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Original Research Paper

Orthopaedics

SURGICAL OUTCOME OF ANKLE FRACTURES

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ABSTRACT Ankle fractures are one of the most common injuries treated by orthopaedic surgeons. Ankle fractures have been the subject of numerous studies and articles regarding the mechanism of injury, classification and treatment modalities. The ankle is a mortise joint formed by the lower end of the tibia and fibula articulating with the talus. Ankle fractures usually affect young men and older women, however, below the age of 50; ankle fractures are the commonest in men. Two commonly used classification systems for ankle fractures include the danis weber AO classification and the Lauge-Hansen classification. In 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 co-morbid 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.

KEYWORDS : Ankle fracture, Treatment, Classification, Management

Introduction

Ankle fractures are one of the most common injuries treated by orthopaedic surgeons. Ankle fractures have been the subject of numerous studies and articles regarding the mechanism of injury, classification and treatment modalities. The ankle is a mortise joint formed by the lower end of the tibia and fibula articulating with the talus. Ankle fractures usually affect young men and older women, however, below the age of 50; ankle fractures are the commonest in men.

The treatment of fractures has its challenges in cases where the fracture is complicated by co-morbid conditions such as Diabetes mellitus, peripheral vascular diseases and neuropathic conditions which complicates the treatment and influences the overall outcome.

Materials and Methods

A prospective randomized study was carried out in AVBRH Sawangi Meghe, from March 2015 to September 2017 and all the patients who fulfilled the below mentioned inclusion criteria were included in the study.

Inclusion Criteria

1. Cases of closed bimalleolar and trimalleolar ankle fractures
2. Skeletally mature patients above 18 years of age
3. Entire definite treatment done in our institution
4. Patients who comply with regular follow up for a period of at least 6 months

Exclusion criteria Children below 18 yrs, Patients who lost to follow up. Multiple trauma or other injuries. Open fractures & Neurovascular Injuries

Patients were initially assessed in the emergency department, appropriate radiological and laboratory investigations were carried out and patients who satisfied the inclusion criteria were considered for the study. The fractures were classified according to the Lauge-Hansen system.

All patients underwent surgical fixation of the fractures, and post operatively were put on a plaster of paris (POP) slab. Post-operative antibiotics were continued for a period ranging from 3 to 5 days depending on the presence of other injuries and therapy was prolonged if there were signs of infection. Initial wound inspection was done on the third postoperative day. Once pain free, patient was trained in non-weight bearing crutch walking. The slab was continued till suture removal following which the patients were advised dorsiflexion and plantar flexion exercises.

There were
12 cases of Supination-Adduction injury, 24 cases of Supination – External rotation injury, 2 cases of Pronation – Abduction injury, 20 case of Pronation – External rotation injury and 2 cases of Pronation – Dorsiflexion injury.

There were 6 cases of type A, 32 cases of type B and 22 cases of type C Weber injury.

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 co-morbid 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 either a first or second generation Cephalosporin's

Spinal anesthesia was given in all the cases. The patient was placed in supine position with a sand bag 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. The lateral malleolar fracture was exposed first.

Lateral malleolar fixation was done in 60 cases. Medial malleolus was approached according to the mode of fixation planned using the standard approaches. Fixation was done in 60 patients. Posterior malleolar fracture was noted in 11 cases. The posterior malleolar fracture was not fixed in any of the cases as there was anatomical reduction of the fragment.

48 patients were operated within first day of the injury. 11 patients were operated between two and five days because of uncontrolled Diabetes and due to fracture blisters. Two patient was operated 10 days later due to unsatisfactory skin condition and fracture blisters.

All the patients were operated under tourniquet control. The duration of surgery varied from 30 mins to 1 hour and 30 minutes averaging 1 hour The implants used for the fixation of fractures were as follows: The medial malleolus was fixed with Malleolar screws in 54 cases of which six were single screw. Tension band wiring was done in 6 cases.

The lateral malleolus was fixed with Semi tubular plate in 10, One third tubular plate in 26, Tension band wire in 6, Dynamic compression plate in 10, Rush pins in 2 and K-wire in 6 cases. Syndesmotic screw was used in 16 cases.

The wound was washed with normal saline, drain tubes were placed and subcutaneous sutures applied using 2-0 Vicryl. Skin was closed with staples. Dressing was done with adequate padding and a below knee plaster of Paris slab was applied. Patients were administered adequate analgesics. Antibiotics were administered for 72 hours postoperatively. The foot was kept elevated over pillows.

Radiological evaluation was done in the postoperative period which included both Anteroposterior and Lateral views. These were graded as per the Kristensons criteria.

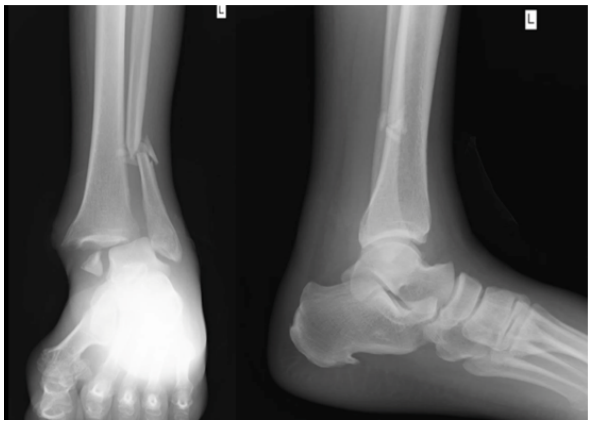
Patient was mobilized on the first post operative day, non weight bearing on the affected leg with the help of walker or auxiliary crutches. Patients were discharged on the fifth day on an average. Staples were removed at follow up in the outpatient clinic at the end of two weeks. Patients were advised to continue non weight bearing ambulation with a walker or axillary crutches for a period of six weeks. However in patients who had other associated injuries, ambulation was delayed or mobilized on a wheelchair

The Plaster slab or cast was removed at the end of 6 weeks. Check x rays were done at six weeks. Presence of callus and status of the joint was noted. The patients were started on active ankle mobilization. Patients with syndesmotic screw fixation were admitted on a day care basis and the syndesmotic screw was removed. Partial weight bearing was stared with support. Weight bearing was decided on the basis of the X-ray picture. Patients were followed up at 3 months and 6 months.

The patients were evaluated as per the rating of the Weber's criteria which included objective criteria, subjective criteria and Radiological evaluation. These were graded into good, fair and poor categories

The objective criteria included the movements of the ankle joint and subtalar joint function together which was deemed good when the rating was 0-1, fair when the rating was between 2-4 and poor when it was 5 and above. The subjective criteria involved the rating of pain, walking and return to activity. Theses were graded as good when the rating was 0-2, fair when it was between 3-6 and poor when it was above 6.

The radiological rating was good when it was 0, fair when it was 1-2 and poor when it was 3 and above.



PREOP X RAYS OF BIMALEOLAR FRACTURE

POST OP X RAYS OF BIMALEOLAR FRACTURE

OBSERVATIONS

This study was done on patients admitted at AVBRH Sawangi, Wardha who were surgically managed and internal fixation was done for fracture fixation. This study was done on patients admitted between 2015 March and 2017 September.

Table depicting sex incidence in different age groups

Age in Years	No of patients	%	Male	%	Female	%
21-30	30	50%	28	66.60%	2	11.10%
31-40	10	16.60%	6	14.20%	4	22.20%
41-50	8	13.30%	6	14.20%	2	11.10%
51-60	6	10%	0	0	6	33.30%
61-more	6	10%	2	4.76%	4	22.20%
Total	**60**		**42**		**18**	

Maximum number of patients in our study ranged between 21-30 years and males were predominant.

Mechanism of injury as per Lauge Hansen classification: Depicting incidence of fractures depending on the mechanism of injury

Type	No of Patients	%
Supination Adduction	12	20%
Supination External rotation	24	40%
Pronation Abduction	2	3.30%
Pronation External rotation	20	33.30%
Pronation Dorsiflexion	2	3.30%

Supination – External rotation injury was the most common mechanism of injury in our study as per Lauge – Hansen's classification comprising upto 40% of the total number.

Pre operative Kristenson's radiological criteria: Depicts pre operative radiological grading of fractures

Kristenson's grade	No of Patients	%
Poor	22	36.60%
Fair	34	56.60%
Good	4	6.80%

Radiologically 56.6% patients were in the fair group according to Kristensons's radiological criteria pre-operatively.

Post operative kristenson's radiological criteria: Depicts post operative radiological grading

Kristenson's grade	No of Patients	%
Poor	0	0%
Fair	20	33.4%
Good	40	66.6%

Kristenson's grading

Post operatively all the patients were evaluated as per ***Kristenson's*** criteria and the results were as shown above 66.6% of patients had good results, 33.3% had fair results and none had poor results.

The cases after discharge were followed up at two weeks, six weeks, three months and six months and at the end of one year regularly. The minimum period of follow up was six months and maximum was thirty months. The average time for fracture union was six months.

The complications encountered were delayed wound healing and dehiscence in 6 patients. The wounds of four patients healed at three weeks with regular dressings. 2 patients required split skin grafting due to skin necrosis. Those who required SSG were the ones who had fracture dislocation.

One patient with DCP fixation of the fibula was noted to have a long screw with intra-articular extension. It was replaced at six weeks with a shorter screw before range of motion exercises of the ankle was instituted.

Final outcome of the study as per Weber's criteria:

Depicts the percentage of the results based on Weber's criteria

	GOOD	GOOD	FAIR	FAIR	POOR	POOR
SUBJECTIVE	30	50%	24	40%	6	10%
OBJECTIVE	32	53.30%	26	43.30%	12	3.40%
RADIOLOGICAL	40	66.60%	16	26.60%	4	6.80%

All the patients who had good results returned to normal activity and had regained their full ankle movements by the end of three months. Those patients with fair results complained of swelling which was noticed towards the end of the day and would respond to rest. Associated pain was related to activity.

DISCUSSION

The fractures of the ankle are injuries seen in the young and middle aged patients commonly. The mean age in our series was noted to be 36 yrs with a male predominance of 66.6%. Sex distribution in our study showed a male preponderance compared to other studies. Mean age in our study was comparable to other studies. Weber's Type B fractures consisted of 53.7% The findings were similar to those of Leistal and Freibrug. The most common mechanism of injury was Supination-external rotation injury with 40% incidence. The findings were similar to observations of Roberts S R, Beris et al. The commonest mode of injury was Road traffic accident. The findings were similar to observations of Lee at el.

There was a wide spectrum of co-morbidities in these patients. 36.6% of the patients had poor, 56.6% had fair and 6.8% had good Kristenson's radiological criteria preoperatively. Post operatively 66.6% of patients achieved good results and 33.4% achieved fair results. In the final score as per ***Weber's*** criteria, the objective signs and subjective symptoms were noted and compared with the radiological criteria. All the comparisons were made once the fractures united and at later follow ups. The results of the treatment is as shown in table 8. The results of other studies were compared with our final outcome. This was divided into 2 groups of excellent and poor results in each of the fracture types

ANALYSIS

60 patients were included in this study with closed ankle fractures that were surgically treated as AVBRH sawangi Meghe by various surgeons with various techniques of internal fixation.

The classifications, review of literature, methods of investigations and management have been enumerated. The Study had a male preponderance of 66.6% with road traffic accidents being the major cause of injury. Supination external rotation was the most common mechanism of injury and Weber's type B fractures were the most common type of fracture. The associated fractures and injuries noted and the co-morbidities seen in these patients have been enumerated.

Open reduction and internal fixation under image intensifier control was done in all patients. Post operatively patients were immobilized with a plaster splint for a period of six weeks and were followed up with full weight bearing walking and active range of movement of ankle exercises.

The final outcome as per the Weber's radiological criteria was 66.6% good, 26.6% fair and 6.8% poor result which showed good correlation between the immediate post operative radiological score and the final radiological outcome. Objective and subjective findings were also comparable.

RESULT

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. During surgery, the soft tissues dissection was kept minimal to avoid further vascular compromise in an already tense, swollen ankle. 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 crutches or 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.

Most of the fractures in our study were fixed within 24 hours which however did not change the final 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 delayed wound healing and superficial infections of the wound which mostly healed with regular wound care.

The six 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. The result of this study in comparison with other studies as enumerated shows similar findings with respect to the functional outcome following surgical stabilization of bimalleolar fractures. The rarity of complications in comparison to other studies may be due to a small number of patients and a very short period of follow up.

Our study used Lauge Hansen's classification for mechanism of injury and Weber's classification for radiological classification. We recommend use of Weber's classification for management which is easier for classification and radiological assessment.

CONCLUSION

Our series encourage operative intervention within 24 hours in the management of bimalleolar fractures of the ankle as the key for high percentage of good result.

Early treatment without delay, anatomical reduction and fracture fixation, stringent postoperative mobilization and rehabilitation should help improve outcome in an operated ankle fracture. Immediate open reduction and internal fixation in ankle fractures yield good results in terms of anatomical reduction, stability and Post Op functional return. Early return of ankle movements Post OP with proper rehabilitation improved functional outcome. After a year of surgery, most patients experience little or mild pain and have certain restrictions of functional activities.

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