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Study of surgical management of malleolar fractures of ankle in adults

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Abstract

Background: Ankle fractures are one of the most common fractures encountered in the emergency and are among the most common injuries treated by orthopaedic surgeons. Operative treatment is indicated when congruity of the joint cannot be restored with closed methods. The postoperative period and the protocol of mobilization of the ankle has been a topic of conflict.

Purpose: 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. So, the purpose of this study was to assess functional outcome of surgery in ankle fractures.

Method: A prospective study was conducted from August 2013 to May 2015 on all patients in age group 20 to 65 years reporting to the hospital with malleolar fractures. Total 36 patients recruited for the study all were surgically treated in Poona Hospital and Research Center by various surgeons with various techniques of open reduction and internal fixation. The patients were evaluated as per the rating of the Baird and Jackson score which included objective criteria, subjective criteria and Radiological evaluation.

Results: The final outcome as per the Baird and Jackson scoring was 30.6% was Excellent, 55.6% was Good, 8.3% was Fair and 5.5% was poor. 6 patients had superficial infection and out of 6 patients 4 patients had uncontrolled diabetes. There was statistical significance between diabetes and infection ($p < 0.05$).

Conclusion: Surgical treatment of malleolar fracture is necessary to achieve anatomical reduction of the fracture fragments. Open reduction and internal fixation within 24hours gives excellent clinical and radiological outcome following malleolar injuries.

Keywords: surgical management, malleolar fractures, Ankle fractures, Operative treatment

1. Introduction

Ankle fractures are one of the most common fractures encountered in the emergency and are among the most common injuries treated by orthopaedic 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]. Normally, the ankle joint has 15-20 degree of dorsiflexion and 35-40 degree of plantar 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].

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. The superiority of ORIF over closed treatment have been thoroughly demonstrated in literature^[7, 8]. When malleolar fractures are not reduced accurately they may lead to posttraumatic painful restriction of motion or osteoarthritis or both^[9].

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The postoperative period, the protocol of mobilization of the ankle has been a topic of conflict. The final outcome of a fractured ankle is of prime importance, as the treatment should benefit the patient just not in short term but also in the long term. The treatment of fractures has its challenges in cases where the fracture is complicated by comorbid conditions such as Diabetes mellitus, peripheral vascular diseases and neuropathic conditions which complicates the treatment and influences the overall outcome. 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. So, the purpose of this study was to assess functional outcome of surgery in ankle fractures.

Material and Method

A prospective study was conducted from August 2013 to May 2015 on 36 patients of age group 20 to 65 years reporting to the Poona Hospital and Research Center. All patients were treated by various surgeons with various techniques of open reduction and internal fixation.

Inclusion Criteria is all patients who have given their consent and are willing to undergo surgery, All types of malleolar fractures (Unimalleolar, Bimalleolar, Trimalleolar), Patients of both sexes with age group 20 to 65 years, Closed fractures. Whereas, Exclusion Criteria being Malleolar fracture associated with pilon fracture, Malleolar fracture associated with lower one third fracture tibia, Old neglected fracture, Patient is medically unfit for surgery and or anesthesia.

The patients were evaluated as per the rating of the Baird and Jackson score which included objective criteria, subjective criteria and Radiological evaluation.

On admission of the patient, a careful history was elicited from the patient and/or attendants to reveal the mechanism of injury and the severity of the trauma. The patients were then assessed clinically to evaluate their general condition and local injury. General condition was assessed with the vital signs and systemic examination. Methodical examination was done to rule out fractures at other site

Management of fracture: Local examination of the injured extremity revealed swelling, deformity and loss of function. Palpation revealed tenderness and crepitus at the fracture site. Distal neurovascular status was assessed by the posterior tibial artery and dorsalis pedis artery pulsations, capillary filling, local temperature, pallor and paraesthesia. Patients were stabilized hemodynamically and were administered adequate analgesia. Analgesics administered were Inj Tramadol or Inj. Diclofenac. Anteroposterior and lateral radiographs of the affected leg were taken and fracture patterns were classified based on Weber classification and AO classification. Mechanism of injury was classified based on Lauge- Hansen classification. Patients were put on a below knee splintage with a plaster of Paris posterior slab. Leg elevation over BB splint and medicines to reduce the edema like tab Phlogam started.

Preoperative planning: Following the radiological evaluation, patients were briefed regarding the need for operative treatment and were investigated with routine investigations for the surgical procedure. Patients with comorbid medical illnesses were treated appropriately with the help of general Physicians. Evaluation by anesthesiologists was done. Consent for the surgical procedure was obtained. Antibiotics were administered at the

time of induction of anesthesia. The antibiotics used were second generation Cephalosporins.

Operative Procedure: Spinal anesthesia was administered to 33 patients and General anesthesia for 3 patients. The patient was placed in supine position with a sandbag under the ipsilateral buttock in cases of lateral malleolar fracture. Following exsanguinations, tourniquet was inflated with time being noted. The affected limb was prepared with a primary scrub with Betadine. The parts were then painted with Betadine and Spirit. Surgical draping was done using the standard methods and the foot was covered with a hand towel or a glove. The operative approach for the fixation of the lateral malleolus was done as per the standard approaches, depending on the mode of fixation planned (Figure 2). The lateral malleolar fracture was exposed first. Lateral malleolar fixation was done in 34 cases. Medial malleolus was approached according to the mode of fixation planned using the standard approaches (Figure 1). Fixation was done in 33 patients. Almost all cases we found that there was soft tissue interposition between fracture fragments. Posterior malleolar fracture was noted in 1 case. The posterior malleolar fracture was not fixed as there was anatomical reduction of the fragment. 28 patients were operated within 24 hours of the injury. 8 patients were operated between two and five days because of uncontrolled Diabetes and due to fracture blisters. All the patients were operated under tourniquet control. The duration of surgery varied from 30 mins to 80 minutes. The implants used for the fixation of fractures were as follows:

The medial malleolus was fixed with Canulated cancellous screws in 21 cases of which 2 were single screw. Tension band wiring was done in 12 cases. The lateral malleolus was fixed with Semi tubular plate in 15, One third tubular plate in 16, Tension band wire in 1, Dynamic compression plate in 2. Syndesmotic screw was used in 2 cases. The wound was washed with normal saline and subcutaneous sutures applied using 2-0 Vicryl. Skin was closed with 3-0 Ethilon or Staple. Dressing was done with adequate padding and a below knee plaster of Paris slab was applied.

Postoperative regimen: Patients were administered adequate analgesics. IV Antibiotics were administered for 5 days postoperatively. The foot was kept elevated over pillows. Radiological evaluation was done in the postoperative period which included both Anteroposterior and Lateral views (Figure 3). 1st dressing was done on the second postoperative day. Patient was mobilized on the first postoperative day, non-weight bearing on the affected leg with the help of walker. Patients were discharged on the fifth day on an average.

Follow up: The patients were followed up at 2nd week, 4th week, 6th week, 3rd Month and 6th month. Staples or sutures were removed at follow up in the outpatient clinic at the end of two weeks. Posterior slab removed same day, crepe bandage applied and range of motion of ankle started but patients were advised to continue non weight bearing ambulation with a walker for a period of four weeks. The Plaster slab was removed at the end of 4 weeks. Check x rays were done. Signs of healing and status of the joint was noted. Partial weight bearing was started with support. Full weight bearing was decided on the basis of the X-ray picture (Fig 3 and 5). Patients were followed up at 3 months and 6 months. At the end of 6 months, patients were evaluated as per the

rating of the Baird and Jackson criteria which included objective criteria, subjective criteria and Radiological evaluation. (Figure 4 and 6).

Statistical Method: PERCENTAGE METHOD and CHI SQUARE TEST were used as the statistical method for analysis.

Results

The age of the patients ranged from 23 to 62 years with the fracture being most common in 3rd and 4th decade and an average age of 39 years. (Table 1)

Out of 36 patients, 24 (66.7%) patients were males and 12 (33.3%) were females showing male preponderance because of travelling and working. The mechanism of injury was classified based on Lauge - Hansen classification. In which 14(38.9%) patients had Supination External Rotation, 12(33.3%) patients Pronation External Rotation, 8(22.2%) patients Supination Adduction and 1 patient each had Pronation Abduction and Pronation Dorsiflexion type of injury. (Table 2)

Functional outcome were assessed by using Baird and Jackson score. At the end of 6 months 11(30.6%) patients had excellent outcome, 20(55.6%) had good results, 3(8.3%) patients had fair outcome and 2 (5.5%) had poor results. (Table 3)

There was statistical significance in functional outcome according to age with the patients in the age group 31 to 50 years having higher no. of patients with excellent and good functional outcome.

There was statistical significance between complication and functional outcome. Functional outcome is fair to poor in patients having complications.

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^{9,10,11,12} In our study, we studied the surgical management of malleolar fractures of ankle in adults and We evaluated our results and compared them with those obtained by various other studies, our analysis is as follows : Our study revealed the average age of the patients with malleolar fracture to be 39 Years. (Table 1)

In our study, the male preponderance for such kind of injuries is high (66.7%) This is possibly due to the fact of male dominance over the female in travelling, occupational injuries etc. in India. (Table 2)

In our study, the most common mechanism of injury was Supination External Rotation injury with 38.9% incidence. (Graph 1).

In our study, 30.6% patients had excellent outcome, 55.6% had good outcome, 8.3% had fair outcome and 5.5% patients had poor outcome. (Graph 3). Our findings were comparable with a study conducted by Nabeel Shams *et al* and Burnwell and Charnley. In our study, there was a statistical significant difference between the patients who developed complications and the functional outcome and those who did not develop

complications and functional outcome ($p < 0.05$). Presence of complications hampered the functional outcome in our study. Study conducted by Eugene and Beauchamp *et al* had superficial infections in 9% patients. In our study 16.67% patients had superficial skin infection and 8.3% patients had ankle stiffness. In our study, 6 patients had superficial infection and out of 6 patients 4 patients had uncontrolled diabetes and infection ($p < 0.05$), which suggest patients having diabetes has more chances of infection as compared to non-diabetic patient (Graph 2). We had 3 patients with ankle stiffness. This was probably due to the noncompliance of the patient to the advised physiotherapy regimen, as there was no means to monitor the physiotherapy of the ankle joint after discharge of the patient. In our study, 28 patients were operated within 24 hours of the injury. 8 patients were operated between two and five days because of uncontrolled Diabetes and due to fracture blisters and swelling. There was statistical significance between functional outcome and time outcome and time duration between injury and surgery ($p < 0.05$). This indicates that fractures treated before 24 hours from injury has excellent to good functional outcome as compared to fracture treated after 24 hours.

Limitations of this study includes 1) only 6 Months follow up is inadequate, longer follow up are required to evaluate the post operative ankle arthritis and functional outcome. 2) Larger number of sample size would have been better to evaluate functional outcome.

Conclusion

1) The fractures of the ankle are commonly seen in the young adult male population with Road traffic accidents and twisting injuries being the common causes. 2) Right side ankles were commonly involved than the left side. 3) Weber type B was the commonest type of fracture. Supination external rotation injury was the most common mechanism of injury. 4) During surgery, the soft tissues dissection was kept minimal to avoid further vascular compromise in an already tense, swollen ankle which helped in reducing skin n suture related complications and early mobilisation. 5) In the post operative period, splintage of the ankle and precaution to prevent swelling of the ankle is necessary. The swelling may lead to delayed wound healing. Patients are ambulated with walker without bearing weight on the injured limb from the first post operative day if there are no associated injuries and can be discharged from the hospital by the first week. 6) Most of the fractures in our study were fixed within 24 hours which however showed excellent to good outcome, though other studies have stressed upon fixation within 8 hours of injury. The complications that arose were in those where the fractures were fixed after 24 hours which were ankle stiffness, delayed wound healing and superficial infections of the wound which all healed with regular wound care and antibiotics. 7) The four week period of immobilization did not affect the final range of ankle function as most patients had achieved full range of motion by the end of 12 weeks postoperatively with active exercise regimen. 8) Uncontrolled diabetes and swelling was responsible for soft tissue complications which lead to fair to poor functional outcome.



Fig 1



Fig 2



Fig 3



Fig 4



Fig 5



Fig 6

Table 1: Showing age distribution

AGE	No. of patients	Percentage
21-30	8	22.2
31-40	12	33.3
41-50	11	30.6
51-60	4	11.1
61-70	1	2.8
Total	36	100

Table 2: Showing sex distribution

Sex	N0. of patients	Percentage
Males	24	66.7
Females	12	33.3
Total	36	100

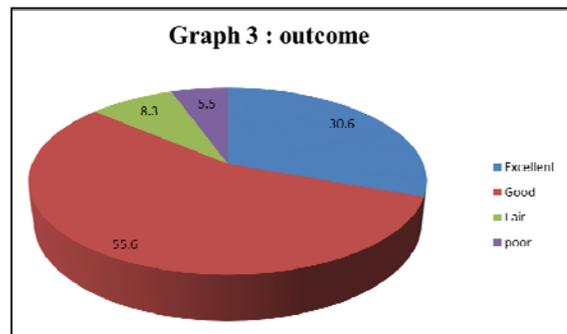
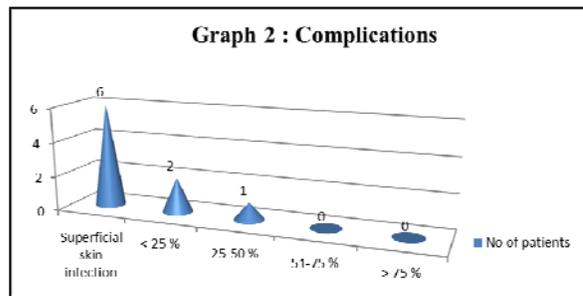
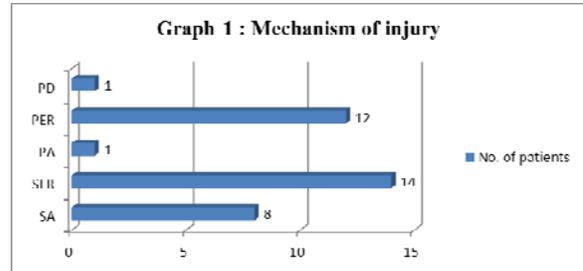
Table 3: Functional outcome

Study	Excellent	Good	Fair	Poor
Nabeel Shams <i>et al</i>	62%	19%	14.3%	4.7%
Maruti CV <i>et al</i>	20%	70%	10%	0
Present study	30.6%	55.6%	8.3%	5.5%

Table 4: Association between complication and functional outcome

Complications	Excellent	Good	Fair	Poor	Total
Superficial skin infection	1	3	2	0	6
Ankle stiffness < 25%	0	0	1	1	2
Ankle stiffness < 25 to 50%	0	0	0	1	1
No complications	10	17	0	0	27
Total	11	20	3	2	36

Chi-square = 39.633 p Value = 0.00001 p < 0.05



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(6):403-12.
4. Muhammad Ayaz Khan, Muhammad Shafiq, Ahmad Sohail Sahibzada. Operative management of closed ankle fracture with AO technique. *J Postgrad Med Inst*, 2005; 19(2):162-5.
5. Morris JM. Biomechanics of the foot and ankle. *CORR*, 1977; 122:10-17.
6. Lindsjö U. Operative treatment of ankle fractures. *Acta Orthop Scand Suppl*, 1981; 189:1-131.
7. Marsh JL, Saltzman CL. Ankle fractures. In: Bucholz RW, Heckman JD, Court-Brown CM, editors. *Rockwood Green's Fract adults*. 6th ed. Philadelphia: Lippincott Company, 2148-247.
8. Leland RH, Mast JW. Ankle fractures and dislocations including Pylon Fractures. *Chapmans Orthop. Surg*. Philadelphia: J.B Lippincott Company, 812-45
9. Beris AE, Kabbani KT, Xenakis TA, Mitsionis G, Soucacos PK, Soucacos PN. Surgical treatment of malleolar fractures – a review of 144 patients. *CORR*. 1997; 341:90-8.
10. 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.
11. 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.
12. Cimino W, Ichtertz D, Silabaugh P. Early mobilization of ankle fracture after open reduction and internal fixation. *Clin Orthop Relat Res*, 1991; 267:152-6.