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The Functional Outcome in Surgical Management of Bimalleolar Ankle Fractures in Adults

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ABSTRACT

Bimalleolar fracture can occur due to various mechanisms of injuries; these tend to produce ankle injuries when one attempts to turn violently over a fixed foot or the foot being used as lever to produce twist at the ankle. The operative method, restores the anatomy and contact loading characteristic of the ankle. Additional advantages include easier rehabilitation without a cast, early mobilization and early weight bearing. All patients attending outpatient department of orthopaedics and patients admitted in department of orthopaedics between 18 years to 65 years of both sex, presenting with bimalleolar ankle fractures, who are willing to undergo surgery were enrolled for the study after obtaining the written informed consent from patient and their attenders. In the present study of 30 patients with bimalleolar ankle fractures treated by open reduction and internal fixation, excellent results were achieved in 12 (40%), good in 9 (30%), fair in 8 (26.66%) and poor in 1 (3.33%) of patients.

INTRODUCTION

Ankle fractures are among the most common types of fractures treated by orthopaedic surgeons. There has been an increased prevalence of such fractures over the last two decades both in young patients and in the elderly^[1]. Bimalleolar fracture can occur due to various mechanisms of injuries., these tend to produce ankle injuries when one attempts to turn violently over a fixed foot or the foot being used as lever to produce twist at the ankle^[2]. The operative method, restores the anatomy and contact loading characteristic of the ankle. Additional advantages include easier rehabilitation without a cast, early mobilization and early weight bearing. Traditionally, the ankle fractures have been considered noncontroversial regarding the indications for operative intervention., however, recent knowledge about the biomechanics of the ankle has given rise to particular areas of clinical uncertainty^[3,4]. These include suggestive of operation in isolated fractures of the lateral malleolus, the operative techniques used for syndesmotic injury and the subsequent postoperative management and the trustworthiness of radiographic assessment of ankle fractures. The purpose of this study on bimalleolar fractures of ankle is to evaluate the functional outcome and results obtained after surgical management by various methods of internal fixation^[3].

MATERIALS AND METHODS

All patients attending outpatient department of orthopaedics and patients admitted in department of orthopaedics between 18 years to 65 years of both sex, presenting with bimalleolar ankle fractures, who are willing to undergo surgery were enrolled for the study after obtaining the written informed consent from patient and their attenders. Follow up at 1 month, 3 months and 6 months interval. As soon as the patients were brought to the casualty/opd a detailed examination was carried out to rule out significant injuries. Then the patient's radiographs were taken, both anteroposterior and lateral views of the ankle joints. On admission to the ward detailed history was taken relating to the age, sex, occupation, address, mode of injury, past and associated medical illness, patients general condition was assessed. The following clinical signs were looked for.

Inspection:

- Relation of ankle to foot., either normal, having Calcaneo-valgus or varus. Interrelation of malleolus and fossa in front of malleoli.
- Prominence of tendoachilles fossa on both sides of tendoachilles.
- Pattern, position and size of heel for broadening.

Palpation: All the bones forming the ankle, i.e. lower end of tibia, fibula including malleolus, calcaneus and

talus are looked for local bony tenderness and bony irregularities, displacement, on natural mobility crepitus, inter relation of malleoli, springing of fibula, dorsalispedis and posterior tibial artery pulsations were checked and noted. Active and passive movements of ankle joint were noted. Analgesics were given and patients were put on a below knee posterior pop slab to alleviate pain. Also antibiotics and tetanus toxoid and tetanus immuno-globulins were given as needed. Vitamin C routinely advised till movements regained fully. The fractures were classified based on Lauge-Hansen's classification in adults. Routine investigations were done for all patients. Patients were operated as early as possible once the general condition stable and fit for surgery, including local condition.

Pre-Operative Procedure:

- Patients were kept fasting for 8-10 hours before surgery.
- Intravenous fluid was given as needed.
- Adequate amount of blood was kept ready for any eventuality.
- Blood investigations for (required blood is 4ml).
- Estimation of haemoglobin (CBC), blood urea, serum creatinine, blood grouping and Rh typing.
- RBS.
- Viral markers (HIV, HBS Ag, HCV).
- Bleeding time, clotting time.
- The whole of the extremity below the umbilicus including the private parts were prepared.
- A properly written and informed consent was taken.
- Systematic antibiotics, usually an Inj. Cefotaxime 1 gm. intravenous was administered 30 minutes before surgery.
- Xylocaine test dose was given.

Study Design: Longitudinal study.

Sample Size: All patients between 18 years to 65 years of both sex, presenting with bimalleolar ankle fractures who are willing to undergo surgery were enrolled for the study follow up at 1 month, 3 months and 6 months interval. Tentative sample enrolled during the above mentioned period shall be 30 and above.

Sampling Method: Purposive sampling.

Study Period: 18 Months studies followed by follow up in 1st month, 3rd month and 6th month.

Inclusion Criteria:

- Patients of age 18-65 years of both sex.
- Displaced bimalleolar ankle fracture.
- Closed fracture.

- Radiological findings confirming bimalleolar ankle fracture under.
- Lauge-Hansen classification.
- Patient who are willing to give informed written consent.

Exclusion Criteria:

- Below 18 and above 65 years of age.
- Compound fractures.
- Associated fractures around ankle joint and foot.
- Trimalleolar/unimalleolar fractures.
- Infections around ankle.

Variables of Interest:

- Primary interest is to gain anatomical reduction of bimalleolar ankle fracture through various internal fixation methods.
- Secondary interest is to achieve early mobilization of patient.
- Follow up of patients at 1st, 3rd and 6th months to assess functional outcome according to Baird and Jackson scoring system.

Post-Operative Management: IV fluids were infused as appropriate. IV Antibiotics were continued for 5 days. Analgesics and Serratiopeptidase were given. Elevation of the affected limb was done. X-rays anteroposterior and lateral views were taken. Post-operative immobilisation with below knee slab until suture removal and converting it into below knee cast for 4 weeks.

Follow UP:

- On cast removal after 4 weeks active mobilization exercises of the ankle is started. Clinical examination was done regarding tenderness and movement of ankle.
- At 4 weeks x-ray of the ankle was taken both AP and lateral views, advised non weight bearing for 2 weeks, Partial weight bearing for the next two weeks and full weight bearing after 10 weeks.
- Regular follow up was done at 1, 3 and 6 months after discharge till the fracture united.
- The seven categories in the scoring system were given alphabetical grades each being assigned a point score.

RESULTS AND DISCUSSIONS

Most of the patients were operated between 2 and 5 days. Average duration between trauma and surgery was 3 days in our series. All the patients were given spinal anesthesia.

Duration of Surgery: Average duration of surgery was about 1 hour.

Implants Used:

Table 1: Representing Medial Malleolar Implants

	Tension band wiring	C C screw fixation	Malleolar screw
Medial malleolus fixation:	17	03	10

Table 2: Representing Lateral Malleolar Implant

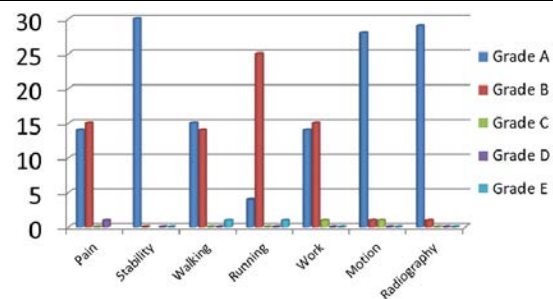
	Semi tubular plate	K-wire
Lateral malleolus fixation:	21	09

Lateral Malleolus Fracture: There were total of 30 lateral malleolar fracture, majority 21 (70%) were fixed with 1/3rd semi tubular plate and remaining 9 (30%) were fixed with K-wire.

Medial Malleolus: In our series, there were 30 cases with medial malleolus fracture, tension band wiring was done in 17 (56.66%), C C Screw fixation for 3 cases (10%) and 2x4.5 mm malleolar screws were used for 10 cases (33.33%).

Table 3: Final Score According to Subjective, Objective and Radiological Criteria

SL No:	Category	Grade A	Grade B	Grade C	Grade D	Grade E	Total
1.	Pain	14	15	-	1	-	30
2.	Stability	30	-	-	-	-	30
3.	walking	15	14	1	-	-	30
4.	Running	4	25	1	-	-	30
5.	Work	14	16	-	-	-	30
6.	Motion	28	2	-	-	-	30
7.	Radiography	29	1	-	-	-	30



Note: X Axis Representing Categories of Baird and Jackson Criteria and y Axis Representing the Total Functional Scores of Subjects

Bar Chart 1: Final Score According to Subjective, Objective and Radiological Criteria

Ankle Pain: In our series 14 (46.66%) had no pain and 15 (50%) patients had grade B i.e. pain with strenuous activities and remaining 1 (3.33%) pain with weight bearing.

Stability of Ankle: 30 patients had no clinical instability.

Ability to Walk: Majority i.e. 15 (50%) of patients could walk desired distances without limp or pain and 14 (46.66%) patients were able to walk desired distance with slight pain and 1(3.33%) patient had moderate restriction in ability to walk.

Ability to Run: 4 (13.33%) patients were able to run desired distances without pain, 25 (83.3%) patients were able to run desired distances with slight pain and 1 (3.33%) patients had moderate restriction in ability to run with mild pain.

Ability to Work: In our series 14 (46.66%) patients were able to perform usual occupation without restriction and 16 (53.33%) patients were able to perform usual occupation with restriction in some strenuous activities.

Motion of Ankle: In our series, 28 (93.33%) patients had range of motion of the ankle within 100 of uninjured ankle and 2 (6.66%) patients were having motion within 150 of uninjured ankle.

Radiographic Result: 29 patients had Anatomical with intact mortise (normal medial clear space, normal superior joint space, no talar tilt) and 1 patient had same as A with mild reactive changes at the joint margins.

Complications: In our study only one complication was encountered a result of infection. This necessitated implant removal, followed by antibiotic coverage to facilitate wound healing.

Table 4: Final Functional Outcome of Study Subject

Functional outcome.	No. of patients	Percentage
Excellent (96-100 points)	12	40
Good (91-95 points)	9	30
Fair (81-90 points)	8	26.66
Poor (0-80 points)	1	3.33
Total	30	100

Note: where x axis Representing Scoring System and y Axis Representing the Percentage Subjects.

In the present study of 30 patients with bimalleolar ankle fractures treated by open reduction and internal fixation, excellent results were achieved in 12 (40%), good in 9 (30%), fair in 8 (26.66%) and poor in 1 (3.33%) of patients.

Table 5: Distribution of Functional Outcome of Bimalleolar Ankle Fractures Across Both Gender

Functional outcome	Male	Percentage	Female	Percentage	Total
Excellent	8	66.66%	4	33.33%	12
Good	1	11.11%	8	88.88%	9
Fair	2	25%	6	75%	8
Poor	0	0%	1	100%	1
Total	11	36.66	19	63.33%	30

χ^2 value: 8.230 df=3 P value :0.0415.

Chi square test was applied to see the differences of the functional outcome among the male and female distribution of population. Functional outcome was excellent among male were 8 and in female were 4, good among male were 1 and in female 8, fair among

male were 2 and female were 6, poor among male were no subject and in female were 1. Here female had a better functional outcome than male and was found to be statistically significant.

Table 6: Comparison of Functional Outcome with Others References

Studies	Number of patients	Results
Motawani ^[3]	40	82.5% excellent to good 12.5% fair 5% poor
Maruthi CV ^[5]	40	90% excellent to good 10% fair 0% poor
Voligi Shanker ^[6]	80	82.5% excellent to good 12.5% fair 5% poor
Present study	30	70% excellent to good 26.6% fair 3.33% poor

The final functional outcome were found to be good to excellent results were obtained in 70% of patients, fair result in 26.6% and poor in 3.33% of patients. The observation in this study support the contention of SSV Raman^[2], Motawani^[3], Maruthi^[5], Voligi Shanker^[6] that anatomical reduction and good post reduction X-rays correlated with good clinical outcome. Fractures of the medial malleolus close to the plafond require more exact reduction to restore normal Tibio-Talar relationship. The type of the fracture did not affect the final outcome in the present study as it did in the study of Bistrom^[7]. But the study supports the view of Klosser and Kristensen^[8], according to which reduction determines the final clinical result irrespective of the type of fracture. Early mobilization was advocated by AO, others have found no significant difference in results produced by early motion or immediate plantar splint application (Beris *et al.*). In this series immobilization with a below knee plaster cast was given for four weeks followed by active mobilization of joint for two weeks, then partial weight bearing and by the end of 10 weeks complete weight bearing was allowed. A number of different regimes have been suggested. Ahl^[9] showed that early weight bearing in a plaster cast had a tendency to display better clinical results, he also found that ankle movements using orthosis showed better results. David Seligson and Paul Kloth recommended short leg walking cast 12-days postoperatively after an appropriate internal fixation. Major and Kumler^[10] used plaster for initial fracture immobilization.

CONCLUSION

In our series there were no malunion of either medial or lateral malleolar fractures. In the present study the fractures that influence the results are:

- Anatomical reduction is the most important factor for a good outcome.
- Type of fracture did not made any difference for the ultimate clinical results.

- Cast immobilization for 4 weeks did not affect the range of motion as after 12 weeks most of the patients achieved near normal range of motion. Malleolar fractures have varied presentation. Bimalleolar fractures in general have a less favorable outcome compared to isolated malleoli fracture. Thorough understanding of the mechanism of injury, patho-anatomy and treatment options with accurate reduction and early mobilization can give rewarding results.

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