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Functional outcome of surgical management of malleolar fractures of the ankle joint using Baird-Jackson scoring - A Prospective study

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Abstract

Introduction- Ankle fractures are the most common type of fractures treated by orthopaedic surgeons worldwide accounting for around 10% of all the fractures. better understanding of the biomechanics of the ankle, improvements in fixation techniques and findings of outcome studies performed worldwide, there has been a gradual evolution in the effective strategies for the treatment of ankle fractures. The purpose of the present study was to evaluate the functional outcome and results obtained after surgical management by various methods of internal fixation for malleolar ankle fractures with the help of the Baird-Jackson score. Material and Methods- 53 patients with bimalleolar fractures were treated between August 2014 and August 2015 at a tertiary care hospital. The inclusion criteria were closed bimalleolar fractures in skeletally matured patients. Patients with compound fractures, pilon fractures and those with syndesmotic injuries were excluded from the study. Results- The mean age of patient was 37.3 years. 34 (64.2%) cases had road traffic accident as the mechanism of injury. The most common fracture as per the Danis-Weber classification was type C including 36 (67.9%) cases. 29 (54.7%) cases had supination external rotation type of injury as per Lauge Hansen classification system, 2 (3.77%) cases had superficial infection which resolved completely with oral antibiotics. There were no cases of non-union or mal-union in the present study. As per the Baird Jackson scoring system, 44 (83%) cases had good to excellent results, 7 (13.3%) had fair and 2 (3.7%) of the cases had poor results respectively. Conclusion- Treatment of bimalleolar fractures by plating and tension band wiring has good and favorable outcomes especially in Indian scenario where manual work is of utmost importance.

Keywords: Ankle joint, Fracture fixations, Ankle fractures

1. Introduction

Ankle fractures are the most common type of fractures treated by orthopaedic surgeons worldwide accounting for around 10% of all the fractures [1]. Of late, there has been an increase in the prevalence of ankle fractures both in the young patients as well as in the elderly [2, 3].

Most ankle fractures are complex injuries encompassing both ligamentous and bony components that are difficult to manage. These injuries gain utmost importance owing to the fact that the whole body weight is transmitted through the ankle and locomotion depends upon the stability of the ankle joint. They have the potential to produce significant long-term disability and complications in the form of pain, instability and early degenerative arthritis [4]. As a result of a better understanding of the biomechanics of the ankle, improvements in fixation techniques and findings of outcome studies performed worldwide, there has been a gradual evolution in the effective strategies for the treatment of ankle fractures. Usually the stable fractures are treated conservatively whereas the unstable ones are operated immediately followed by an extensive rehabilitation programme [5]. The various operative methods that are used to treat malleolar fractures restore the anatomy and contact-loading characteristic of the ankle in addition to allowing early weight bearing and early mobilization [6]. The purpose of the present study was to evaluate the functional outcome and results obtained after surgical management by various methods of internal fixation for malleolar ankle fractures with the help of the Baird-Jackson score.

2. Material and Methods

53 patients with bimalleolar fractures were treated between August 2014 and August 2015 at a tertiary care hospital. The inclusion criteria were closed bimalleolar fractures in skeletally matured patients. Patients with compound fractures, pilon fractures and those with syndesmotic injuries were excluded from the study. All the necessary pre-operative work-up was done in the form of Radiological and (Fig. 1) hematological investigations. All the fractures were classified using the Lauge Hansen classification system. Well written informed consent was taken from all the patients enrolled in the study. Prior ethical committee approval was obtained. Regular follow-ups were done at 3, 6 and 12 months post-operatively (Fig. 2). The final results were calculated using the Baird Jackson scoring system (Table 1).

Fig 1: Pre-Operative X ray

Fig 2: Post-Operative X ray

Table 1: Baird and Jackson's Scoring System

Pain	Score
No Pain	15
Mild Pain with strenuous activity	12
Mild Pain with activities of daily living	8
Pain with weight bearing	4
Pain at rest	0
Stability of Ankle	
No Clinical instability	15
Instability with sports activities	5
Instability with activities of daily living ability to walk	0
Able to Walk	
Able to walk desired distances without limp or pain	15
Able to walk desired distances with limp or pain	12
Moderately restricted inability to walk	8
Able to walk short distance only	4
Unable to walk	0
Able to Run	
Able to run desired distances without Pain	10
Able to run desired distances with slight Pain	8
Moderate restriction in ability to run with mild pain	6
Able to run short distances only	3
Unable to run	0
Motion of the Ankle	
Within 10 degrees of uninjured ankle	10
Within 15 degrees of uninjured ankle	7
Within 20 degrees of uninjured ankle	4
<50 degree of uninjured ankle, or dorsiflexion <5 degree	0
Radiographic result	
Anatomical with intact mortice	25
Same as with mild reactive changes at joint margins	15
Measurable narrowing of superior joint space	10
Moderate narrowing of superior joint space	5
Severe narrowing of superior joint space	0
Ability to Work	
Able to perform usual occupation without restrictions	10
Able to perform usual occupation with restrictions in some strenuous activities	8
Able to perform usual occupation with substantial restriction	6
Partially disabled	3
Unable to work	0

Maximal Possible Score 100
Excellent: 96-100, Good: 91-95: Fair: 81-90 and Poor: 0-80

2.1 Surgical Technique

The patient was placed in supine position after administration of spinal and/or epidural anaesthesia. A sandbag was placed under the ipsilateral buttock. Pneumatic tourniquet with a pressure of 300mm of Hg was used in all the cases. Standard surgical steps were followed in all the cases. Fibula was operated first in all the cases.

2.2 Approach to Fibula

A direct lateral approach over the fibula was taken with the dissection plane between the peroneus tertius anteriorly and the peroneus longus and brevis posteriorly. Soft tissues and periosteum were cleared a few millimeters of the fracture edge and fracture fragments were visualized. Fracture reduction was done by reversing the force that caused the fracture. Preliminary fixation of the fragments was done using the inter fragmentary lag screws which was later followed by application of 3.5mm Low contact dynamic compression plate/ distal fibula anatomical LCP or a reconstruction plate was applied on the lateral or posterior surface of the fibula as appropriate. The reduction was visualized at every crucial step under fluoroscopy in both the orthogonal views. Meticulous closure was done in all the cases.

2.3 Approach to Medial malleolus

The sandbag under the buttock was removed to facilitate the approach for medial malleolus fracture. Anteromedial approach centered over the fracture was used in all the cases. Fracture fragment was reduced and the articular surface was visualized for any soft tissue interposition. Modified tension band wiring was done for all the cases. Meticulous closure and repair of deltoid ligament was done wherever required.

3. Results

The mean age of patient was 37.3 years. There were 33 (62.3%) males and 20 (37.73%) females in the present study. Right sided preponderance was seen in the present study accounting for 37 (69.8%) cases. 34 (64.2%) cases had road traffic accident as the mechanism of injury while 19 (35.8%) had accidental fall in the present study. As per the Danis-Weber classification and 36 (67.9%) cases had type C, 10 (18.8%) cases had type B and 7 (13.2%) cases had type C fractures respectively. According to Lauge Hansen classification system, 29 (54.7%) cases had supination external rotation type of injury, 13 (24.6%) cases had pronation external rotation type of injury and 11 (20.7%) cases had Pronation adduction type

of injury pattern. Radiological union was seen at 14±4.6 weeks in 33 (62.3%) cases, 17±4.3 weeks in 17 (32%) cases and 20±5.7 weeks in 3 (5.6%) cases. 2 (3.77%) cases had superficial infection which resolved completely with oral antibiotics. There were no cases of non-union or mal-union in the present study. As per the Baird Jackson scoring system, 17 (32%) cases had excellent results, 27 (51%) had good results, 7 (13.3%) had fair and 2 (3.7%) of the cases had poor results respectively.

4. Discussion

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, 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 joint.

Several studies indicated that, internal fixation of displaced malleolar fractures of ankle provides better results [6, 7]. 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 results11.

In the present study, road traffic accidents accounted for 64.2% of the cases, which was in accordance with the study by Lee *et al.* [8].

29 (54.7%) cases had supination external rotation type of injury, 13 (24.6%) cases had pronation external rotation type of injury. The observations of the present study are comparable to those made by Roberts RS [9] and Baird and Jackson [10].

Using paired t-test, the values obtained were t=18.8, degrees of freedom = 2 and probability = 0.003 ($p<0.05$) which shows that our results are statistically significant.

Most authors have stated that anatomical reduction of displaced medial malleolus ensures correction of talar displacement and is of paramount importance in treating unstable fractures [11]. However, Yablon *et al.* [12] state that talus is more accurately repositioned in mortise by anatomical reduction of lateral malleolus and that lateral malleolus is the key to the anatomical reduction of bimalleolar fractures, because the displacement of the talus faithfully followed that of the lateral malleolus. Poor reduction of distal part of fibula would result in persistent lateral displacement or residual shortening. This does not necessarily lessen the importance of the medial malleolus in contributing to the congruity of medial aspect of ankle, but it does serve to emphasize that the lateral malleolus should no longer be ignored in the treatment of ankle injuries.

Lateral malleolus can be fixed by various methods. Lateral plate, as advocated by AO group has become widely accepted for treatment of fibular fracture13.Hughes14 *et al.* recommended that lateral malleolus should be fixed first. The medial malleolus is then inspected for stability and fixed if necessary. This allows minimal postoperative immobilization and rapid recovery of function.

In the present study, all 53 cases were fixed with a lateral plate (3.5mm distal fibula anatomical LCP, Reconstruction plate, 1/3rd tubular plate and 3.5 LC-DCP) in which 44 (83%) cases had good to excellent results, 7 (13.3%) had fair and 2 (3.7%) of the cases had poor results respectively. The results in were compared with those of Burwell & Charnley6, Colton11, De souza *et al.* [7] and Beris *et al.* [15].

Although early mobilization was advocated by AO, immobilization in the initial post-operative period has also been supported. Others have found no significant difference in the results produced after early motion or immediate plaster splintage3. In the present study, immobilization till suture removal in plaster cast followed by mobilization and partial weight bearing was used successfully. The range of motion was reduced initially but after the cast removal the ankle movement rapidly improved. A number of different treatment regimens have been suggested.

Burwell and Charnley6 advocated postoperative joint mobility exercises in bed until motion was restored followed by full weight bearing in a cast. Meyer and Kumler13 used a post-operative cast but only for an average of 3.8 weeks followed by non- weight bearing mobilization until fracture union.

According to Makwana16 the risk of complications after internal fixation is low but higher with closed treatment. Significantly in this study there were no non-unions of themedial malleolus and no malunions which were reported in some series to occur in 30% and 48% respectively after closed reduction. The only complication reported in this study was superficial skin infection, reported in 2 cases, which resolved with oral antibiotics.

A broad understanding of all aspects of mechanism of injury, pathoanatomy and treatment options coupled with training experience is required before any attempt should be made to treat these injuries with thorough understanding of injury patterns repair of the damaged ankle joint can lead to rewarding outcomes for the patient and the surgeon.

4.1 Limitations

Low sample size and short term follow up are the limitations of the study.

5. Conclusion

In the Indian scenario, where a major chunk of the people belong to the lower rung of the socioeconomic ladder and, as a result, are entirely dependent on a pain-free and stable, early mobility of the ankle to carry on their work and day-to-day activities without any hurdles and also where most people are time-bound for various reasons – economic or social - it is important to make sure that such patients of malleolar fractures of the ankle are appropriately treated via open reduction and internal fixation in order to avoid complications. However, further multi centric trials and comparative studies will help to come to an adequate outcome

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7. References

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