surgical treatment of malleolar fractures.

II. MATERIALS AND METHODS

It is a prospective study with 30 cases of ankle bimalleolar fractures done between May 2014 and June 2016 according to the inclusion and exclusion criteria. Regular follow-up will be done on the outpatient department for a period of 6 months. Follow-up at intervals 1st, 3rd, 6th months postoperatively.

Inclusion criteria

1. Patients having unstable bimalleolar fractures of ankle, treated surgically
2. Patients above the age of 20 years.
3. Closed type of fractures & Open fractures Type I & II
4. Patients who are medically fit for surgery

Exclusion criteria

1. Open fractures of the ankle Type III
2. Those patients who are below 20 years and above 65 years.
3. Stable malleolar ankle fractures (treated conservatively).
4. Patients who are treated by non-operative methods.
5. Patients who are medically unfit for surgery.

Evaluating the results:

The analysis of data was made using various statistical methods like mean, standard deviation and standard error. All data was compiled and calculated by Epi-info software. Significance of difference was measured by determining p value and value less than <0.05 was considered significant. The functional outcome was evaluated using the *Biard and Jackson ankle* scoring system.

Operative technique:

In our study tension band wiring, malleolar screw, K wires, cancellous screws were used for fixing medial malleolus. One third tubular plate and K wires were used to fix lateral malleolus. In patients with syndesmotic screw fixation, weight bearing was delayed till screw removal. Follow-up of cases was done at regular intervals of 6 weeks for a minimum of 6 months.

III. RESULTS

In our series 30 bimalleolar fractures of ankle, treated by surgical methods during the period of May 2014 to June 2016 were studied.

1. SEX INCIDENCE: In our study majority of the patients were male (83.3%)

GENDER	FREQUENCY	PERCENT
MALE	25	83.3
FEMALE	5	16.7
TOTAL	30	100

2. AGE INCIDENCE: Most of the patients were in the age group of 19-30 years with mean age of 37.3 years.

AGE	FREQUENCY	PERCENTAGE
< 30	12	40
30-40	6	20
40-50	8	26.67
50-60	4	13.33
TOTAL	30	100

3. MODE OF INJURY: In this study mode of injury is highly associated with road traffic accident which accounts for about 56.6% followed by fall from height and fall on level surface which account the rest of the cases.

MODE OF INJURY	FREQUENCY	PERCENTAGE
R.T.A	17	56.6
fall from height	07	23.4
fall from level surface	06	20.00
TOTAL	30	100.00

4. TYPE OF INJURY: Majority of the patients sustained these injuries following road traffic accidents. Supination external rotation injury is the most common fracture type in this study, 3 patients had associated syndesmotic injury.

TYPE OF INJURY	FREQUENCY	PERCENTAGE
SUP.ADDUCTION	6	20
SUP.EXT.ROTATION	16	53.34
PRON.EXT ROTATION	4	13.33
PRON.ADDUCTION	4	13.33
TOTAL	30	100

5. TREATMENT OF INDIVIDUAL FRACTURES:

A) Medial Malleolus Fracture

Majority of the medial malleolus fractures were fixed with malleolar screws 16 (53.3%).

In the rest of the cases cancellous screws, tension band wiring and K wires were used.

Implants	Malleolar screws	Cancellous screws	TBW	K-WIRE
No of cases	16	6	3	5
percentage	53.3	20	10	16.6

B) LATERAL MALLEOLUS FRACTURE: Majority of the lateral malleolar fractures were fixed with one third tubular plate 21(70%). Rests of the fractures were fixed with K wires and cancellous screws.

Implants	Plating	K-wire	Cancellous screw
No of cases	21	7	2
percentage	70	23.3	6.6

C) SYNDESMOTIC FIXATION : In 3 cases (10%) syndesmotic injury was noted and was fixed with a fully threaded screws. Weight bearing was delayed till screw removal which was done at 6-8 weeks.

6. UNION TIME: In our study average time taken for union was 10.6 wks. Most of the cases showed union between 8- 14 wks.

Union (wks)	8 wks	10 wks	12 wks	14 wks	16 wks
No of cases	9	10	5	5	1

7. COMPLICATIONS: In our series 5 cases (16.6%) had complications.

Two patients had superficial infection, 2 patients had deep infection and 1 patient had delayed union. Infections were managed with debridements and antibiotics. Delayed union fracture medial malleolus is treated with continued immobilization, which eventually united without surgical intervention.

Complications	No of cases	Percentage
Superficial infection	2	6.6
Deep infection	2	6.6
Delayed union of medial malleolus fracture	1	3.3

8. FUNCTIONAL RESULTS

In this present study 30 patients with bi malleolar fractures were treated surgically. Excellent results were achieved in 18 cases (60%), good in 8 cases (26.6%), fair in 2 cases (6.6%), poor in 2 cases (6.6%). Excellent results were seen in most of the bi malleolar fractures, 4 patients who had fair to poor results were seen in cases with delayed union of medial malleolus, superficial and deep infection. The patients who had poor results had mild pain during their

Functional score	No of cases	Percentage
Excellent	18	60
Good	8	26.6
Fair	2	6.6
Poor	2	6.6

V. DISCUSSION

There has been an increase in the prevalence of bi malleolar fractures over the last two decades both in the young, active patients and in the elderly. Methods to restore function and to prevent arthritis are either closed treatment, which includes manipulative reduction and immobilization in plaster cast or open reduction with internal fixation.

A. Rationale behind ORIF of Ankle Fractures

The key to open reduction and internal fixation for displaced ankle fractures is to restore tibiotalar congruency, as Ramsey and Hamilton in 1976 showed that a 1mm lateral shift of the talus in the ankle mortice reduces the contact area by 42%(5) .

Further studies have shown that posterior malleolus fractures involving more than 33% leads to a significant loss of tibiotalar contact (6). However, DeSouza, 1985 showed 90% satisfactory results could be obtained even if up to 2mm of lateral displacement was present (7).

Generally open reduction and internal fixation is recommended in young patients if there is over 1mm displacement or 2 degrees talar tilt (8). With elderly patients; 2mm of displacement is deemed acceptable. One must always take into account the ambulatory needs of the patient and judge treatment accordingly.

There is a reduction in the incidence of arthrosis in patients where an anatomical reduction has been achieved as prospective trials shows higher total ankle scores in those that are treated operatively (9). However, this incidence increases with severity of injury. Further studies demonstrated degenerative changes in ankle of 10% of anatomically fixed fractures compared with 85% if not adequately reduced, and these changes apparent within 18 months (8)

Stable reduction of the fibula in its anatomic position is the key for the stability of the talus. Recently, the recommended and accepted treatment of Weber type C ankle injuries is open reduction and internal fixation, but despite appropriate initial fracture reduction, painful osteoarthritis and unstable joint still develop in some patients. One of the most acceptable factors is the inaccurate reduction of the syndesmosis.

Several studies have demonstrated that failure to reduce and stabilize a disruption of the syndesmosis that occurs in association with some rotational ankle fractures is associated with poor outcomes. Inadequate initial reduction of the syndesmosis in patients with bimalleolar or trimalleolar fractures can present a negative effect on the subjective and objective measures of outcome and correlated with the presence of late instability and arthritis of the ankle.

B) COMPARATIVE DESCRIPTION OF THIS STUDY:

In the current study, we have 30 patients with bi-malleolar ankle fractures, who were operated upon. All patients were followed up with minimum period of 6 months.

AGE INCIDENCE:

STUDY	NO OF PATIENTS	MEAN AGE
Roberts SR(10)	25	40
Beris et al (11)	144	30
Lee et al (12)	108	41
Present study	30	37.3

SEX DISTRIBUTION:

STUDY	NO OF PTS	MALE:FEMALE	% MALE
Roberts SR(13)	25	11:14	44
Beris et al (14)	144	56:88	38.8
Present study	30	25:5	83.3

FUNCTIONAL RESULTS:

The results in current study were compared with that of Burnwell & Charnley, Colton, De souza et al, Beriset al. In Colton series. 70% of the patients had a good to excellent results. Burnwell & Charnley in their series of 132 patients, 102 (77.3%) had good results, 16% had fair results and 6% were found to poor score. In De souza series, 150 cases of ankle fractures treated by open reduction and internal fixation using AO/ASIF method, obtained 90% good results. In a study by Beris et al, of 144 patients with ankle fractures, 105 (74.3%) had good to excellent results. The analysis has been made using the following subjective, objective and radiological criteria by Baird and Jackson for 25 patients: Pain, Stability, Walking, Running, Work, Motion and Radiograph.

STUDY	GOOD TO EXCELLENT	FAIR	POOR
Burnwell & Charnley (15)	102 (77%)	22 (17%)	8 (6%)
Colton (16)	18 (70%)	4 (15%)	4 (15%)
Beriset al (17)	105 (74.3%)	21 (14.6%)	16 (11.1%)
De souza (18)	135 (90%)	9 (6%)	6 (4%)
Present study	26 (86.6%)	2 (6.6%)	2 (6.6%)

VI. CONCLUSION

- Ankle fractures are one of the most common lower limb fracture, representing a significant portion of the trauma workload.
- Most fractures are associated with inferior Tibio-fibular ligament injuries, the direction and nature of the force applied to the ankle joints correlating to the pattern of the fracture and ligament injury.
- Non-operative treatment with immobilisation can provide satisfactory results if anatomical reduction is maintained and closely followed, however cast immobilisation can also lead to muscle atrophy, cartilage degeneration, and a stiff painful and swollen joint.
- Surgical treatment involves open reduction (if displaced) and internal fixation of the fractured parts using various fixation devices such as plates, screws, tension band or external fixation.
- These operative techniques aim to provide anatomical restoration and immediate stability, which facilitates earlier mobilisation. All surgery carries the risk of complications such as wound infection, pulmonary embolism, implant or fixation failure, mortality, amputation and revision procedure. Management after surgery may also include the use of a plaster cast.

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