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Original Research Article

Functional and radiological outcome of open reduction and internal fixation in bimalleolar fractures of ankle: a prospective study

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ABSTRACT

Background: Bimalleolar fractures are commonly encountered fractures in the orthopaedic emergency. The goals in the treatment of these fractures are aimed at perfect anatomical reduction which could be obtained by open reduction and internal fixation.
Methods: A prospective study conducted in the department of orthopedics, Government Medical College, Jammu, Jammu and Kashmir from June 2019 to December 2020 in patients with bimalleolar fracture. Clinical history, socio-demographic profile, and Lauge Hansen classification was noted for all patients. Functional outcome was evaluated 6 months postoperatively using the Baird and Jackson criteria.
Results: Mean time for radiological union was 18 weeks. Baired and Jackson scoring was used with excellent results in 21 patients (43.75%), good results in 19 patients (39.58%), fair results in 8 patients (16.66) while no patients had poor outcome.
Conclusions: In our study we concluded that open reduction and internal fixation (ORIF) in bimalleolar fractures with plating for lateral malleolus and cannulated cancellous screw (CCS) for medial malleolus is an effective treatment modality with very good results in experienced hands.

Keywords: Bimaleolar fractures, Lauge–Hansen classification, Baird and Jackson criteria

INTRODUCTION

The ankle joint supports more weight per unit area than any other joint in the body.[1] The most congruous joint in the lower extremity is the ankle joint which bears upto five times the body weight.[2] Ankle fractures excluding pilon fractures, currently account for approximately 9% of all fractures.[3] Closed management with manipulation, though avoids the operative risks, can result in poor long-term outcomes.[4,5] The results of bimalleolar ankle fractures are better with emphasis on anatomical reduction of fracture, stable internal fixation, regaining full fibular length and early active pain free mobilization. There is need of near anatomical reduction of bony structures and restoration of ligaments as there is narrow threshold for error in treatment of these fractures.[6] The superiority of open reduction and internal fixation (ORIF) over closed treatment has been thoroughly demonstrated in the literature.[7] Additional advantages include easier rehabilitation without a cast, early mobilization and earlier weight bearing.[8]

The objective of the present study is to evaluate clinically and radiologically the type of injury and to analyze the results of closed bimalleolar ankle fractures treated with ORIF.

METHODS

Authors conducted a prospective observational study in the department of orthopedics, Government Medical College (GMC), Jammu from June 2019 to December

2020 in which authors included bimalleolar ankle fractures, all of which were managed with open reduction and internal fixation. 67 patients with bimalleolar fractures attended the emergency and outpatient's department of orthopedics, out of which 53 patients which fulfilled the inclusion criteria were included in this study after taking informed written consent. 5 patients were lost to follow-up and were excluded from this study. Hence, the final number of patients included in the study was 48 (n=48). Institutional ethics committee approval was sought before we started enrolling the patients in the study. The collected data of all the patients included in the study design was analysed using EpiInfo 3.0 and statistical package for social sciences (SPSS).

Inclusion criteria for our study were age of patient above 20 years and less than 70 years, patients having closed bimalleolar fracture, and are fit for surgery and are willing to participate in the study. However, patients below 20 years and more than 70 years were not included in the study. Patients with compound injuries or having tibial pilon or trimalleolar fracture or any history of previous bimalleolar fracture of either ankle and patients who were either unfit for surgery or not willing to participate in the study were excluded from the study.

After receiving the patient in emergency room (ER), patient was thoroughly evaluated for any associated injury. Involved limb was splinted and proper analgesia given. Strict antero-posterior (AP), lateral and mortise views (Figure 1a) of involved limbs were obtained. Fracture morphology was studied and fractures were classified using the Lauge–Hansen classification.[9] All baseline blood investigations along with electrocardiography (ECG) and chest X ray were done and fitness for anaesthesia determined. Soft tissue condition was assessed and operation was planned accordingly. Injection cefuroxime 1.5 gm was given as routine prophylaxis to all the patients.

Figure 1: (a) Pre and (b) post-operative X rays of bimalleolar fracture.

Procedure

All the patients were operated under spinal anaesthesia. Using standard protocol, the operative approach for the fixation of the lateral malleolus was made. Fracture fragments were reduced under vision and fixed by using tubular locking plate with or without syndesmotic screws. The medial malleolus was fixed with canulated cancellous screws, or tension band wiring. Soft tissue interposition between fracture fragments of the medial malleolus, was observed in all cases. Closure of the operative wound was done according to the standard protocol. Dressing with adequate padding and a below knee slab was applied in all cases. Immediate post-operative X-rays were done (Figure 1b). Sutures were removed and crepe bandage was applied in the outpatient clinic at the end of two weeks was restricted for 6 weeks. At 6 weeks the slab was removed. Clinical examination was done regarding movement of ankle. At 6 weeks X-ray of the ankle was taken in AP and lateral views and looked for signs of fracture union and then were advised partial weight bearing once the fracture showed signs of union. Patients were advised to perform active movements of ankle joints. Weight bearing was then gradually increased to full weight bearing. Regular follow up was done at 6 weeks, 3 months and thereafter at monthly intervals till 6 months after operation till the fracture united .Follow up X-rays were taken to assess fracture union. At the end of 6 months, patients were evaluated for functional outcome using the Baird and Jackson criteria.[10]

RESULTS

This was a prospective study done on 48 patients in GMC Jammu from December 2019 to March 2021. During this study, bimalleolar fractures were more commonly seen in males (28 patients, 58.33%) than females (20 patients, 41.66%) as depicted in Figure 2. Right ankle (26 patients, 54.16%) was more commonly injured as compared to left one (22 patients, 45.83%).

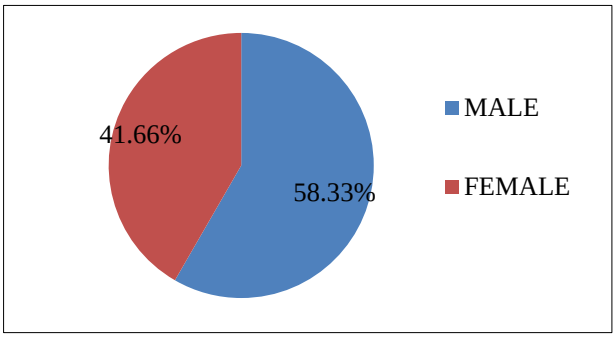

Figure 2: Sex distribution.

In our study group we had 7 patients (14.58%) in age group of 20-30 years, 10 patients (20.83%) in age group of 31-40 years, 16 patients (33.33%) in age group of 41-50 years, 11 patients (22.91%) in age group of 51-60 years and 5 patients (10.41%) in age group of 61-70 years as shown in Figure 3. The mean age of patients in this study was 43 years. Primarily, mode of injury was road traffic accident (25 patients, 52.08%) followed by ankle twist and fall (20 patients, 41.66%), remaining cases sustained injury due to fall of heavy object over ankle (3 patients, 6.25%). The

most common mechanism of injury was suppination external rotation injury (23 patients, 47.91%) followed by pronation external rotation (15 patients, 31.25%) and suppination abduction (7 patients, 14.58%), pronation abduction (3 patients, 6.25%) was the least common injury as represented in Figure 4.

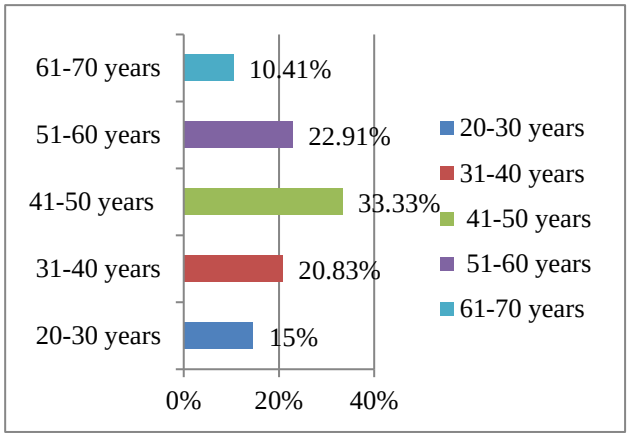

Figure 3: Distribution of patients according to age.

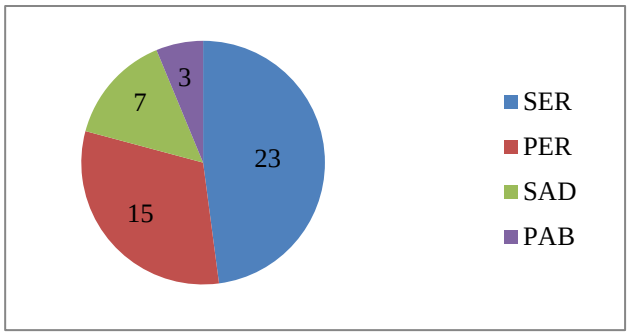

Figure 4: Percentage of different bimalleolar injuries according to Lauge-Hansen classification.

Majority of patients (42 patients, 87.5%) were operated within 48 hours of injury while few (6 patients, 12.5%) were operated after 48 hours. Out of 48 patients, 28 had some known comorbidities. Mean operative time was 93 minutes while mean blood loss was about 100-120 ml. Medial malleous was fixed by cannulated cancellous screw (CCS) in all cases except 2 cases where tension band wiring (TBW) was done. Lateral malleous was fixed by plating in all cases. In all cases range of motion achieved at ankle is comparable with the opposite side. Mean time for radiological union was 18 weeks. Baired and Jackson scoring was used 21 patients (43.75%) reported excellent results, 19 patients (39.58%) reported good results, 8 patients (16.66) had fair results while no patients had poor outcome. Various parameter studied during the study are tabulated in Table 1.

4 patients (8.33%) had infection post op for which culture specific antibiotic was given and infection resolved uneventfully. 5 patients (10.41%) complaint of hardware prominence while 3 had ankle stiffness which was managed by physiotherapy. One patient (0.85%) had delayed union while there was no case of malunion or non-union in our study.

Table 1: Various parameters studied.

Parameter studied	No. of patients	Percentage
Gender		
Male	28	58.33
Female	20	41.66
Side		
Right	26	54.16
Left	22	45.83
Bilateral	00	0
Mode of injury		
RTA	25	52.08
Ankle twist and fall	20	41.66
Fall of heavy object	03	6.25
Lauge – Hansen classification		
SER	23	47.91
PER	15	31.25
SAD	07	14.58
PAB	03	6.25
Delay in surgery		
Within 48 hours	42	87.50
After 48 hours	06	12.50
Baired and Jackson score		
Excellent	21	43.756
Good	19	39.58
Fair	08	16.66
Poor	00	0
Complications encountered		
Hardware symptoms	05	10.41
Infection	04	8.33
Delayed union	01	0.85
Ankle stiffness	03	6.25
Non-union/malunion	00	0
Mean time for radiological union		18 weeks
Mean operative time		93 minutes
Mean blood loss		100-120 ml

DISCUSSION

We studied 48 patients who underwent operative intervention for bimalleolar ankle fracture. In our study we found that males (58.33%) are more commonly involved than females (41.66%) and right side (54.16%) is more commonly involved than left (45.83%) which is comparable with the study by Motwani and Maruthi with 82.5% and 70% patients in their study being males respectively.[11,12]

Mean age of patients included in our study was 43 years. Similar results were observed in Mohapatra and Raj with mean age of 43.8 years, however Beris et al, Lee et al, Roberts, and Baird and Jackson found bimalleolar fracture

were common in age group of 31 to 40 years which is slight variation in this study.[10,13-16] In our study, RTA (52.08%) was the most common mode of trauma followed by ankle twist and fall (41.66%) which were in accordance with study by Mohapatra, Raj and Lee et al.[13,15]

SER injury was found to be most common injury which was in accordance with study by Parvataneni, Roberts and Beris et al.[14,16,17]

Average time required for radiological union was 18 weeks, which was in accordance with study by Parvataneni and Maruthi.[12,17]

At the end of 6 months, majority (83.33%) of patients in present study have excellent (43.75%) to good (39.58%) Braid and Jackson score. Similar results was observed in other study like Shah, Arif, De souza et al, Beris et al, Motwani as shown in Table 2.[11,14,18,19]

Table 2: Comparison of results of our study with previous studies.

Study	Good to excellent (%)	Fair (%)	Poor (%)
Shah and Arif[18]	33 (82.5)	5 (12.5)	2 (5)
Beris et al[14]	105 (74.3)	21 (14.6)	16 (11.1)
De souza et al[19]	135 (90)	9 (6)	6 (4)
Motwani[11]	33 (82.5)	5 (12.5)	2 (5)
Present study	37 (92.5)	02 (5)	01 (2.5)

CONCLUSION

ORIF in bimalleolar fractures with plating for lateral malleolus and CCS for medial malleolus is an effective treatment modality with very good results in experienced hands. Anatomical reduction, restoration of fibular length and stable fixation were found to be essential for achieving good return of joint function.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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