



International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2017; 3(3): 620-623
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www.orthopaper.com
Received: 22-05-2017
Accepted: 24-06-2017

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Evaluation and surgical management of bimalleolar fractures of ankle joint

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DOI: <http://dx.doi.org/10.22271/ortho.2017.v3.i3i.98>

Abstract

Objective: The objective of the present study was to assess the functional outcome of surgically managed bimalleolar fractures of ankle joint.

Material and Methods: The surgical study was conducted on twenty seven patients at Kakatiya Medical College, Warangal, Telangana, India, for a period of eighteen months. All the cases were treated by open reduction and internal fixation technique. The functional outcome was evaluated using the Baird and Jackson's ankle scoring system.

Results: In our study the operative results we achieved were good in 83.2% cases, 8.3% fair results, 8.3% poor results. Good functional results were obtained by surgical management of bimalleolar ankle fractures. Early weight bearing and mobilisation was achieved in these patients. Open reduction and internal fixation restores the articular congruity of the ankle joint. There were no intra operative complications observed in this study.

Conclusions: Anatomical reduction is essential in all intra articular fractures, more so if a weight bearing joint like ankle is involved. Open reduction and internal fixation guarantee high standard of reduction besides eliminating chances of loss of reduction. Functional outcome and the results of surgery treatment were found to be good.

Keywords: ankle fracture, malleolus, Lauge-Hansen

Introduction

Ankle is the most injured joint of the body but the least well treated^[1]. Ankle fractures are one of the most common fractures encountered in the emergency and are among the most common injuries treated by orthopaedic surgeons. Some sports seem ideally designed to hurt the ankle eg., soccer, hockey, basketball, etc.

Over the last two decades, there has been an increased prevalence of such fractures both in young, active patients and in the elderly. Ankle injuries involving malleolar fractures is one of the important fractures which caused loss of efficiency both in athletes and workers as well, particularly when associated with sub-laxation.

Malleolar fractures are one of the most common fractures in orthopaedic traumatology^[2, 3]. Malleolar fractures include injuries of bones (malleoli) and or ligaments.

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 both^[4]. A thorough understanding of the ankle anatomy, mechanism of the injury, interpretation of the radiographs and adherence to basic principles of fracture management are the basis for a good result.

Many of the fractures which are stable are reduced by conservative treatment and have given good result. The other unstable displaced and open fractures require open reduction internal fixation (ORIF). The operative method restores the anatomy and contact-loading characteristic of the ankle. Additional advantages include easier rehabilitation without a cast, early mobilization and earlier weight bearing^[5].

Malleolar fracture has varied presentations which have given rise to a wide variety of classification systems, of which two are in vogue: Lauge-Hansen's and Danis-Weber classification.

Common symptoms of a malleolar fracture include: deformity around the ankle, swelling, hematoma, bony tenderness, instability and pain on attempting to walk in the presence of

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such symptoms, clinical examination follows the principle of “look-feel-move”. The purpose of this study is to assess the functional outcome and the results of surgical treatment of malleolar fractures.

The aim of the study was diagnosis, demographic analysis of bimalleolar fractures among various injuries, analyze the merits and demerits of different surgical methods of stabilization and compare the results of non-operative treatment of bimalleolar fracture of ankle joint.

Material and Methods

This study was carried out for a period of eighteen months in Kakatiya Medical College, Warangal, Telangana, India. Two hundred and fourteen patients of malleolar ankle fractures who were admitted to the Department of Orthopaedics in Mahatma Gandhi Memorial (MGM) Hospital, Warangal, Telangana, India were included in the present study.

Methodology

Patients admitted to the Department of Orthopaedics with malleolar fractures of ankle joint satisfying the inclusion criteria were included in the study and with follow up from the time of admission to a minimum of 6 months of post-operative period was done. All the patients were informed about study in all aspects and informed consent was taken about their inclusion in the study. Ethical approval was taken from the College Ethical Committee Board.

Inclusion criteria

- a) Patients having any malleolar fracture of ankle joint.
- b) Patients of any sex and in age groups of 11-50.
- c) Patients who were fit for surgery.

Exclusion criteria

- a) Open ankle fracture,
- b) A fracture and open epiphyses,
- c) A previous fracture of either ankle,

- d) Patient unfit for surgery and/or anesthesia.
- e) Patient not given written consent for surgery.

Cases were diagnosed on history, clinical examination and investigation. Fractures of the ankle were evaluated using plain radiographs in antero-posterior, lateral and mortise views. Statistical data included name, age, sex, ward, chief complaints, history, general examination, diagnosis, investigations, treatment done, operative technique and type of implants used, post-operative complications of surgery and follow up results. Baird and Jackson’s [6] scoring system was used for functional assessment.

Results

In this study 214 cases of ankle joints of either sex with age ranging from 11-50 were studied for a period of 18 months in Kakatiya Medical College, Warangal, Telangana, India. The type of injuries and number of cases are listed in Table 1. The data in Table indicates that sprains were n=135, followed by medial malleolar fractures n=34 (15.88%), followed by bimalleolar fractures n=25 (11.68%), then trimalleolar fractures n=7 (3.27%) and the least were lateral malleolar fractures n=4 (1.87%).

These cases were treated either by conservative or surgical method (Table 1). Out of n=214 cases, 135 cases were sprains and the treatment given was conservative (100%) method. Out of 34 medial malleolar fractures n=22 (64.7%) cases were treated by conservative and n=12 (35.2%) by surgical method. Out of 25 bimalleolar fractures n=17 (68.2%) cases were treated by conservative method and n=8 (32.0%) by surgical method. Out of 4 lateral malleolar fractures n=2 (50%) were treated by conservative and n=2 (50%) by surgical method. Among 7 trimalleolar fractures n=5 (71.4%) cases were treated by conservative and n=2 (28.5%) by surgical method. Dislocation cases were n=9 out of which n=6 (66.6%) were treated by conservative method while n=3 (33.3%) by surgical method.

Table 1: Type of treatment by either conservative or surgical method

S No.	Type of injury	Total number of cases	Conservative		Surgical	
			Number of cases	(%)	Number of cases	(%)
1.	Sprains	135	135	100	-	-
2.	Lateral malleolus fracture	4	2	50	2	50
3.	Medial malleolus fracture	34	22	64.7	12	35.2
4.	Bi malleolus fracture	25	17	68.2	8	32.0
5.	Tri malleolus fracture	7	5	71.4	2	28.5
6.	Dislocations	9	6	66.6	3	33.3
Total			187		27	

In this study 27 cases of ankle fractures were treated by surgical method at MGM Hospital, Warangal (Table 2). The average age for the whole group was 30.10 years (11-50yrs). Male to female ratio was 7:2 (Table 2). In this study left side

was observed to be more often injured than right side (Table 2). Left side was affected in n=15 cases (55.5%) and right side in n=12 (44.4%) cases.

Table 2: 27 cases that were operated showing age incidence, sex ratio and side incidence

	Age Group				Sex		Side	
	11-20	21-30	31-40	41-50	Male	Female	Right	Left
No. of cases	5	12	8	2	21	6	12	15
Percentages	18.5	44.4	29.6	7.4	77.77	22.22	44.4	55.5

Out of 27 cases n=22 (81.4%) cases were displaced fractures and failure to reduce cases were n=5 (18.5%) and non-union cases were NIL (Table 3). Open reduction and internal fixation was done in n=22 (81.4%) displaced fractures and dislocated ankles. Open reduction for Non-Union was NIL.

Table 3: Displaced fractures, failure to reduce and non-union cases and their percentages

Indication	Number of cases	Percentage
Displaced fractures	22	81.4
Failure to reduce	5	18.5
Non- union	NIL	NIL

In the present series studied, the distribution of cases and their percentages (%) depending on the nature of the causative injuries are shown in Table 4. In this study it was observed that abduction type of injury was the most pre-dominant type with n=14 (51.8%) out of 27 cases, followed by Adduction type with n=8 (29.6%) cases, followed by Pronation External Rotation in n=3 (11.1%) cases and the least was Supination External Rotation Type in n=2 (7.4%) cases. In the present study labours topped the list of injuries however, followed by housewives with 51.85% and 22.22% involvement respectively.

Table 4: Incidence for causative injuries

S No.	Type of injury	Number of cases (n=)	Percentage (%)
1.	Abduction	14	51.8
2.	Adduction	8	29.6
3.	Pronation external rotation	3	11.1
4.	Supination external rotation	2	7.4

Follow up

The follow up of 3 months to 2 yrs and 6 months was made.

Table 5: Grading of cases in bimalleolar fractures

Grade	Criteria	Number of cases	Percentage
GOOD	Full range of painless ankle movements, no limp	10	83.2
FAIR	Terminal degree of ankle movements restricted. Limping present	1	8.3
POOR	Painful restricted movements of ankle, limping present	1	8.3
Total		12	



PRE-OPERATIVE **POST-OPERATIVE**

Fig 1A. Pre-operative, B, post-operative X Ray and Clinical Photographs

Complications

No surgery is without complications even in the best hands. But it is the careful selection of cases that decreases the overall bad results. And the need of a good technical skill always looms large. Our patients too had some complications as we found out during our follow up. The commonest problem we faced was edema that occurred after removal of the slab, casing and initiation of weight bearing. We used an elasto crepe bandage in these patients during day time and advised elevation of foot during night time. In most cases with time the edema subsided. In those which are compound dislocations and in those where reduction was not all that good, their edema persisted. In cases (n=3) where edema did not subside, ultimately these patients developed painful movements and pain on weight bearing. We presumed that they were developing secondary osteoarthritis.

Most patients were followed up once in 3wks and later 6wks. Then physiotherapy was started. After 6-12wks partial weight bearing was allowed. During the review these patients were examined clinically for complaints of pain, signs of swelling and range of movements. Any deformity was looked for and the patients were educated regarding physiotherapy. For all the cases radiological examination to assess the progress of union was done regularly.

The following implants were used: Malleolar screw fixation, under tourniquet control – B/K slab applied, through medial approach under SA done and B/K pop slab applied, K-wire, tension band wiring under SA. The majority of the cases were treated with malleolar screw, K-wire and tension band wiring. In this study 12 patients with malleolar fractures were treated surgically (Fig. 1A & B). The final result was graded as good, fair, or poor (Table 5) as using healing criteria. Good results were achieved in 10 cases (83.2%), fair in 1 case (8.3%) and poor in 1 case (8.3%). The patient who had fair results had terminal degree of ankle movements restricted and limping was present. The patient who had poor results had mild pain during his activities of daily living, painful restricted movements of ankle and limping was present.

Infection occurred in 4 patients out of which 2 were superficial. After treatment with appropriate antibiotics these patients had good recovery. In 2 cases with deep infection the result was fair and poor. There was no mal-union or non-union. For all the cases union occurred in 6 – 8 weeks.

Discussion

Fractures of the ankle being articular and weight bearing extremity, need accurate reduction if residual pain and disability are to be avoided and incidence of arthritis is to be reduced. Treatment of ankle fractures with accurate open reduction and internal fixation using AO principles was found to give good results. In our study 27 patients with ankle fractures were treated surgically by open reduction and internal fixation.

There has been gradual evolution in management of ankle fractures due to improved analysis of biomechanics, improvement in fixation techniques and analysis of results of recent studies. The goal of treatment is to provide fracture union with painless full motion of ankle and with anatomical restoration of the injured ankle.

Closed method of treatment is often inadequate in restoring the anatomy and biomechanics of ankle in unstable malleolar ankle fractures. Conversely, open reduction with internal fixation is an excellent method for restoration of normal anatomy of the joint. Several studies indicated that, internal fixation of displaced malleolar fractures of ankle provides good results [4, 7-9].

In case of our patients there was no instability of ankle or subtalar joints, because we allowed sufficient time for the soft tissues around the ankle to heal. We preferred post-operative immobilization rather than allowing active ankle exercise as there was no difference in the results after 6 months of follow up.

The treatment of bimalleolar fractures with accurate open reduction and stable internal fixation using AO method and principles was observed to give a high percentage of good results [4]. The present study results support these conclusions and are comparable with those in other studies.

In our study, fractures were more common in the 21-30 yrs age group, with mean age being 30.1 yrs. However, findings of the studies made by Beris *et al* [4], Baird and Jackson [6] and Lee *et al* [10] showed fractures were common in the 31-40 years age group with slight variation in our present study. Left ankle was most commonly affected in the present study, contradictory to the results of Beris *et al* [4], Roberts [11]. In the present study, the most common type of injury was abduction (51.8%), followed by adduction injury (29.6%), followed by pronation-external rotation injury (11.1%), later followed by supination-external rotation (7.4%), contradictory to the results published by Roberts [11], Beris *et al* [4], Baird and Jackson [6], Zakir Ali Shah and Uzma Arif [12].

In our study males more often injured their ankles, the left side was more often injured and most patients were in their third decade when injured. In most of the cases conservative management was performed and surgery was done when closed method was not satisfactory. Post-operative complications were found not so frequently but were usually seen in compound fractures. Time of interval between operation and weight bearing in most of our cases was about 6 weeks. Routinely all our cases had post-operative pop slab, to prevent premature walking for 6 weeks. Anatomical reduction was obtained in 10 cases out of which 7 had good recovery ultimately. There was no mortality in our study. An attempt was made to follow up all cases as far as possible. But only half the cases turned up for long term follow up.

The results in the current study were compared with that of Burnwell and Charnley [7] (Table 6). In Burnwell and Charnley [7] series, 82% of the patients had a good to excellent results, 17.5% had fair results and 0.5% was found to score poor.

Table 6: Comparison of results with other series

S No	Series	Follow up period	GOOD (%)	FAIR (%)	POOR (%)
1.	Burnwell and Charnley [7]	8 years	82	17.5	0.5
2.	Jer Gessen	--	84	16	0
3.	Present study	3 months to 2yr	83.3	8.3	8.3

In Jer Gessen series, among the cases of ankle fractures treated by open reduction and internal fixation using AO technique, obtained 84% good results, 16% Fair and 0% poor results. The functional results of the present study were comparable with that of the above cited studies, with 83.3% had good results, 8.3% had fair results and poor results in 8.3%.

Conclusion

Just as anywhere else the ultimate result depends on proper case selection and great judgement is required in proper selection of surgical approach and method of fixation. The abduction type of injury was most common and required internal fixation most often. As even slightest lateral displacement produced a gross reduction, in the talo-tibial contact area anatomical reduction was aimed at in all cases. We frequently mobilized the ankle joint early to achieve good range of movements of the ankle joint. Routine pop

immobilization was done in all our cases to help the soft tissues to heal better. It is found that the quality of clinical results depend mostly on the accuracy of the reduction and to less extent on the degree of initial displacement. 83.2% of our results are good. It is concluded that rigid internal fixation follow anatomical reduction and early mobilization is most often met with success than closed methods of treatment.

The surgical treatment of bimalleolar fractures with open reduction and rigid internal fixation using AO principles was found to give a high percentage of good results. By this technique we achieved good results of 83.3 percent.

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