

Surgical Management of Bimalleolar Fractures of Ankle in AdultsVishal Anand¹, Rakesh Ramdayal Singh², Soman Kumar Chatterjee³^{1,2}Senior Resident, Department of Orthopaedics, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar³Assistant Professor, Department of Orthopaedics, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar

Received: 10-01-2024 / Revised: 13-02-2024 / Accepted: 10-03-2024

Corresponding Author: Dr. Rakesh Ramdayal Singh

Conflict of interest: Nil

Abstract:

Background: Malleolar injuries are the most common significant lower extremity fractures. These injuries gain importance, because the whole body weight is transmitted through the ankle, and locomotion depends on the stability of the ankle. Open reduction and internal fixation have become the mainstay of treatment for most of the unstable bimalleolar fractures, as these operative methods restores the anatomy, biomechanics and contact loading characteristics of the ankle. Aim of this study to the functional outcome of surgically managed bimalleolar fractures of ankle in adults.

Methods: A prospective study of 40 cases of bimalleolar fractures of ankle in adults, managed surgically by various techniques in Department of Orthopaedics, JLNCH, Bhagalpur, Bihar from January 2020 to December 2020, satisfying the inclusion and exclusion criteria were studied. The functional outcome was evaluated using the Biard and Jackson's ankle scoring system.

Results: Forty patients were included in the study: 24 men and 16 women. Excellent results were achieved in 23 cases (57.5%), good in 10 cases (25%), fair in 5 cases (12.5%) and poor results in 2 cases (5%). Fair to poor result, were seen in those with associated syndesmotic injury and in patients with delayed union of medial malleolus and those with superficial or deep infections. The average time taken for union was 10.4 weeks. Most of the cases (80%) showed union between 8-12 weeks.

Conclusion: Functional outcome of surgery remained good to excellent.

Keywords: ankle fracture, malleolus, syndesmosis, Lauge-Hansen.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Ankle fractures are one of the most common fractures encountered in the emergency and are among the most common injuries treated by orthopedic surgeons. [1] Population-based studies suggest that the incidence of the ankle fractures has increased dramatically since the early 1960s. [2,3] The ankle is a complex joint consisting of functional articulations between the tibia and fibula, tibia and talus, and the fibula and talus, each supported by a group of ligaments. [3,4]

Ankle is not a true hinge joint and is a highly congruent saddle shaped joint. Normally, the ankle joint has 15-20 degree of dorsiflexion and 35-40 degree of planter flexion. This motion is essential for normal function and anything that reduces this motion will limit function of the entire foot-ankle complex. [5,6] As a result of better understanding of the biomechanics of the ankle, and improvement in fixation technique, there has been a gradual evolution in the effective strategies for the treatment of ankle fractures. The goals of treatment

continue to be both fracture union and an ankle that moves and functions normally without pain. Operative treatment is indicated when congruity of the joint cannot be restored with closed methods. [6] So, the purpose of this study was to assess functional outcome of surgery in ankle fractures in adults.

Materials and Methods

Forty patients of either sex above 21 years having closed or grade-I open malleolar fractures with less than two weeks old were identified and informed consent was taken about their inclusion in the study. Patients with Infected, pathological fractures and isolated malleolar and tri malleolar fractures were excluded from study.

The demographic profile (i.e. age, sex) were noted. After careful history and examination, necessary radiographs of ankle were taken. In emergency department leg was elevated after correcting deformity and back slab was applied. All the patients

were evaluated medically and base line investigations were carried out. Pre-operative antibiotics were given in all the cases at the time of induction. The patients were operated under anesthesia by open reduction and internal fixation with AO technique. Patients follow up was done in outpatient department at 2 weeks, 6 weeks and 6 months. X-rays were made to see for the union. Baird and Jackson's scoring system was used for functional

assessment. All the collected information was entered into SPSS version 17.0 and Qualitative & Quantitative variables were calculated.

Results

In our study, 40 cases of bimalleolar fractures of ankle were treated by surgical methods at hospital. The mean age was 37.4 years (Table 1).

Table 1: Age incidence

Age in years	No. of cases (n=40)	Percentage
21-30	12	30%
31-40	17	42.5%
41-50	6	15%
51-60	5	12.5%

In present study, majority of the patients were males, with M: F ratio of 3:2 (Table 2)

Table 2: Sex incidence

Sex	No. of cases (n=40)	Percentage
Male	24	60%
Female	16	40%

Right side was involved in 25 (62.5%) cases and left ankle in 15 (37.5%). Road traffic accident was the most common mode of injury (Table.3).

Table 3: Mode of injury

Mode of injury	No. of cases (n=40)	Percentage
Road traffic accident	18	45%
Fall	14	35%
Twist injury	8	20%

In our study, Lauge Hansen classification was used (Table 4).

Table 4: Fracture type (Lauge Hansen)

Lauge Hansen type	No. of cases (n=40)	Percentage
Supination-external rotation	15	37.5%
Supination-adduction	5	12.5%
Pronation-abduction	8	20%
Pronation external rotation	12	30%

Medial malleolar fractures were fixed with malleolar screws and the lateral malleolar fractures were fixed with one third tubular plate. In two cases (5%) syndesmotic injury was noted and in these two cases it was fixed with a fully threaded screw. Weight bearing was deferred till screw removal which was done at 6-8 weeks. In our study, the average time taken for union was 10.4 weeks. Most of the cases (80%) showed union between 8-12 weeks. In our study, 4 patients had superficial infection, 1 patient deep infection, 2 patients delayed union medial malleolus. The

infections (superficial and deep) were managed with debridement and antibiotics. Delayed union of medial malleolus was treated with continued immobilization, which eventually united without surgical intervention. In this study, excellent results were achieved in 23 cases (57.5%), good in 10 cases (25%), fair in 5 cases (12.5%) and poor results in 2 cases (5%). Excellent results were observed in most bimalleolar fractures. The patients with poor results had mild pain during their activities of daily living (Table.5).

Table 5: Functional Results

Functional score	No. of cases (n=40)	Percentage
Excellent	23	57.5%
Good	10	25%
Fair	5	12.5%
Poor	2	5%

Discussion

Of all the intra-articular fractures, the most common joint involved is the ankle joint. 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. Closed method of treatment is often inadequate in restoring the anatomy and biomechanics of ankle joint. 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 [8,9,10,11]. In our study, we had 40 patients with bimalleolar ankle fractures, who were operated upon and were followed up with minimum period of 6 months.

In our study, fractures were commoner in the 31-40 years age group, which is comparable to the studies made by, Beris et al [11], Roberts RS [12], Baird and Jackson⁷ and Lee et al [13]. Road traffic accidents constituted majority of cases, which was in accordance with study by Lee et al [13].

Right ankle was more commonly affected, in accordance with Roberts RS [12], Beris et al [11]. In our study, Lauge-Hansen classification system was used for operative evaluation. The most common type of injury was Supination-external rotation 15(37.5%), followed by Pronation-external rotation injury (30%), in accordance with by Roberts RS [12], Beris et al [11], Baird and Jackson [7].

The results in current study were compared with that of Burnwell & Charnley⁸, Colton¹⁴, De souza et al [9], Beris et al [12]. In Colton [14] series, 70% of the patients had a good to excellent results. Burnwell & Charnley [8] 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 [9] series, 150 cases of ankle fractures treated by open reduction and internal fixation using AO technique, obtained 90% good results. In a study by Beris et al [13], of 144 patients with ankle fractures, 105(74.3%) had good to excellent results. The functional results of the present study were comparable with that of the above cited studies, with 82.5% had good to excellent results, 12.5% had fair results and poor results in 5%.

Although early mobilization was advocated by AO group, other studies⁸ have found no significant difference in the results produced after early mobilization. In our study, immobilization was done for 4 weeks. Partial weight bearing was advised for those with early radiological signs of union and full weight bearing when the signs of union were complete. In our series there was 30 degrees or more plantar flexion in 35 patients (87.5%) and 20 degrees or more dorsiflexion in 33(82.5%) patients. Majority of the patients

(82.5%) had good to excellent results in the current study, similar to what was observed in other series like Burnwell & Charnley [8], Colton [14], De souza et al [9], Beris et al [13]. The treatment of bimalleolar fractures with open reduction and stable internal fixation using AO principles was found to give a high percentage of excellent and good results [11]. This study supports these conclusions and was comparable with those in other studies.

Conclusion

Surgical management of bimalleolar ankle fractures provides good functional outcome.

References

1. SooHoo NF, Krenek L, Eagan MJ, Gurbani B, Ko CY, Zingmond DS. Complication rates following open reduction and internal fixation of ankle fractures. *J Bone Joint Surg Am* 2009; 91:1042-9.
2. Honkanen R, Tuppurainen M, Kröger H, Alhava E, Saarikoski S. Relationships between risk factors and fractures differ by type of fracture: a population based study of 12,192 perimenopausal women. *Osteoporos Int*. 1998; 8:25-31.
3. Michelson JD. Ankle Fractures Resulting From Rotational Injuries. *J Am Acad Orthop Surg* 2003; 11:403-12.
4. Khan MA, Shafiq M, Sahibzada AS. *J Postgrad Med Inst* 2005; 19:162-5.
5. Morris JM. Biomechanics of the foot and ankle. *Clin Orthop* 1977; 122:10-17.
6. Lindsjö, U. Operative treatment of ankle fractures. *Acta Orthop Scand* 1981; 52:1-131.
7. Baird AR and Jackson TS. Fractures of the distal part of the fibula with associated disruption of the deltoid ligament. *J Bone Joint Surg*. 1987; 69:1346-52.
8. Burwell HN, Charnley AD. The treatment of displaced fractures of ankle by rigid internal fixation and early joint movement. *J Bone Joint Surg*.1965; 47:634-60.
9. De Souza LJ, Gustilo RB, Meyer TJ. Results of operative treatment of displaced external rotation-abduction fractures of ankle. *J Bone Joint Surg*. 1985; 67: 1066-74.
10. Cimino W, Ichtertz D and Silabaugh P. Early mobilization of ankle fracture after open reduction and internal fixation. *Clin Orthop Relat Res*.1991; 267:152-6.
11. Beris AE, Kabbani KT, Xenakis TA, Mitsionis G, Soucacos PK, Soucacos PN. Surgical treatment of malleolar fractures – a review of 144 patients. *Clin Orthop Relat Res*.1997; 341: 90-8.
12. Roberts RS. Surgical treatment of displaced ankle fractures. *Clin Orthop Relat Res*.1983; 172: 164-70.

13. LeeYih-Shiunn, Huang, Chun-Chen NSP, Chen, Cheng-Nan, LinChien-Chung. Operative treatment of displaced lateral malleolar fractures: The Knowles pin technique. J Orthop Trauma. 2005; 19:192-7.
14. Colton CL .The treatment of Dupuytren's fracture dislocation of the ankle. J Bone Joint Surg Br 1971; 53:63-71.